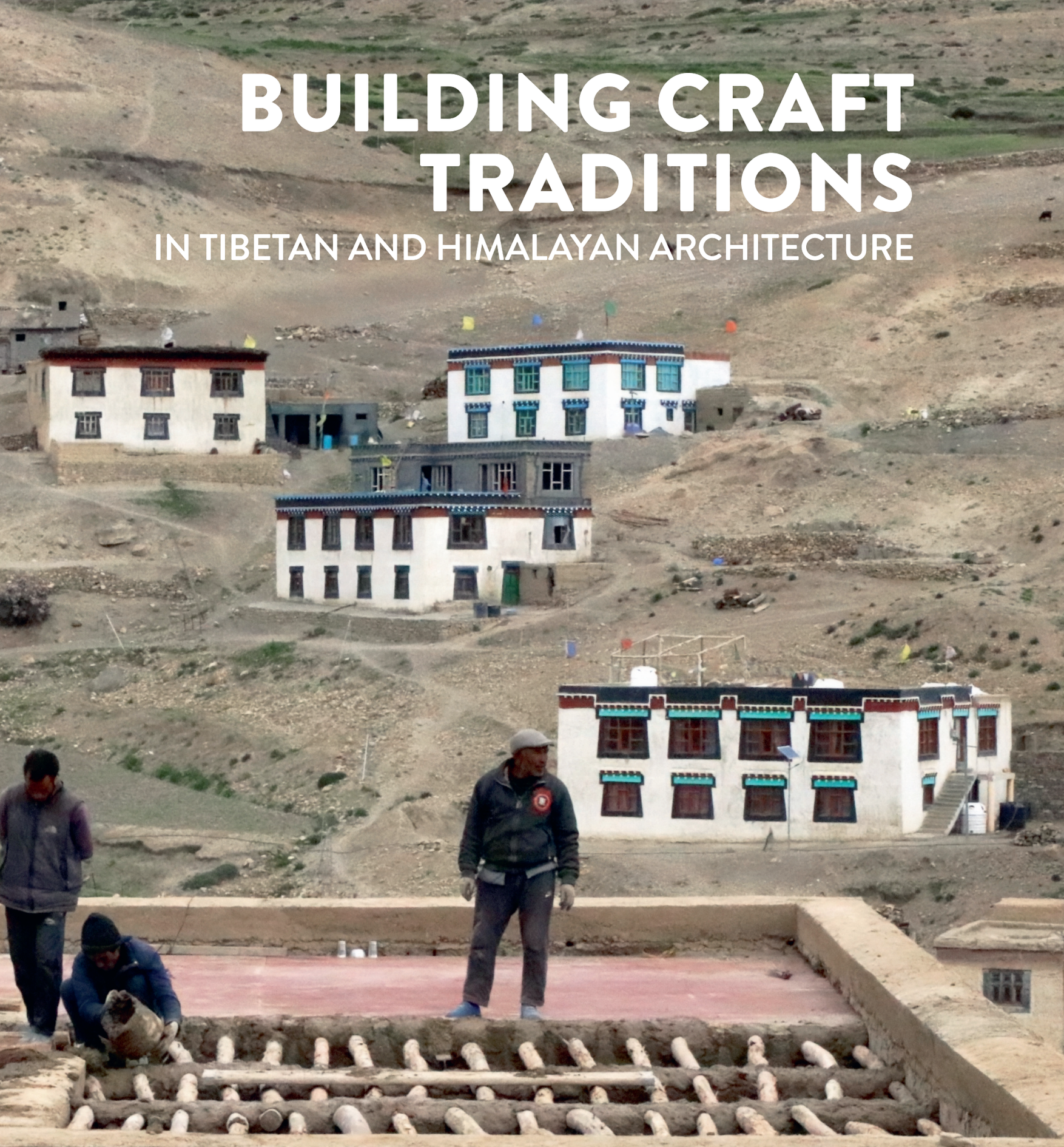
BUILDING CRAFT TRADITIONS

IN TIBETAN AND HIMALAYAN ARCHITECTURE



Edited by Hubert Feiglstorfer and Calum Blaikie

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Rammed earth house construction in Kibber in Spiti, India.

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Language Policy

The chapters in this volume concern various parts of the vast Tibetan plateau and Himalayan regions, encompassing speakers of several different languages and dialects thereof. The contributing authors have differing levels of linguistic competency and utilise local language terms to varying degrees in their chapters, while generally limiting this to key words for which suitable English translations are not available. For these reasons, each chapter follows its own language policy and no single convention for rendering non-English terms applies to the entire book. In most chapters, non-English words are phonetically transcribed, while in some cases simplified phonetics are accompanied at first usage by standardised transliterations according to the language in question (e.g., Wylie for Tibetan). Non-English scripts appear only in the concluding chapter, where a comparative analysis of key terms in Tibetan, Dzongkha, Hindi and Chinese reveals some of the benefits and challenges of thinking and writing about building craft traditions across linguistic and cultural frontiers.

A

Table of Contents

A

Table of Contents

Table of Contents 2

B

Introduction

Calum Blaikie and Hubert Feiglstorfer

Introduction 13
Buildings, building, and builders 16
- Rural areas 16
  - Tents 16
  - Farmhouses 19
  - The *kath-khuni* architecture of Himachal Pradesh 19
  - Rural houses and building crafts in Bhutan 20
  - Wooden houses in eastern Tibet 21
- Urban zones 23
  - Urban Bhutan 23
  - New earthen architecture in Ladakh, India 24
  - Concrete in Sikkim, India 25
  - Renovation and adaptive reuse of a Ladakhi townhouse 26
- Religious buildings and prominent structures 28
  - Rebuilding a *stupa* in central Tibet 28
  - Earthquakes and the tiered temples of the Kathmandu valley 29
  - Building craft traditions of the Kathmandu valley 30
  - Bhutanese *dzong* as "propelling monuments" 32
- Material components and decorative features 33
  - *Arga* roofs and floors in Tibet and beyond 33
  - Material mimesis and craft simulation in early Tibetan Buddhist temples 34
  - Marouflage wall paintings in Bhutan 36

Approaching building crafts 37
Bibliography 39

I

The Black Tent: Construction, Use, and Transformation among the Nomadic Pastoralists of Eastern Ladakh

Monisha Ahmed

Locating Changthang 48
Textiles and weaving in Ladakh 50
Origin of weaving in eastern Ladakh 53
Weaving the threads of life 55
The tent 57
The structure of the tent 58
The white tent 61
Spatial organisation within the tent 62
Separation and formation of new tents 64
Settlement patterns within the campsite 65
Transformations in nomadic life 66
Tents in eastern Ladakh today 67
Bibliography 69

II

Kath-khuni Architecture of Himachal Pradesh: Continuity, Change, and Challenges

Jay Thakkar and Mansi Shah

Introduction 73
Kath-khuni construction practice: craft tradition and sustainability 75
Sustainable and resilient features of *kath-khuni* architecture 78
- Structural resilience 78
- Energy-efficiency and climatic resilience 78
- Resource efficiency 79
- Built form and everyday usage 79
- Low maintenance and resource reuse 79

Local materials, craftspeople, and artistry 81
- Craftspeople and their artistry 83

Current practices in Himachal Pradesh and the decline of *kath-khuni* 86
- The emergence of industrial material and decline of local materials 87
- Lifestyle changes and visible impact on spatial requirements 87
- Breakdown in knowledge transmission 87

The way forward — Adaptation and continuity 89
Conclusion 90
Bibliography 91

III

"Making" in Contemporary Bhutan: Balancing on the Cutting Edge of Culture Transfer and Culture Rupture from the Perspective of the Thirteen Traditional Crafts (*zorig chusum*)

Marc Dujardin

Introduction 95
Bhutan's contemporary dwelling culture: built summary of diverging space definitions 96
Drukpa architecture as a cultural force: Bhutan's morpho-typological palette 97
The reproduction of concepts: Bhutan's three-tiered world (*Lha Tsen Lu Ragsum*) 98
Thinking, shaping, and making in Bhutan: nation building along the Eastern Himalayas 100
Thirteen-a-dozen: Bhutan's 13 traditional crafts in a nutshell 103
Traditional timber architecture in contemporary Bhutan: practising the *shing zo* art 104
The house of Sangay Dorji at Begana: the *zorig chusum* activated 106
- Family history 106
- The initial planning 107
- Design issues 107
- The construction process and main stakeholders 107
- Role of the house builder, owner and patron 108
- Role of the master-builder woodwork (*shing zo lopon*) 108
- The role of the carpenter (*shing zope*) 109
- The role of the carpenter helper (*shing zo lagshep*) 109
- Role of the mason/stone dresser (*do zope*) 110
- Role of the unskilled labour force 110
- The actual cost of construction 110
- Description of the house 110

The "ruin-carnation" of Punakha Dzong: the *zorig chusum* re-activated 119
From *dzong* to farmhouse: Disseminating the *zorig chusum* v1.4 throughout Bhutan 123
Bhutanising Bhutanese architecture: The quest for cultural uniqueness institutionalised 125
Struggling between identity and difference in contemporary Bhutan: The 13 traditional crafts in jeopardy? 132
Towards a contagious stylistic decline of Bhutan's Art of Woodwork (*shing zo*): A case in practice 133
The traditional architecture guidelines: the *zorig chusum* as institutionalised "cosmetic" description and prescription 138
Dzong reconstruction as hybrid "Makers Lab": Bhutan's 13 traditional crafts upscaled 140
Epilogue 142
Bibliography 145

IV

Contemporary Homes in Eastern Tibet

Anna Wozniak

Introduction 149
Study site 150
Forest resources in eastern Tibet 150
Recent developments 152
Households in the rural communities of Drango 154
Rural income and costs of building a new house in the 2010s 155
Construction principles and significant changes to contemporary house design 156
Process of house construction and role of craftspeople 162
Craftspeople in contemporary Drango 164
Concluding remarks 165
Bibliography 168

V

Back to Earth: Negotiating Tradition and Change in Ladakh's Building Tradition

Gawa Norboo, Martina Oeter, Alexandra Skedzuhn-Safir

Introduction 173
Ladakh and the new interest in earthen construction 174
Earth building tradition in Ladakh 174
Some considerations on tradition, nostalgia, and heritage construction 177
Ladakh: Back to Earth 177
The "Back to Earth" trend in Ladakh in relation to the worldwide revival of earth building 177
Local attitudes and practices 179
Analysis and evaluation of 2013 interviews 180
Analysis and evaluation of 2021 interviews 183
Concluding thoughts: New earthen building in Ladakh — Is the building tradition continued? 187
Bibliography 189

VI

Building Modernity in Sikkim, India

Duncan McDuie-Ra and Mona Chettri

Introduction 193
Situating concrete 195
Sikkim: Sustainable dependency 199
Concrete and tourism 201
Concrete and hydropower 204
Concrete housing 206
Conclusion 208
Bibliography 209

VII

The Munshi House: Restoration and Adaptive Reuse in Leh Old Town

John Harrison and Monisha Ahmed

Introduction 215
The Munshi House 216
The LAMO project 221
Repair and design philosophy 221
Labour 223
Materials 226
Establishing the LAMO Centre — The way forward 229
Conclusion 231
Bibliography 234

VIII

Stupa Thoughts, Occasioned by Building a *chörten* in Tibet

John Harrison

Introduction 237
The site 237
Tibet Heritage Fund 238
The Master Builder and the *stupa* design 239
Building the *stupa* 242
Conclusion 247
Interviews by the author and interpreter Nyima Tsering in Lhasa and region 248
Bibliography 248

IX

Why did the Tiered Temples Collapse in the 2015 Nepal Earthquake? A Scrutiny of the Traditional Built Heritage of the Kathmandu Valley, based on Experiences from Post-Earthquake Reconstruction

Sudarshan Raj Tiwari, Prem Nath Maskey, Hans Christie Bjønness and Tore Haavaldsen

Introduction 251
Historical development of tiered temple architecture 252
Material, craft and climatic response of the tiered temples 254
Temple building crafts — evolving in the environment of earthquakes 255
Tradition of cyclical maintenance, repairs, and renewal 258
Observation and response to the Gorkha earthquake 259
Individual building research and reconstruction response 261
Major case: Kasthamandap (2018–2021) 261
Minor case: Nyatapola (2020–2021) 266
Minor case: 55 Windows Palace (2003–2009) 268
Minor case: Panchamukhi Hanuman (2015–2018) 270
Conclusion through cross-case comparison 273
Recommendations — Towards an indigenous strategy 275
Bibliography 279

X

Building Craft Traditions in the Kathmandu Valley: Challenges, Transformation, and Continuity

Kai Weise and Anie Joshi

Introduction 283
The earthquake emphasises the need for traditional building craftspeople 285
Traditional building craftspeople and their role in ensuring the continuity of tangible and intangible heritage 287
Damaged monuments caused by inappropriate past interventions and lack of maintenance 288
Questioning the standard government reconstruction procedures 289
The challenges faced by building craftspeople 292
Safeguarding the culture 292
Ensuring livelihood and required procedures 294
Acknowledgement of the craftspeople and traditional knowledge 295
Transfer of knowledge and certification 297
Research and documentation 299
Getting organised 300
Conclusion 301
Bibliography 303
Webpages 304

XI

Arga Stone Roofs and Floors in Tibet and Beyond: A Material Trans-cultural Approach

Hubert Feiglstorfer and Martin Michette

Introduction 307
Historical background and prevalence of *arga* 308
Current activities in *arga* use 310
Risks to the *arga* technique 310
- Neglect of care and destruction 310
- Socio-economic reasons for declining *arga* use 311
- Climatic change 311

Specific material properties of *arga* 311
Social context, cultural idiosyncrasies and a reflection on craft modes 315
- Digging and determining the quality of *arga* 316
- Preparing the *arga* before ramming 316
- The clay below the *arga* 317
- Ramming 317
- Repairing cracks and material defects 320
- Burnishing 320
- Sealing the surface 321
- Maintenance 321

Further discussion 322
- Spread of knowledge on *arga* 322
- Summary of *arga* material culture 323

Looking beyond Tibet: Crafts showing parallels to Tibetan *arga* stone floors and roofs 323
- Research criteria 324
- *Opus signinum* and terrazzo 324
  - Historical background and material properties 324
  - Summary in relation to *arga* 327
- Flat earth roofs in the Eastern Mediterranean 327
  - Historical background and socioenvironmental context 327
  - Material properties, craft modes, and conservation approaches 329
  - Summary in relation to *arga* 330
- Cyclic maintenance of *banco* architecture in West Africa 330
  - Historical background, social context, and risks to the technique 330
  - Social context 331
  - Cultural idiosyncrasies and conservation approaches 332
  - Reflections on *arga* 333

Conclusion 333
Glossary on a variety of clays and their use in Tibet 335
Bibliography 336
Translation 339
Interviewees 339

XII

Material Mimesis and Craft Simulation: Textile Depictions and Questions of Trans-mediality in early Western Tibetan Buddhist Temples

Christiane Kalantari

Introduction 343
Historical context 345
Tabo ceiling paintings 346
Cloths as support of ceiling paintings in the early architecture of Tabo 346
Defining sacred space: on the relation of temples and textiles in India and in Tibet as reflected in textual sources 347
Silk, pearls, and precious metals — the ceilings above the Tabo sanctum and ambulatory 348
Intersections of woodcarvings, architecture and painting — The tri-partite passage 352
Textiles in the assembly hall (*'du khang*) 354
Some observations on Tibetan sartorial and craft traditions depicted at Tabo 360
Material mimesis, worldly representation and spiritual power in a Buddhist temple 361
Art for merit and meditation — Material simulation and art creation in a Buddhist temple 364
Conclusion 366
Bibliography 367

XIII

The Emergence and Contemporary Craft of Marouflage Wall Paintings in Bhutan

Karma Yeshey, Lan Pu and Joshua A. Hill

Introduction — The wall paintings of Bhutan 373
The technology of wall paintings 374
Marouflage wall paintings 374
Regional and global technological context 375
Historic marouflage 376
Survey 376
Wholesale change of existing decoration 376
Case 1: Dumtseg Lhakhang (0F, internal and external circumambulatories) and Kyichu Lhakhang (Dukhang) 377
Case 2: Tango Monastery (*utse* 1F, west chapel) 378
Repair or modification of structural support 379
Case 1: Tango Monastery (2F, east chapel) 379
Case 2: Dumtseg Lhakhang (ground floor) 379
Modification or enhancement of painting scheme 380
Case 1: Menchuna (side chapel) 380
Case 2: Family home of Khandro Sonam Pelden 380
Case 3: Dumtseg Lhakhang (ground floor external circumambulatory) 381
Diversity of canvas use 381
Case 1: Dumtseg Lhakhang (1F, outer wall) 381
Case 2: Tango Monastery (2F, east corridor) 381
Case 3: Kyichu Lhakhang 382
Case 4: Dumtseg Lhakhang (1F, inner wall) 384
Discussion 385
Contemporary production of marouflage wall paintings in Bhutan 386
Training and transmission 386

Legal/professional context 387
Contemporary methodology of marouflage wall paintings 387
Paint materials 388
Installation: Adhesion process 389
After completion 389
Conclusion — Continuity and change in marouflage wall painting 390
Bibliography 391

D

Conclusion: Characterising Tibetan and Himalayan Building Craft Traditions

Calum Blaikie and Hubert Feiglstorfer

Buildings, builders and building 397
Buildings and value 400
Buildings as material culture 402
Craft 404
Craft and technology 405
Craft, cognition and skill 406
Craft as "indigenous technical knowledge" 407
Critical craft 407
Tradition 408
Craft traditions in flux 410
Identity, organisation and transmission 411
Communities of practice 414
Vernacular architecture and building craft traditions 415
Cultural heritage, conservation, and craft 418
Tentative conclusions and avenues for further research 421
Bibliography 424

E

List of Figures

List of Figures 434

B

Introduction

Calum Blaikie and Hubert Feiglstorfer

Name: Hubert Feiglstorfer
Designation: Senior Researcher
Affiliation (Institute): Austrian Academy of Sciences (Institute for Social Anthropology)

Name: Calum Blaikie
Designation: Researcher
Affiliation (Institute): Austrian Academy of Sciences (Institute for Social Anthropology)

Biography

Hubert Feiglstorfer

holds a Diplom Ingenieur in Architecture from the Vienna University of Technology (TU Wien), and two PhDs in Architectural History and Clay Mineralogy from the TU Wien and the University of Natural Resources and Life Sciences in Vienna (BOKU) respectively, where he also teaches in the fields of vernacular architecture and earthen architecture. In 2019, he concluded his habilitation at the TU Wien in the field of vernacular architecture. Targeting an interdisciplinary approach in applying technical, material and ethnographic research methods, he is working at the interface of construction technology, architectural history, architectural anthropology and material culture. As principal investigator, he currently leads research projects in the fields of sacred space and ritual topography, and climate and transformations of vernacular architecture. Recent journal and book publications focus on sacred and ritual space in the Western Himalayas and building craft traditions in Tibetan and Himalayan architecture.

Calum Blaikie

holds an MSc in International Development from the School of Oriental and African Studies (University of London) and a PhD in Social Anthropology from the University of Kent. Working at the interface of medical, economic and environmental anthropology, his research mainly concerns Sowa Rigpa (Tibetan medicine) in Himalayan India and Nepal. Recent journal and book publications focus on the artisanal production of Tibetan medicines, the integration of Sowa Rigpa into Indian state structures, the industrialisation of Asian traditional medicine, and the contemporary dynamics of Himalayan building craft traditions, including *Asian Medical Industries: Contemporary Perspectives on Traditional Pharmaceuticals* (Routledge 2022, co-edited with Stephan Kloos) and *Crafting Potency: Sowa Rigpa Artisanship across the Himalayas* (HASP 2025, co-authored with Barbara Gerke, Jan van der Valk, and Tawni Tidwell).

INTRODUCTION

The Tibetan plateau and Himalayan regions[1] cover a vast geographical area, encompassing enormous environmental, biological, and cultural diversity. As sites of extensive trade, cultural and religious exchange, competition and conflict, they have also long constituted "contact zones" between the peoples and civilizations of China, India, Tibet, and Central Asia. These patterns of diversity and interaction are reflected in the rich array of building types, forms and styles that can be found in villages, hamlets, towns, and cities across these regions. The most well-known buildings include grand edifices such as the Potala Palace and Jokhang in Lhasa, the multi-tiered temple complexes and urban ensembles of the Kathmandu Valley, and the network of Tibetan Buddhist monasteries that extends across the plateau and along the Himalayan belt from Ladakh in the west, through Nepal, Sikkim, and Bhutan to Arunachal Pradesh in the east. Less prominent—but no less important—are the myriad farmhouses, townhouses, mosques, markets, temples, and shrines that form much of these regions' built environment and remain crucial to the daily lives of the population. (Fig. B-1)

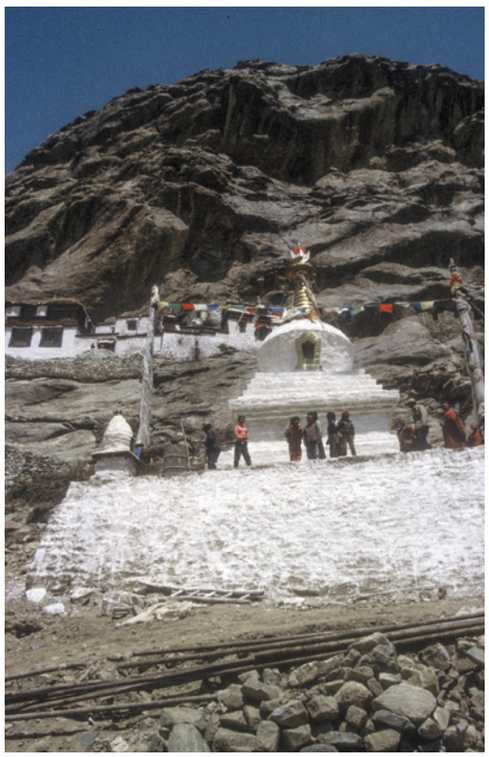


Fig. B-1 Completing work on a rebuilt stupa with Sang Yak Drak nunnery in the background (Central Tibet, PRC).
Source: John Harrison (2000).

There is a rich body of scholarly literature published in European languages examining various aspects of architecture and building in these regions. Much of this work explores the historical development of architecture, the positioning and role of buildings in sacred landscapes, or their relationship to social life, ritual practice, religious symbolism, and ecological conditions.[2] Another group of works focuses tightly on architectural styles, built forms, and structural features. Here we find detailed descriptions and illustrations of various building types, as well as discussion of the materials, components, and techniques involved in their construction.[3] A third set of publications explores the contemporary effects of modernity, urbanisation, and other transformative processes on local construction activities, tracing recent shifts in architecture and building practice in relation to broader patterns of socioeconomic, political, and cultural change.[4]

While these works offer many deep insights and provide important foundations upon which the current volume builds, the people and processes actually involved in constructing and maintaining these buildings remain relatively obscure. With some notable exceptions,[5] few studies have paid much attention to the builders and craftspeople who were (and are) crucial contributors to both the iconic and the ordinary architecture of the Himalayas and the Tibetan plateau. This means that we still know remarkably little about who these people are, how they are organised, how they learn and practice their crafts, or how they actually set about sourcing, processing, and transforming raw materials to produce, adapt, and maintain the built environment of these regions.

Alongside European-language studies there is a sizeable literature on architecture and construction-related topics published in the languages of our focal regions. For example, a large number of texts and manuals concerning architecture, carpentry, and construction are available in the Chinese language, such as the 12th century *Yingzao Fashi* and the 15th century carpenters' manual *Lu Ban Jing*, which remain important sources guiding the construction of domestic and farm buildings in the present day (Ruitenbeek 1993; Steinhardt 2019). Similarly, numerous ancient Sanskrit texts such as

1 This volume draws on examples from across the Tibetan plateau and the Himalayas. While recognising these as contiguous yet reasonably distinct areas in geographical terms, we note the many historical and contemporary interactions between them, as well as the fact that each region constitutes a patchwork of ethnolinguistic and cultural identities which do not neatly correspond to national and regional boundaries. All mentions of "Tibet" and "Tibetan" in this volume refer to the geographical area of the Tibetan plateau, which today forms part of the Peoples' Republic of China, as well as to the Tibetan-speaking peoples residing there.

2 Bernier (1989); Chayet (1988); Dujardin (2000b); Feiglstorfer (2011, 2014, 2016, 2017a,b,c, 2021a); Gray 2011; Gutschow (2011); Gutschow et al. (2003); Huber (1999); Jest and Sanday (1983); Jinpa et al. (2005); MacDonald (1997); Ramble (1996, 1997); RGB (2014); Singh (1999); Sørensen and Hazod (2005); Thakur (1996); Toffin (1991); Vanquaille and Vets (2003); Vergara and Béguin (1987).

3 Alexander (2005, 2011); Bernier (1989, 1997); Bhushan (2016); Bonapace and Sestini (2003); Dujardin (1997); Chayet (1988); Dave at al. (2013); Feiglstorfer (2009, 2011, 2012, 2014, 2016, 2017a, b, c, 2019, 2021b, in press); Feiglstorfer et al. (2024); Ferrari (2018); Handa (1994, 2004, 2006, 2008); Harrison (2019); Herrle and Wozniak (2017); Hughes (2000); Jest and Sanday (1983); Joshi et al. (2022); Khosla (1979); Larsen and Sinding-Larsen (2001); Singh (1999); Rautela et al. (2008); Tiwari (2009); Satish (2003); Schacher and Quaisar (2009); Weise (2012).

4 Belz (2012, 2013, 2015); Costello (2008); Dujardin (1994); Feiglstorfer et al. (2024); Grothmann (2011); Handa (2006, 2012); McDuie-Ra and Chettri (2020); Thakur (1996); Yeh (2008, 2013).

5 Alexander (2011); Belz (2012); Bonapace and Sestini (2003); Bhushan (2016); Dujardin (1990, 2005); Feiglstorfer (2016); Grothmann (2011); Handa (2006); Harrison (2019); Ronge (1978); Wozniak (2022).



Fig. B-2 Master carpenter teaching.
Master carpenter Laxmi Bhakta Rajchal proudly teaching his grandchildren the traditional craft of wood carving in Kathmandu, Nepal.
Source: Anie Joshi (2020).

the *Mānasāra*, *Viśvakarmaprakāśa*, *Mayamatam*, and *Samarāṅgaṇasūtradhāra* compile detailed measurements and practical guidelines for the construction of houses, temples, and other buildings. Various translations of, and commentaries upon, these old texts combine with more recent technical literature to ensure that traditional knowledge of Indian and Chinese architecture remains accessible and relevant today (e.g., Acharya 1927, 2010; Bhāṭṭācāryya 1963; Shukla 1993; Wu 1989).

Several recent Tibetan-language books describe the historical development and contemporary status of domestic and monastery architecture (Charigpa Lobzang Namgyal 2007; Khedup and Tenzin Phuntsog 1999; Sharyul Phuntsog Tsering 2007). Others draw upon older Tibetan texts and accumulated experiential knowledge to compile detailed technical and practical guides for the construction of various building types and structural components (e.g., Könchog Tenzin et al. 2010; Chö Phuntsog 2013). A number of publications in Dzongkha cover similar technical and historical topics (Chang Dorji 2004; RGB 2014), while others examine Bhutanese traditional craft knowledge and practice more broadly (Khenpo Phuntsho Tashi 2003).

These local language literatures offer a vast wealth of historical, descriptive, and technical information concerning architecture and construction techniques. However, because much of it is practical and applied in approach, it too tends to overlook the identities, training, and day-to-day activities of the craftspeople involved. Thus, both European and Asian language literatures leave many sociological, experiential, and processual aspects of craft-based construction in the shadows.

By placing craftspeople and their activities centre stage, the current volume takes some initial steps towards illuminating these lacunae. The authors identify the people, knowledge, skills, and practices involved in creating and maintaining the built environment of the Tibetan plateau and the Himalayas as constituting "building craft traditions". This is an intentionally broad and flexible concept that spans a wide range of activities such as carpentry, masonry and painting, various levels of engagement from master craftsperson to unskilled labourer, and the full array of building types from simple rural dwellings to elaborate monuments. We argue that those involved in constructing and maintaining these buildings form part of craft traditions that both reproduce and adapt themselves over time, constituting integral parts of their societies, cultures, and local identities while contributing a huge amount to the built environment of these areas. (Fig. B-2)

A set of basic questions provides starting points from which our investigation of these topics proceeds: What characterises building craft traditions in these regions? Who are the craftspeople and how do they identify themselves? What forms of knowledge and skill are involved, and how are they transmitted, learned, and applied? In what ways is construction work commissioned, organised and assessed? How are raw materials classified, sourced, transported, processed, and used? To what extent are these traditions connected to one another? How have they changed over time, and what factors are shaping them in the present day?

Building craft traditions do not fit comfortably within any one academic discipline and no single methodology or viewpoint would enable such questions to be answered in anything more than a partial manner. For this reason, this book takes a resolutely holistic and multidisciplinary approach, bringing together contributions from scholars trained in architecture and architectural history, anthropology, sociology, and art history, as well as applied fields of engineering, heritage conservation, and materials science. Although the primary focus is on the present day, several contributors are concerned with particular historical moments while others address change over specific periods of time. Each chapter offers a finely detailed fragment of a vast, complex picture that stretches out across space and changes across time. When compared, contrasted, and viewed ensemble, these fragments reveal a great deal about how and by whom the buildings of these regions were and are constructed, maintained, understood, used, and valued.

A holistic approach does not need to be comprehensive or exhaustive, or to account for the entirety of any craft or process. In this case, it encourages us to keep in mind that building always takes place at the intersection of material, technical, social, cultural, economic, and political processes, so cannot be adequately understood if reduced to any one of these fields, or approached as a discrete, isolated and bounded activity. As well as producing material objects within complex social contexts, craft-based construction activities engage with tacit, symbolic, discursive, and ideological dimensions (Paphen 2006; Handa 2006; Misra 2009). They are embedded within cultural frameworks, religious beliefs and ritual practices, as well as ethnic identi-

ties, social processes, and economic and political systems. Our collective approach aims to take into account the numerous factors that have shaped—and continue to influence—construction related decisions, activities, and outcomes in these regions. Fixed or relatively slow-moving features are important, such as topography, ecology and climate, sacred geographies and historical processes, as well as deep-seated cultural and religious influences. Interacting with these are a range of more dynamic factors such as economic and infrastructural developments, social and demographic change, new government policies and laws, changing fashions and emerging aesthetic sensibilities. Factors specific to the realm of construction also play key roles, such as shifting patterns of resource availability, the evolution of discourses and policies relating to cultural heritage, and the growing pervasiveness of new building materials such as concrete and corrugated iron. Each chapter in this volume examines how certain of these factors and processes intersect to shape building craft traditions and the artefacts they produce within particular spatiotemporal and sociocultural contexts.

The book as a whole reveals these building craft traditions to be complex and diverse, yet sharing sufficient commonalities to constitute a reasonably distinct and analytically useful category. It also sketches a promising field for future studies, which are urgently needed due to the considerable challenges that building craft traditions are facing across these regions as the 21st century progresses. While several chapters stress continuity and resilience when discussing these challenges, others highlight rupture and decline. Most reflect some combination of these processes and all contribute to making transformation and adaptation prominent themes of the book. The authors note decreasing demand for skilled, craft-based building services across many Tibetan and Himalayan regions, as well as declining social status and incomes for those craftspeople still able to secure work in this field. In the face of rapid urbanisation, socioeconomic change and the easy availability of industrially produced building materials, question marks are growing over the future of craft-based modes of construction. One of the main aims of this volume is to examine these challenges soberly and to chart the responses to them at various levels, while striving to avoid idealised notions of tradition or romanticised visions of the past.

This introductory chapter provides an overview of the main topics and arguments presented in the individual contributions. In so doing, it introduces the concept of building crafts traditions and briefly positions it within the wider literature. The concluding chapter of this volume then takes up some of the key themes and issues raised in the individual contributions, discusses how building craft traditions might be approached theoretically, and considers some of the debates surrounding different framings of them. It breaks down the components of the book's title and considers each from a range of perspectives, clarifying what we mean by "building", "craft", and "tradition" and thinking through the implications of bringing these terms together. The final part of the conclusion reassembles these components into a coherent object of study—Tibetan and Himalayan building craft traditions—before reflecting back on the framing questions posed above in search of tentative conclusions, areas of productive tension, and promising avenues for further investigation. By outlining ideas, questions, theories, and methods that could further illuminate these traditions beyond the scope of the current volume, the concluding chapter thus sketches a larger field of inquiry. The authors' backgrounds in social anthropology and international development (Blaikie), and architecture, architectural history, and clay mineralogy (Feiglstorfer) certainly influence the way we frame and approach this vast field. However, by including a broad range of sources and perspectives we strive to open these topics up to readers from different backgrounds, while laying the groundwork for productive and engaged research in the future.



Fig. B-3 Cluster of ancient buildings in Kanji village, Ladakh.
Source: Martina Oeter (2011).

BUILDINGS, BUILDING, AND BUILDERS

This volume is very much concerned with "buildings" in the noun form. It examines a wide variety of structures in terms of their location, form, design, scale, social role, and cultural significance, as well as the patterns of their use and the values assigned to them. However, the contributions mainly revolve around "building" as a verb, which encompasses all of the processes involved in planning, constructing, maintaining, adapting, and embellishing buildings. Our focus on building extends to include the identities, organisation, and social dynamics of the craftspeople involved in it in various ways.

In this section, we outline the location, form, and function of the buildings discussed in the individual chapters and introduce the craftspeople, materials, knowledge, and techniques involved. In addition to providing an overview of the book as a whole, this allows us to draw some initial connections between the case studies, the framing questions posed above, and the wider issues that are fleshed out in the concluding chapter. The overview follows the structure of the book as a whole, with sections focusing on rural areas, urban zones and religious settings, and a final part addressing material components and decorative aspects. This arrangement reflects the fact that buildings are always embedded in particular geographical, environmental, and social settings, which strongly influence the type, form, scale, and style of the structures built there. These factors in turn shape the way craft traditions develop, how they are distributed and practiced, and how they respond to change.

Certain raw materials, building types, and techniques are more prevalent in some zones than in others. Agricultural and pastoralist lifeways are spread across large numbers of villages, hamlets, and nomad camps, where tents and farmhouses are the main dwellings and other building forms are relatively limited. Towns and cities have greater population density, more diverse dwelling forms (such as apartment blocks and townhouses), and larger numbers of commercial and administrative buildings. Although rural and urban areas are often intricately related to one another, with people, resources, knowledge, and ideas moving constantly back and forth between them, we feel there are sufficient differences in terms of settlement structure, building type, and craft practice to merit their separation, so long as the many overlaps and interrelations between them are properly assessed. Religious buildings such as monasteries and temples exist in both rural and urban settings, but tend to have distinct forms, larger scales, and higher levels of decoration than ordinary buildings. They also generally involve larger and more diverse teams of craftspeople in their construction and maintenance, as well as carrying much higher levels of cultural and symbolic value, which justifies their separate treatment. The final overview section reflects the tight focus of several chapters on specific materials or techniques, which address similar issues to the rest of the book but demand a slightly different analytical approach. Thus, the structure proposes meaningful distinctions between rural, urban, religious, and material fields while anticipating significant overlap and interaction between them.

RURAL AREAS

Tents

The first chapter in this volume examines the black hair tents (Fig. B-4) used by the Changpa nomadic pastoralists of Ladakh, northwest India. Monisha Ahmed focuses on the history, symbolism, and practice of weaving crafts among Ladakhi nomads, as well as shedding light on tent construction methods and their changing use patterns. Although some might not consider tents to be "buildings" in the strictest sense, this chapter shows how they share many of the characteristics of rural houses: providing the main living space for entire families and a central point around which economic and social life revolves.[6] Nomads' tents contain many of the features found in Ladakhi farmhouses, such as a hearth and kitchen area, a family shrine, and clearly defined zones for the storage of different kinds of goods, for daily work activities and for sleeping. However, the fact that they also need to be light, portable, and durable enough to function as mobile dwelling structures brings a set of factors into play that are not shared with farmhouses. These lead to tents being made from much lighter materials than houses, to their smaller size, and to the more frequent maintenance they require. Ahmed shows how far from being simple objects with self-evident requirements and properties, black hair tents are complex assemblages of many ingenious and effective parts, technically optimised over centuries to provide comfort and security dur-

6 Based on research in Turkey and Iran, Cribb notes that nomad tents and farmhouses share many "virtually identical characteristics" (Cribb 1991, in Ingold 2000: 181). The main distinctions arise from the use of different materials and varying levels of durability and mobility, which in turn demand a particular frequency, order and intensity of construction and maintenance activities.



Fig. B-4 A black hair tent in Changthang, Union Territory of Ladakh, India.
Source: Monisha Ahmed (2006).

ing frequent movement through harsh, high-altitude environments.[7]

The early sections of Ahmed's chapter illustrate just how deeply embedded weaving and tent making are in the culture, society, and daily life of the Changpa nomads, citing many references to these crafts in myth, song and everyday expressions. Employing ethnographic material collected over many years, she traces intricate connections between tent making and kinship, socialisation and cultural reproduction, gender roles and household relations, religious and ritual practice. We learn how the size and constitution of each Changpa tent reflects the identity, status, and wealth of its owner. Families with larger herds have more wool available, and can make larger tents if needed. Those owning many yaks can weave their tent fabric purely from yak hair, as opposed to the less favoured yak-goat mix, or the all goat hair tents of families that lack yak altogether. Ahmed also shows how the spatial organisation of tents and their surroundings both reflect and instantiate social relations and roles, particularly concerning gender. With half of the tent designated as the male side and the other half as female, daily activities and interactions are structured in relation to established gender roles and associated social positions and values. As with houses, tents can thus be understood as primary agents of socialisation (Bourdieu 1977; Carsten and Hugh-Jones 1995), with their structure, layout, and functions playing central roles in the reproduction of Changpa individuals, household units, and wider groupings.

Many of the building crafts discussed in this volume operate as specialised trades or as optional, part-time activities, carried out in addition to core livelihood tasks. In contrast, Ahmed shows that the crafts associated with black hair tents are neither clearly defined trades nor occasional income generation activities, but rather practices engaged in continuously by almost every member of the community. These crafts are fundamental elements of nomadic life. How well they are learned and performed combines with other factors such as herd size, pasture access, and labour power to directly affect the comfort, wellbeing, and quality of life of each household, as well as indexing their wealth and social status. The chapter also notes how black tents are never truly "finished" because their constituent parts are continuously being repaired and replaced. They thus exist as "living" dwellings in a permanent state of decay and reconstitution, in which craft activities play a central role.

From Ahmed's perspective, making, maintaining, and living in black hair tents is inseparable from the dynamic ensembles of land, water, animals, plants, and humans within which these activities unfold. The concept of "dwelling" (Ingold 1993, 1995, 2000; Lenhard and Samanani 2020; Macnaghten and Urry 1998; Muir 1999) resonates here as it captures "the rich, intimate, ongoing togetherness of beings and things which make up landscapes and places, and which bind together nature and culture over time" (Cloke and Jones 2001: 651). A dwelling perspective focuses on emergent processes that unfold through interactions between numerous human and non-human components, showing nomad tents to be much more than simply mobile places of shelter.

Towards the end, Ahmed's chapter discusses the significant impacts of socioeconomic change in the Changthang and shows how these are affecting the form, size, production, and usage of black tents. As many nomadic groups increasingly rely on permanent tent encampments or established houses, as families divide in pursuit of diversified livelihoods and some give up nomadism altogether, the existential dependence on tents is reducing and the array of tent types required altering. The ready availability of mass-produced fabrics such as canvas is also resulting in some families adopting lighter but less durable "white" tent forms. Nevertheless, the chapter attests to the ongoing centrality of tents to nomadic lifeways in Ladakh, as well as to the continuing importance of the materials and crafts involved in their production to dwelling in harsh, marginal areas. Ahmed highlights the key part tents play in cultural reproduction, in the maintenance and expression of kinship and social relations, and in the full range of socioeconomic activities despite the many changes taking place.

7 For a detailed study of sociotechnical aspects of black hair tents in Tibet and beyond, see Feiglstorfer et al. (2024).

Farmhouses

With nomadic pastoralists largely occupying high altitude and ecologically marginal areas, settled agriculture and agro-pastoralism have long provided the main foundation of rural life across the Tibetan plateau and Himalayan regions. In villages and hamlets, various kinds of farmhouses were and are the main dwellings, forming the focus of family life, social relations, and activities, as well as central points around which agricultural work revolves. Several chapters in this volume examine the craft traditions involved in farmhouse construction and maintenance, focusing on Himachal Pradesh in India (Thakkar and Shah), on Bhutan (Dujardin), and on the eastern edge of the Tibetan plateau (Wozniak). Because these houses are (at least partially) built by their occupiers using manual labour and locally-available raw materials, without the use of detailed plans or construction professionals, they exemplify the concept of "vernacular architecture" (Asquith and Vellinga 2006; Frey 2010; Oliver 1997, 2003; Vellinga, Oliver and Bridge 2007). However, by highlighting change processes as well as continuity and by showing how innovative features and new materials have been integrated into farmhouses across the region, the authors challenge notions of "the vernacular" as an inherently static, bounded, locally preferred or ecologically sustainable mode of construction (Vellinga 2013). We see instead how farmhouses emerge at the intersection of longstanding localised traditions and evolving contemporary needs, as well as how they reflect the shifting availability of raw materials and the growing trend towards the use of imported products and techniques. As the chapter by Duncan McDuie-Ra and Mona Chettri shows for Sikkim, if people move to the cities in large numbers and those remaining in the villages elect to rebuild their dwellings in concrete and steel, traditional farmhouses can also reach a point of virtual disappearance. This observation highlights the precarious position of vernacular architecture and associated craft traditions across the region, bringing the other cases discussed in the volume into sharp relief.

The *kath-khuni* architecture of Himachal Pradesh

The chapter by Jay Thakkar and Mansi Shah offers a detailed and insightful study of the *kath-khuni* (Fig. B-5) architecture of Himachal Pradesh (India), as well as considering the reasons for its recent decline and the possibilities emerging for its continuation. The authors explain *kath-khuni* as a distinctive cator-and-cribbage technique based on interlocking layers of wood with stone infill, often used to build multi-storey structures that include extensive wooden balconies around the upper levels. For many centuries, *kath-khuni* has been the basis for the construction of farmhouses and granaries as well as temples and princely homes across the towns and villages of this region. These buildings are well adapted to the local alpine climate, remaining warm during the cold winters, with slate roofs able to resist the monsoon rains, and with sufficient ventilation and open spaces to remain pleasant in the heat of summer. The design of *kath-khuni* houses has evolved in relation to local needs, providing space for livestock on the ground floor, storage on the middle level, and distinct private and public living areas on the upper storeys. They are also resilient in the face of seismic events, due to the combination of energy-dissipating dry masonry with wooden frames, which allow for flexion without splitting.

Fig. B-5 Temple in Gavas village.
A living testament to the ingenuity and skill of the craftspeople who built it using traditional *kath-khuni* building techniques.
Source: Mansi Shah (2012).



Most *kath-khuni* construction was formerly led by families of hereditary *mistri* (carpenters who also work with stone) scattered across the region, who passed on their knowledge and skills through long apprenticeships. Because house owners and their kin, local priests, ritual specialists, and other community members are also involved throughout the construction process, the authors refer to *kath-khuni* as a "craft of the entire village". However, they also show how a host of factors has contributed to its marginalisation over recent decades. These include an increasing overall population, urbanisation, changing rural livelihoods that rely less heavily upon agriculture, tightening government regulations over the use of natural resources, and increasing access to new construction materials, which many now associate with modernity and progress.

While the authors are clear that these developments are placing the knowledge and practice of *kath-khuni* under significant threat, they document numerous adaptations through which new materials such as concrete blocks and bricks can be incorporated into the existing timber frame system. They also show how changing ideas about the best use of space and the need for modern amenities can be accommodated into new rural buildings without wholesale rejection of the *kath-khuni* model. These emerging hybrid forms offer possibilities for *kath-khuni* to adapt to changing user needs, patterns of resource availability, rural livelihoods, and social circumstances while retaining much of the aesthetic, seismic and thermal advantages of traditional *kath-khuni* houses (see also Feiglstorfer 2022). Such adaptations may enable at least some aspects of this remarkable craft tradition to survive in the longer term. The authors note that the tourism industry may have a part to play in the revitalisation of *kath-khuni*, and that its future might look brighter if college training courses in architecture, construction, and engineering were more inclusive of traditional techniques rather than focusing exclusively on modern materials and approaches.

Rural houses and building crafts in Bhutan

The chapter by Marc Dujardin draws together several themes from his extensive research into various aspects of Bhutanese architecture and building craft (Dujardin 1994, 1997, 2000a, 2000b, 2003, 2005). By focusing on the status and trajectory of the *zorig chusum* or "13 traditional crafts", and particularly that of *shing zo* (carpentry), the chapter offers a perceptive analysis of the precarious balancing act between continuity and rupture that characterises contemporary Bhutanese building culture. Rather than concentrating on any



Fig. B-6 RHP *rabsel* window frame. Erecting the *rabsel* window frame for the prototype improved traditional farmhouse at Paro, Bhutan (Rural Housing Project). All the components were assembled and tested onsite, fitting together perfectly without the use of nails or screws. Here, monks are preparing to ritually commission the *rabsel* before the last section of the timber framework can be lifted into position.
Source: Marc Dujardin (1989).

single building type or location, Dujardin traces the larger currents shaping building design and construction in today's Bhutan through the lens of the *zorig chusum*. He shows how *dzong* (monastery-fortresses), urban buildings, and rural architecture are transforming in relation to one another as well as to broader patterns of change. A key argument raised here is that far from being inherently static and conservative, architecture in the kingdom has long been dynamic and open to innovation, with "factors such as change, impermanence, ambiguity, tolerance, deconstruction, and reconstruction celebrated as exponents of Bhutanese traditionalism". The regular destruction of monasteries and *dzong* enabled the incorporation of new materials and design features during their reconstruction, which in turn propelled the adoption of similar innovations across the country, including in farmhouses, while maintaining a distinct and shared architectural identity. However, in the context of profound socioeconomic change and rapid urbanisation over recent decades, labour-saving shortcuts, new building materials and designs, and the increased use of professional contractors have undermined *shing zo* and other traditional building crafts to a degree that now threatens the fine balance between continuity and change that formerly distinguished Bhutan's building culture. (Fig. B-6)

A detailed account of the construction of one rural house during the late 1980s offers rich insights into the roles and activities of the craftspeople involved, while also providing a baseline from which the subsequent changes discussed in the chapter are traced. We learn how planning discussions between the homeowner and head carpenter allowed for the incorporation of design features garnered from various locations, as well as for structural decisions to be made that reflected the specific requirements the owner set for the building.

We learn about the team assembled to carry out the construction work, its constitution, responsibilities, duration and remuneration. This team was led by the head carpenter, who played the roles of project manager, foreman, architect, and woodwork specialist all at once, assisted by junior carpenters and stonemasons. We also see the contribution of a large unskilled labour force constituting kin, friends, and neighbours to the construction process, an aspect often overlooked in academic writings. Overall, this account sheds welcome light onto the "complexity, contingency and variability of traditional house construction" in the early stages of a period of rapid change, while reflecting on the subsequent trajectory of the 13 traditional crafts, to which we return in the sections below.

Wooden houses in eastern Tibet

The chapter by Anna Wozniak focuses on rural house construction on the eastern edge of the Tibetan plateau in Drango, Ganzi Tibetan Autonomous Prefecture, Sichuan (PRC), where relatively high levels of forest cover have enabled the emergence of largely wood-based building traditions. Contrasting starkly with other chapters in the volume—and indeed with much of the wider literature—the chapter documents the renewed vibrancy of local building craft traditions, notably carpentry and decorative painting, despite significant socioeconomic changes and the easier availability of imported building materials over recent decades. Key to Wozniak's argument is recognition of the fluidity and adaptability of building culture in this region, which allows for the incorporation of new structural elements, design features, and construction technologies while retaining a strong sense of local identity and cultural continuity. She shows how the economic and infrastructural developments of recent decades have seen significant increases in cash incomes for the people of Drango, much of which they have invested in farmhouse reconstruction. Wozniak notes how those who rebuilt their homes during the housebuilding boom of the 2010s pointedly eschewed the now abundantly available concrete, brick and steel, instead further embracing wood as their primary construction material. At the same time, houses were becoming major symbols of wealth and status, so families started competing with one another to create the most beautiful and comfortable wooden houses. (Fig. B-7)

In this context, new houses were built largely in tune with longstanding plans and designs, but with more extensive use of wood, larger overall dimensions, and the incorporation of innovative structural features such as the hipped roofs borrowed from lowland Han Chinese houses. They also tended to include far larger and more elaborate interior decorative wall paintings than was formerly the case. One result of these combined trends has been the significant revitalisation of the crafts of carpentry and painting. Both are now considered respectable and lucrative trades, attracting large numbers of young people who learn them through apprenticeship with experienced craftspeople. Training in this context allows

for both the passing on of time-tested knowledge and skills, as well as the instantiation of new ideas and innovative techniques.

Recalling the work of Trevor Marchand (2006), Wozniak notes the importance of the transmission of social and verbal skills alongside craft techniques during apprenticeships, as the ability to negotiate with clients effectively during planning and implementation phases are considered crucial aspects of building craftwork. Wozniak's contribution deftly shows the intertwining of building craft traditions with social change, infrastructural development, and government policy. She notes how unhelpful it is to tie building crafts to notions of tradition as inflexible and brittle, because under the right circumstances they are clearly able to adapt to prevailing conditions while maintaining a strong local grounding. As Wozniak puts it: "This renegotiation of 'tradition' by the craftspeople has created an architectural mode that responds to the changing needs and aspirations of its inhabitants, while remaining an important expression of eastern Tibetan cultural identity." She points to the possibility of a bright future for vernacular architecture and associated craft traditions in this region, so long as they are able to continue successfully combining traditional materials, styles, and designs with modern tools and innovative features and, crucially, can maintain access to sufficient raw materials. Government policies are key here, as they must allow for continued use of forest resources and for building regulations that are inclusive of such materials and the techniques associated with them. Echoing Thakkar and Shah (this volume), Wozniak points to the lack of formal training opportunities in construction related fields as a major limiting factor. Local building crafts could be even stronger if young people were able to study construction and engineering in a manner that included the use of natural raw materials and traditional techniques, and which enabled them to better integrate plumbing, heating, and electrical systems into wooden houses in future.



Fig. B-7 Timber logs ready for house construction, with one partially constructed and one newly completed house in the background, Drango, PRC.
Source: Anna Wozniak (2016).

URBAN ZONES

Several chapters in this volume focus on buildings situated in towns and cities. A common thread running through these contributions is the huge impact that urbanisation processes are having on construction activities across the Tibetan plateau and the Himalayas in recent times. There are a number of large settlements within this region that have long histories and have played important roles at local and regional levels for many centuries, notably Lhasa and Kathmandu. However, there is no question that towns and cities have become increasingly central to economic, political, and social life over the last century or so, nor that urbanisation processes are accelerating across much of the region and look likely to continue to do so for the foreseeable future (Tiwari et al. 2018; Yeh 2013). Serving as home for a growing proportion of the population and as centres of economic and cultural activity, towns and cities have become powerful symbols of modernity and progress as rural life has become associated with poverty and backwardness. As this part of the book clearly shows, cities are now playing a major role in the transformation of building cultures across the region, although not always in straightforward, predictable or consistent ways.

Marc Dujardin highlights the rapid growth of Thimphu since the 1960s as a major contributing factor in the reorientation of architecture in Bhutan, setting up a "tension field" between the distinct figures of village and city, with significant implications for the overall trajectory of traditional building crafts. Duncan McDuie-Ra and Mona Chettri connect the massive expansion of concrete use in Sikkim over recent decades with the political project of integrating this border region into India, which has resulted in enormous changes to the built environment in both towns and villages. Gawa Norboo, Martina Oeter and Alexandra Skedzuhn-Safir examine the global "back to earth" trend towards the use of modified earth materials as manifested in contemporary Ladakh, showing it to be a phenomenon largely restricted to wealthy, urban sections of the population. Finally, John Harrison and Monisha Ahmed document the recent renovation of the Munshi House in Leh (Ladakh), providing insights into the current status of building craft traditions in the region as well as a positive case study in conservation as adaptive reuse. Each of these contributions sheds light on the dynamic role that cities are playing in the reconfiguration of construction activities and the changing status of traditional building craft communities, while drawing out regional specificities and localised responses that resist simple categorisation.

Urban Bhutan

Marc Dujardin's chapter traces the profound effects of urbanisation upon the architecture of Bhutan, while keeping in view the cycles of destruction, renewal, and modification that have for centuries given impetus to the evolution of the kingdom's building culture. Between the 1960s and the present day, Thimphu has been transformed from a small, sleepy town into a bustling city home to almost half of Bhutan's population. Dujardin shows how the early years of Thimphu's rapid growth saw the widespread demolition of old buildings and their replacement with multi-storey structures made largely from concrete and steel. As migrants poured in from other parts of the country, some built large houses inspired by designs from their home regions, but used larger amounts of imported building materials and subdivided them into flats in a marked divergence from their initial constitution, form, and function. Others found accommodation in purpose-built residential blocks or the flats included in commercial developments, as the largely uncontrolled construction boom continued apace. It was only from 1980s onwards that government agencies started making serious attempts to control this construction "tsunami" through design guidelines and building codes. During this period, cultural preservation also emerged as a key issue in Bhutanese politics and public discourse. However, efforts to control urban development and ensure the maintenance of cultural identity through building codes amounted to little more than "facade control guidelines". These forced new buildings to look like traditional timber architecture, yet behind the facade lay cheapened, simplified, and denuded forms, paying only lip service to the once unifying craft of *shing zo* (nail-less timber architecture). (Fig. B-8)

Dujardin shows how this urban-led trend towards cheap imitation of traditional designs was in certain ways encouraged by the reconstruction of the *dzong* at Thimphu (1960s) and Punakha (1990s), but simultaneously offset by the involvement of large numbers of traditional craftspeople in these projects. These workers had the opportunity to experiment with new materials and methods, while retaining a strong grounding in traditional crafts and a distinctly Bhutanese architectural and

Fig. B-8 A contemporary construction site in Thimphu, Bhutan. Components of Bhutan's outstanding timber architecture are cheaply copied and incorporated into new buildings as functionless, formalistic additions, entirely omitting traditional craftsmanship and its toolbox of the 13 traditional crafts. Source: André Loeckx (2013).



stylistic palette. He also shows how recent decades have seen Bhutanese nationals gaining higher levels of education and expertise in architecture, engineering, planning, and related disciplines, often overseas. This new generation is now taking up positions in governmental agencies, bringing greater interest in traditional architecture and building crafts as well as greater awareness of their imperilled condition. This new awareness is reflected in official planning documents, which pave the way "towards a more plausible, comprehensive, and culture-geared approach" in which the *zorig chusum* retain at least a place at the table. Combined with the ongoing reconstruction of Wangdue Phodrang Dzong, to which we return below, such developments bring some hope for the revitalisation of Bhutanese building craft traditions and some impetus for their involvement in a more sensitive, and less generic, approach to urban architecture in the future.

New earthen architecture in Ladakh, India

Gawa Norboo, Martina Oeter, and Alexandra Skedzuhn-Safir assess the transformation of architecture and building culture in contemporary Ladakh by focusing on local interpretations of the global "back to earth" trend. They are particularly interested in what this movement can reveal about the "connection between the search for identity and a sense of tradition on the one hand, and worldwide trends towards ecological building, sustainability, earthquake safety and comfortable, scientifically-proven building materials on the other". The chapter firstly considers the long-standing environmental and social conditions that gave adobe and rammed earth such a central role in Ladakhi building craft traditions. It then shows how from 1970s onwards, Ladakh emerged from a period of relative isolation into a new era of tourism, infrastructural development, and socioeconomic change. With the influx of modern construction materials and cheap, non-local labour, many buildings in Leh town were built or rebuilt in a generic, modernist style, often lacking even a trace of traditional Ladakhi architecture. These new building styles, materials, and practices gradually diffused out from the city to the villages, as earth increasingly came to be seen as a poor construction material, associated with poverty and backwardness. The central part of the chapter then examines technical and practical aspects of the recent introduction of "stabilised earth products",[8] as well as local discourses concerning them.

The authors find the use of new earthen materials to be largely an urban phenomenon, driven by wealthy locals and incomers from

8 This term refers to a range of building materials (mainly in brick or block form) that combine earth with industrial stabilising agents such as cement.



Fig. B-9 Rammed earth construction site in Choglamsar, Ladakh.
Source: Gawa Norboo (2021).

other parts of India, but far too expensive for the vast majority of Ladakhis. Drawing on interviews with building owners and craftspeople, they show how this trend reflects emerging cosmopolitan aesthetic sensibilities, global moves towards ecological sustainability, the search for materials with better thermal properties than concrete, and the preference of tourists for traditional characteristics, as well as genuine wishes to revitalise historical building traditions. The authors note the emergence of new forms of craft knowledge and skill arising from the use of these adapted materials, but argue that this should be understood as an emerging field rather than the revitalisation of an existing tradition. They argue that current developments may even serve to further undermine traditional earth-based building crafts rather than to revitalise them. They also question the ecological and structural arguments that accompany the global "back to earth" movement, concluding that the structural benefits of modified earth products are limited and the claims to sustainability spurious, given that imported industrial additives are needed and such products cannot be reused or recycled as traditional earthen materials can.

The conclusion of the chapter offers a nuanced analysis. It suggests that a rigid understanding of tradition would result in a picture of earth building traditions in Ladakh as hopelessly denuded, with the "back to earth" movement representing little more than a case of facadism and alignment with elite fashion. However, "if we accept that tradition has always been a process of negotiation between proven concepts and new promises, we might rather see evidence of the emergence of evolving, hybrid traditions that occupy particular social, economic and physical spaces in a constantly changing socio-technical and cultural context."

Concrete in Sikkim, India

Moving eastwards to Sikkim, Duncan McDuie-Ra and Mona Chettri take a very different approach to understanding urbanisation and theorising architectural change by placing concrete at the centre of their analysis. They argue that "as distinctions between urban and rural dissolve across the Himalayas, concrete characterises the transformation of these landscapes and the assemblages that hold them together." This forces us to confront the extent to which the built environment is entangled in larger political, economic, and social processes, and to accept that such entanglements may, under certain conditions, result in the almost total dissolution of building craft traditions.

Following Sikkim's formal merger with India in 1975, concerted efforts were made to establish political connections and extend economic networks, while deepening the region's dependency on India. The extensive use of concrete became key to the integration and management of this geopolitical frontier zone with China, Bhutan, and Nepal, as well as to Sikkim's transformation into an economically productive area in terms of tourism, hydropower, and urban development. McDuie-Ra and Chettri argue that concrete is "central to the way development is conceived and enacted in Sikkim and offers a critical reading of the ways landscape is imagined, reproduced and politicised." They show how concrete materialises people's aspirations for a better life, allowing them to leave behind the images of poverty and backwardness associated with traditional housing forms and to invest in buildings that demonstrate Sikkimese modernity, while generating income in the form of rent. They also show how concrete has become an integral component of Sikkim's political culture and economic activity, further entangling it within India and "producing a loyal border state out of a recently independent polity".

In stark contrast to the other contributions, building craft traditions are entirely absent from this account. However, by focusing tightly on why, how and by what these traditions have been replaced, we gain a clearer understanding of the factors contributing to their general decline. We see how concrete has become the preferred construction material because it is "inexpensive, extendable (vertically), impermeable (by rain), earthquake resistant, and a sign of status, of modernity, and of urbanity, even in rural or semi-urban areas." We see how concrete is at once modern and low-tech, cheaply available and thus democratic. It can be used for vast infrastructure projects but can also be mixed on a small scale in remote places, and precisely because it does not require skilled craftspeople to apply it, migrant manual labour can be employed to build with it cheaply. The authors argue that status and wealth in Sikkim are signified by ownership and rental of new concrete buildings, whereas "traditional" houses are read as signs of a lack of capital rather than as conscious efforts at maintaining heritage. Versions of "traditional" houses are still being built, but using imported labour instead of local craftspeople and concrete in place of wood, earth,

and stone, or through the combination of old and new elements. However, the overriding image that emerges from this chapter is of unfettered urbanisation and vertical expansion; of multi-storey concrete buildings pushing upwards and overhanging their footprints, with the uppermost floors left unfinished so further levels can be added in future. (Fig. B-10) Concrete thus announces, demonstrates, and facilitates modern economic activities and social relations, notably political integration and dependence, capitalism, commercial resource extraction, and domestic tourism. The authors do not claim universal approval of this model and show how concrete expresses anxieties as well as aspirations, but they insist that without it, the story of Sikkim's contemporary transformation could not be told.



Fig. B-10 A rare glimpse of Mount Khangchendzonga through the forest of concrete and steel.
Source: Karchoong Diyali (2021).

Renovation and adaptive reuse of a Ladakhi townhouse

Although covering a comparable period of rapid urbanisation and socioeconomic change to that described for Sikkim, John Harrison and Monisha Ahmed's account of the renovation of the Munshi House in Leh, Ladakh illustrates quite a different set of architectural possibilities. They trace one building's trajectory from its construction during a time of Ladakhi political strength, through a period of decline and abandonment into a phase of renovation, adaptation, and reuse. The chapter shows how longstanding craft skills were combined with new materials and ideas to result in a unique structure that meets contemporary needs while displaying the best of traditional architecture and craftwork.

The original Munshi House was built in the 17th century, when Ladakh was an independent kingdom and Leh an important trading entrepot, and it was expanded considerably over the subsequent centuries. Following India's independence and the decline of the overland trade routes, Leh Old Town entered a period of decline and the Munshi House was abandoned during the 1980s. While the new centre of Leh was being rapidly redeveloped in concrete and steel, much of the Old Town was left to crumble.

By the time John Harrison and Ladakh Arts and Media Organisation (LAMO) began renovating the Munshi House in 2003, they found serious structural problems including fractured beams, disintegrating masonry, and collapsed ceilings. The project set out to fix these problems and prepare the building for its new role as an arts and cultural centre, while retaining as much as possible of the original fabric of the building. The aim was to repair, salvage, and reuse rather than replace, and to keep new building work to a minimum. They relied heavily on traditional materials and construction systems while minimising the use of modern inputs such as cement. The aim was "to create forms sympathetic to the surrounding historic buildings" and retain as many traditional features as they could, displaying rather than hiding the building's "continuous history of accretions and adaptations over several hundred years." By integrating renewed original elements with new-built features and through the innovative use of materials, a hybrid building form emerged. The authors show how the careful and creative integration of new materials such as roofing felt, recycled bottles, and acrylic sheets into a traditionally-made house can bring both structural bene-

fits and new possibilities for the use of space, while maintaining much of the original design sensibility. (Fig. B-11)

The section concerning labour shows how Leh's recent building boom has led to a huge influx of construction workers from other parts of India and Nepal, while skilled Ladakhi craftspeople are becoming increasingly rare. Assembling an effective team for the renovation work required knowledge of labour market dynamics, negotiation with various groups of craftspeople, and careful management. The team comprised a small number of Ladakhi *mistri* skilled in wood and stone craft, a large group of stonemasons from the Doda area of Kashmir, and a handful of Tibetan refugee painters, as well as unskilled labourers from Ladakh. This mixed group reveals the scattered nature of Himalayan building craft traditions in the 21st century, but also demonstrates how different workers can collaborate, adapt their skills and learn new techniques in order to complete complex projects.

The latter part of the chapter outlines the factors that inspired LAMO to take up this project as well as reflecting on its outcomes. It shows how the Munshi House has become a vibrant arts and media centre, hosting numerous exhibitions, festivals and events, while providing a space for young Ladakhis to showcase their cultural productions. The project has breathed new life into a crumbling area of this rapidly expanding city, providing an example of what is possible and inspiring others to renovate, redevelop, and revitalise Leh Old Town. Against a backdrop of uncontrolled, generic and largely concrete-based urban redevelopment, the renovation and repurposing of the Munshi House has "amply demonstrated that historic houses can be upgraded for modern living, and that derelict buildings can be brought back to provide valuable community services", while inspiring new approaches not only to architecture and craft but also to Ladakhi culture more broadly.



Fig. B-11 The renovated LAMO Centre (Munshi House) seen from the south, Leh, Ladakh.
Source: John Harrison (2010).

RELIGIOUS BUILDINGS AND PROMINENT STRUCTURES

Numerous fortresses, palaces, and administrative buildings are scattered across the Tibetan plateau and the Himalayas, standing as testament to the region's long history of trade, cultural exchange, conflict, and nation building. The architecture of the region has also been significantly influenced by the major religions practiced there, most notably Hinduism, Buddhism, and Islam. Today, the region presents a vast tapestry of fortified buildings, palaces, temples, monasteries, mosques, and votive structures in varying states of preservation or decay. Some of these are internationally famous, attracting support from national government bodies and/or global organisations such as UNESCO. Many such buildings, and countless less prominent ones besides, remain of great importance to the local population, who visit them frequently or occasionally for religious, ritual, and social purposes. We note also the wide range of approaches being taken to the conservation of "heritage buildings", with some being actively preserved in their current condition, some being renovated or reconstructed (with varying degrees of craft engagement), and others left to degenerate. Such large and often well-known buildings differ in many ways from the simple vernacular structures such as tents and farmhouses discussed in earlier parts of the book. They reflect different uses, values, social statuses, and functions, linked to various forms of religious authority, political power, and cultural significance. They are often built on grander scales, using more expensive materials, and include more elaborate decorative elements. Most were built by large teams of craftspeople, sometimes brought in from different areas, which contrasts with more localised, owner-led modes of construction. However, there are also many similarities and parallels, given that both types of building are conceived within the same cultural matrices, build upon similar aesthetic foundations and a similar range of raw materials, and were constructed by skilled workers who learn, practice, and pass on their knowledge and skills within building craft traditions.

Several chapters in this volume explore aspects of these prominent buildings, focusing on the craftspeople involved in their construction, reconstruction, and maintenance, as well as broader contextual factors shaping these processes. John Harrison offers a detailed account of the reconstruction of a *stupa* (or *chörten*) in central Tibet, showing how the needs, interests, and skills of diverse groups aligned to make the project possible. Two contributions then focus on the tiered temples of the Kathmandu Valley. Sudarshan Raj Tiwari, Prem Nath Maskey, Hans Christie Bjønness, and Tore Haavaldsen (henceforth Tiwari et al.) examine the historical, technical, and organisational factors that caused particular temples to collapse during the 2015 Gorkha earthquake while others remained unscathed. The chapter by Kai Weise and Anie Joshi addresses similar questions but looks more deeply into the current status and condition of the craftspeople, as well as the effects of government policies upon them. Finally, we return to Marc Dujardin's chapter to reflect on the key role played by *dzong* (monastery-fortresses) in processes of architectural continuity and change in Bhutan.

Rebuilding a *stupa* in central Tibet

For centuries, various forms of *stupa* dotted the landscape across much of the Tibetan cultural area, situated in and around villages, towns, and cities or nestled on hillsides, along trails and at the top of mountain passes. While still ubiquitous in Indian regions such as Ladakh, Sikkim, and Arunachal Pradesh, in Bhutan and the northern reaches of Nepal, many of these votive structures were destroyed during the Cultural Revolution that followed China's occupation of Tibet. John Harrison's chapter tells the story of the reconstruction of one such destroyed *stupa* during the late 1990s at Sang Yak Drak nunnery, to the south of Lhasa in central Tibet. Harrison shows how the alignment of diverse factors allowed for this project's inception and proved crucial to its eventual success. These include the political freedom necessary to implement such a religiously oriented activity, the wishes and priorities of the local nuns and lay villagers, and the ability to attract external support and funding, as well as the availability of skilled craftspeople capable of undertaking the work. The author is clear that without such a convergence the project would not have taken place, underscoring the extent to which the built environment and the crafts that produce it depend on socioeconomic and political conditions as well as particularities of spatiotemporal location, cultural process and social context.

Harrison provides some revealing insights into the status and condition of building craft traditions on the Tibetan plateau at that time. He notes how little craft-focused construction or renovation work was taking place and the scant training or support that was available



Fig. B-12 Final ceremony before the installation of the *sogshing* (Tree of Life) into the stupa at Sang Yak Drak nunnery near Lhasa, PRC.
Source: John Harrison (1999).

for building workers, even as a concrete driven building boom was in full swing across the region. He also shows how a foreign NGO was instrumental in arresting the decline of Tibetan craft traditions and contributing to their revitalisation, which enabled a capable team to be assembled for the *stupa* reconstruction at Sang Yak Drak. Harrison describes the reconstruction process in detail, including valuable reflections on the role of Tibetan language texts in the design process, the sourcing of raw materials, the rituals involved, and the complementary roles played by skilled craftspeople and unskilled labourers. (Fig. B-12) The chapter concludes by noting the remarkable convergence of factors that came together to enable this project to take place, as well as reflecting on the subsequent social and political changes that would make similar activities highly problematic or even impossible in the current context.

Earthquakes and the tiered temples of the Kathmandu valley

The 2015 Gorkha earthquake caused significant loss of life and enormous damage across the Kathmandu Valley and beyond. Many hundreds of notable buildings either collapsed or sustained severe damage, including ten of the iconic, multi-tiered temples that form part of the UNESCO Kathmandu Valley World Heritage Site. (Fig. B-13) The chapter by Tiwari et al. asks why some of these tiered temples collapsed while others did not, especially given that the earthquake in question was far less powerful than earlier ones, such as that of 1934. The authors draw upon decades of experience in architecture, engineering, urban planning, and heritage conservation in order to assess the historical, social, technical, and structural factors affecting the performance of these buildings under severe seismic stress. They note that in the aftermath of the 2015 earthquake, government bodies were quick to point to structural problems as the main cause of the monuments' collapse. In numerous reports "traditional building materials like mud, brick, and timber, as well as the associated technologies and structural crafts such as joinery and mortar, were singled out as key factors of weakness and under-performance." The chapter critically analyses these assertions from three main perspectives. Firstly, it takes a

Fig. B-13 The main beams are set into position during the reconstruction of Kashthamandap, Kathmandu.
Source: Sudarshan Raj Tiwari (2019).



historical view of the designs, materials, crafts, and techniques involved in tiered temple construction, as well as looking at changes in the social organisation of maintenance. Secondly, it assesses the performance of these buildings through previous seismic events and, thirdly, examines several instances of post-earthquake assessment and reconstruction following the 2015 event. Bringing these strands together, the chapter robustly rejects the official narrative concerning the collapse of the temples and offers an alternative explanatory framework, as well as a set of recommendations for how craftspeople could be better supported, trained, and integrated so as to reduce the likelihood of such disastrous outcomes in the future.

Tiwari et al. argue that the designs, materials, and techniques involved in the construction of the temples reflect significant awareness of seismic risk and that, over time, they were adapted to better mitigate those risks. The authors locate the main causes of severe damage more in the breakdown of traditions of cyclical repair, maintenance, and material renewal than in any inherent structural or technical weaknesses. They show how a general state of disrepair combined with a lack of regular maintenance to result in the deterioration of crucial joints and other structural features, as well as how inept conservation interventions of earlier decades exacerbated rather than improved the situation. The central part of the chapter offers a detailed account of the long history of large temple construction in the valley, documenting the various crafting castes involved and their changing roles over time. It reflects on the sources and qualities of materials used, the environmental challenges the builders had to face, and the development of distinctive and highly effective carpentry, masonry and brickwork techniques in this context. They note structural and technical evolution over time in response to regular seismic events, which optimised temple design and enabled almost all of them to survive earlier earthquakes. The social and practical basis of cyclical temple maintenance and material renewal is also explored in detail, revealing the causes and consequences of its decline over recent centuries, which is framed as a major contributor to the 2015 disaster. Several case studies examine the post-earthquake assessments of particular temples, bringing detailed technical evidence to bear in establishing the role of geological conditions, past conservation activities, and maintenance failures in the varying responses of the temples to this seismic event. In conclusion, Tiwari et al. insist on the need for broader recognition of the ingenuity of design and the quality of craftwork that was involved in the construction of these remarkable temples. They stress the importance of craft-based maintenance and the costs that have resulted from its decline, as well as the dangers inherent to the inappropriate use of modern materials in largely failed attempts to improve structural integrity. The authors reiterate "the central role of the craftspeople not only in its developmental history and reconstruction tradition, but also in post-earthquake reconstruction and its continuity into the future". They make several clear, applied recommendations for how this situation could be improved, including better understanding of traditional techniques and designs, a greater role for members of building craft traditions in maintenance activities, and more opportunities for co-learning between craftspeople, state authorities, and experts in modern technical disciplines.

Building craft traditions of the Kathmandu valley

The next chapter, written by Kai Weise and Anie Joshi, focuses on the status and condition of the craft traditions involved in maintaining and reconstructing historical monuments in the Kathmandu Valley. Drawing on extensive research among these craftspeople and including accounts of several meetings organised by associations of carpenters, the authors lay out in detail the challenges these groups are facing in the present day as well as their responses to them. We learn how existing government-defined contracting procedures surrounding reconstruction projects significantly favour large construction firms over members of long-standing craft communities. The higher costs and slower completion rates associated with traditional craftwork exacerbate this problem, leaving many highly skilled workers unable to find employment for long periods of time. We are shown how these factors combine with broader patterns of socioeconomic and cultural change to discourage the younger generation from taking up building craft traditions, further contributing to a sense of precarity. The chapter also attends to the way the craftspeople understand and express the challenges they face, as well as to the strategies they are developing to improve their situation.

Weise and Joshi note how the 2015 earthquake not only caused extensive damage to more than 150 buildings in the seven monument zones of the UNESCO World Her-

itage site, but also revealed and deepened the challenges being faced by the traditional crafting communities. Tensions manifested between members of the main crafting castes and other non-caste-based craft groups, the government bodies responsible for managing assessment and reconstruction, and the various international agencies supporting these efforts. Although numerous official documents mentioned the importance of traditional craftspeople to the reconstruction effort, these were quickly forgotten once work actually began. Most contracts were given to construction firms with little or no experience of, or interest in, these forms of craftwork. This resulted in many inadequate and unsuccessful works being carried out, while large numbers of skilled craftspeople were left watching from the sidelines.

The central part of the chapter echoes many of the findings of Tiwari et al., showing how inappropriate structural interventions in the past combined with the breakdown of traditional maintenance practices to weaken several prominent buildings, contributing to severe damage during the Gorkha earthquake. It further provides some positive counter examples, where the meaningful involvement of skilled craftspeople yielded much better outcomes. The authors then trace out the details of current government-led contracting procedures, showing precisely how crafting communities come to be excluded. This leads to an important set of insights into how craft workers understand and express the difficulties they face. A series of meetings culminated in a plan of action which the craftspeople feel has potential to ameliorate their situation by securing their livelihoods, gaining greater social recognition, encouraging youngsters to learn and practice these crafts, and ensuring their involvement in future conservation activities.

This chapter underscores the extent to which the fate of building craft traditions is entangled with government policies and priorities, the mainstream construction industry, global approaches to heritage conservation, and wider social, economic, and cultural change processes. It reflects on the causes and consequences of the precarious condition of building craft traditions in 21st century Nepal, and unites the tangible (buildings and structural components, materials and tools, interventions) and intangible (knowledge and skill, rituals and festivals) aspects of cultural heritage. Crucially, it also shows how the craftspeople are organising themselves to respond to the challenges they face, recognising that the long-term survival of these monuments may well depend on them.



Fig. B-14 Carpenter Gopal Krishna Silpakar restoring the salvaged deity image from the pavilion balcony during the reconstruction of the Kasthamandap, Nepal.
Source: Anie Joshi (2021).

Bhutanese *dzong* as "propelling monuments"

A key theme running through Marc Dujardin's chapter is the connection between the reconstruction of *dzong* and broader patterns of architectural continuity and change in Bhutan. As well as playing important roles in religious and social life, *dzong* represent the epitome of Buddhist iconography, architectural expression and craft-centred construction techniques. Dujardin shows how through their periodic rebuilding, often following fires or other disastrous events, *dzong* function as both a locus of cultural renewal and a vehicle of innovation. Throughout the reconstruction process patrons, ritual masters, and master builders confer over questions of structure, design, and embellishment, while large teams of craftspeople employ techniques (primarily carpentry, masonry, and painting) drawn from the *zorig chusum* "toolbox" to put their plans into practice. Familiar structural forms and design schemes are thus combined with new elements, materials, and stylistic influences, resulting in updated, contemporary versions of these quintessentially "traditional" buildings. As people visit the renovated *dzong* to participate in festivals and rituals, and the craftspeople return to their homes once the work is complete, innovative features are spread across the country, copied or adapted whenever farmhouses and other buildings are reconstructed or newly built. Thus, *dzong* simultaneously represent the peak of Bhutanese traditional architecture and propel change within it. The reconstruction of Thimphu *dzong* during the 1960s and Punakha *dzong* during the 1990s involved significant changes to design schemes and building structure, as well as the replacement of traditional features with simplified replicas rendered in new materials such as concrete. However, they also employed large numbers of skilled craftspeople, who had the chance to experiment with these new elements, updating and developing their techniques while retaining a distinctly Bhutanese architectural identity. (Fig. B-15) More recently, the generic, modernising trends shaping construction activities in contemporary Bhutan have been further offset by new architectural guidelines, in which traditional crafts play a more integral role. This approach is epitomised in the ongoing reconstruction of Wangdue Phodrang Dzong, which consciously aims to combine the full power of remaining Bhutanese traditional craft knowledge and skill with the sensitive use of imported materials and techniques:

> Wangdue Phodrang Dzong will look much like its magnificent predecessors from the outside in terms of architectural greatness and will thus display the very best of Bhutan's timber architecture and *shing zo* building craft traditions. At the same time, it will be embedded with numerous material innovations and hi-tech devices such as reinforced concrete raft slabs, earthquake-resilient features installed in the central tower (*utse*), and an array of inbuilt fire safety measures.

Dujardin argues that while the simplification, standardisation, and modernisation of building methods to meet the demands of an increasingly urban society continues to give "a 'slap in the face' to practitioners of the 13 crafts", there is cause for hope that a more respectful and integrative architectural form may be emerging. Renowned masters and trainee craftspeople are currently engaged together in "revisiting, rewriting and upscaling an advanced version of the 13 traditional crafts" through the reconstruction of Wangdue Phodrang Dzong, which has the potential to "transform potentially culture-threatening change into culture-generating energy".



Fig. B-15 Intricately decorated pillars and window frames illustrate the enormous amount of craft skill and labour power involved in the reconstruction of Punakha Dzong.
Source: Calum Blaikie (2009).

MATERIAL COMPONENTS AND DECORATIVE FEATURES

Rather than focusing on particular building types or locations, several contributions take specific craft techniques or materials as their main entry point. Hubert Feiglstorfer and Martin Michette place a stone and its associated craft form known in Tibetan as *arga* at the centre of their analysis. They combine ethnographic observations with technical and material science approaches to develop a holistic picture of *arga* collection, processing, application, and maintenance, as well as bringing in comparative material from other parts of the world. The chapter by Christiane Kalantari explores the origins and significance of decorative techniques that use fabrics, or representations of them, in early Buddhist temples located in present-day India. It examines the movement of artisans and the exchanges of ideas, motifs, and techniques across Tibet, India and Central Asia a thousand years ago, while reflecting upon the boundaries between artistic representation and craft production. Finally, Karma Yeshey, Lan Pu, and Joshua Hill's contribution focuses on the shift from painting directly onto walls to the use of fabric supports for mural painting in Bhutanese monasteries and temples. They trace the evolution and contemporary practice of this technique, referred to as marouflage, within the changing field of Bhutanese craft production and conservation. Through their tight focus on single materials or techniques, these chapters encourage appreciation of the depth and complexity of craft practices involved in the making and ornamentation of prominent buildings, as well as the intricate networks of trade and cultural exchange that have shaped craft activities and material usage across different locations and historical periods.

Arga roofs and floors in Tibet and beyond

Certain kinds of stone, known in Tibetan as *arga*, possess properties that lend themselves to specific building applications. Following labour-intensive processing, *arga* can become a hard, reflective, and waterproof surface ideal for flat roofs and floors. The chapter by Hubert Feiglstorfer and Martin Michette shows how *arga* was used widely across much of the Tibetan cultural area for over thousand years and is still in use today in certain regions. (Fig. B-16)

The authors examine the classification, properties and symbolism of *arga*, as well as the craft techniques involved in its processing, application, and maintenance. They show how high transportation, processing, and labour costs have concentrated *arga* use in Buddhist monasteries and temples or the houses of the wealthy. However, they also question the widely assumed separation between elite and vernacular architectural realms due to the significant involvement of ordinary people in its application. The authors extend their analysis to other areas where similar materials are used for similar purposes, notably the Mediterranean and Middle East, showing how comparative, trans-cultural approaches can take the study of building craft traditions in promising new directions. By combining data on the material properties of *arga* with a socially and culturally situated perspective on its use, the chapter reveals "materiality as a dialectic between people and objects".

While the use of *arga* in prominent buildings continues in central and eastern Tibet, it has declined significantly in other areas such as Ladakh (India) and Humla (Nepal). The authors show how the high costs involved arise from the fact that *arga* must be "rammed" in situ over long periods to achieve its characteristic reflective and waterproof surface. They offer various estimates as to the duration and costs of this process, all of which involve large work teams engaged over many days, which mitigates against its use in ordinary houses.



Fig. B-16 The craft skills required to make *arga* roofs remains widespread across much of the Tibetan cultural area.
Source: Hubert Feiglstorfer (2019).

Arga surfaces also require regular maintenance, which further raises costs and restricts widespread usage. We also see here how larger currents of socioeconomic change influence material choices and shape associated craft traditions. The combination of corvée labour and voluntary community-level work parties that formerly enabled large-scale *arga* ramming is no longer possible, further restricting its application to elite and religious buildings.

The authors consider terminological and descriptive categories in detail, connecting the naming of *arga* to both its materiality and its patterns of usage. Materials science studies reveal a wide range of types and properties, while different sources and processing techniques result in a range of colours and surface properties. These observations combine to reveal the heterogeneity of *arga* in terms of its material constitution, classification, and use patterns, as well as in its final appearance and properties. The chapter further describes the technical aspects, tools, and methods involved in the entire process of *arga* sourcing, processing, application, ramming, and burnishing in central Tibet. It also includes revealing information on the social organisation and hierarchies involved, as well as the work songs and rituals that embed the process in its cultural context.

The comparative sections examine parallels and contrasts between the use of *arga* in the Tibetan cultural area and the historical and contemporary use of similar materials in the Mediterranean, West Africa, and the Levant. We learn how a range of comparable techniques for producing reflective and waterproof floors were being used around the southern and eastern Mediterranean region from at least the 7th century BCE onwards. These techniques were adopted and adapted by various peoples living across a vast area and were spread even further afield through the Roman empire. Such methods were perfected under the name *terrazzo* in 15th century Venice and continue to be used in the present day, albeit in a modernised and semi-industrialised form. The extinct flat earth roofing techniques of the eastern Mediterranean provide a second comparative example, which explores commonalities and variations across different geographic scales in response to social, material, and environmental factors. More contemporary comparisons are made with the *banco* architecture of West Africa, including detailed accounts of maintenance processes and knowledge transmission as well as reflections on the social, economic, and political factors shaping these techniques.

Overall, Feiglstorfer and Michette show how the use of *arga* and similar materials developed through complex patterns of "local tradition, wider appropriation, and partial standardisation". The spread of such techniques was accompanied by new material and technical terminologies, as well as the emergence of craft guilds dedicated to them. By combining insights from several academic disciplines with comparative, trans-cultural, and historical data, this chapter makes a bold attempt at holistic analysis of a particular set of materials and their associated craft traditions.

Material mimesis and craft simulation in early Tibetan Buddhist temples

Christiane Kalantari's chapter focuses on the values assigned to crafted objects, particularly textiles, in early western Tibetan Buddhist culture. It traces how fine fabrics, jewellery, sculptures, and other material cultural objects reached western Tibet from western India, Kashmir, and Central Asia during the 10th and 11th centuries, which then stimulated their evocation in other media, notably temple ceiling paintings. By reflecting on interrelations between material and visual culture, as well as crossovers between various artistic media, Kalantari offers original insights into how the form, value, and meaning of crafted objects were both brought together and transformed during the construction and embellishment of early Tibetan Buddhist temples. This confluence reflected not only the power and aspirations of the wealthy temple patrons, but also the skills, everyday lives, and religious practices of the communities that supported them. The author uses her analysis to question the limitations and assumptions of Western art historical approaches to Tibet, which tend towards inappropriate hierarchical divisions between crafts, figurative art, and decorative art, overlooking the many connections and overlaps across these fields. The chapter also encourages us to rethink the boundaries between Buddhist, Hindu, and Islamic spheres of influence by demonstrating extensive contact and exchange across these assumed divides, not only of luxury objects but also of craftspeople, aesthetic sensibilities, and design schemes. The chapter focuses primarily on the ceiling paintings at Tabo monastery in the Spiti area of Himachal Pradesh, India. (Fig. B-17)

It shows how the early phases of the temple's construction involved ceiling panels painted on actual textiles, which themselves imitated the designs of Central Asian silks

and Gujarati fabrics, as well as woodcarvings and metalwork of diverse origin. Later phases of the temple's construction also display varied influences, with many decorative features drawing upon or directly referencing luxurious textiles. Such mimetic practices demonstrate the interconnectedness of various cultural realms, which were brought together as expressions of the spiritual majesty of Buddhism. These temples provided spaces for veneration, meditation, and merit generation, while also displaying the power and prestige of the religious-political elite.

Kalantari's finely detailed analysis shows how various aesthetic sensibilities, material flows, craft skills, and artistic techniques converged to produce elaborate expressions of religious and secular power, as well as auspicious spaces for meditative and ritual practice. She breaks open the widely-assumed solidity of artisanal traditions to reveal their permeability and openness to diverse influences. Rather than seeing painting, sculpture, woodcarving, architecture, clothing design, and jewellery making as separate fields of knowledge, skill, and production, she deftly shows the crossovers and intersections that linked them to one another over 1,000 years ago, including imitation and mimesis across a broad range of media.

Fig. B-17 Bodhisattva image showing details of cloths and jewellery, Tabo *gtsug lag khang* (ambulatory), 11th century.
Source: Hubert Feiglstorfer (2019).



Marouflage wall paintings in Bhutan

Across Bhutan, decorative elements in monasteries, temples, and *dzong* serve as crucial repositories of the kingdom's rich cultural and religious heritage, notably in the form of *thangka* (painted scrolls), sculptures, and mural paintings. Many spectacular and important wall paintings have been lost due to natural disasters, fires or the intermittent renovations also discussed by Dujardin (this volume). Whereas most older murals were executed directly onto earthen plaster, those produced over the last two centuries were made on canvases affixed to the wall using a technique known in Dzongkha as *reyja debri*, or more widely as marouflage. (Fig. B-18) The chapter by Yeshey, Pu and Hill asks when, why and how this shift took place, as well as examining its implications for the making and makers of wall paintings in contemporary Bhutan. The authors employ art historical, materials science, heritage conservation, and ethnographic approaches to gain insights into these processes and their effects.

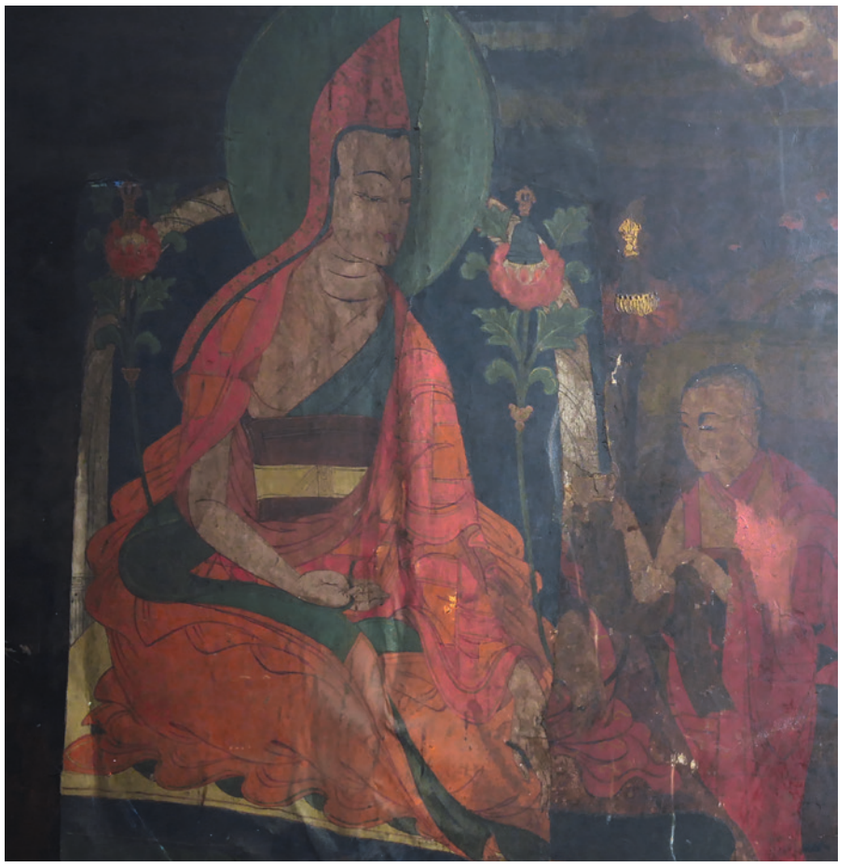


Fig. B-18 Canvas patches have been put to diverse use in Bhutanese wall painting. Here, at Menchuna, painted canvas patches were used to repair or modify existing wall paintings on earthen plaster.
Source: Karma Yeshey (2021).

Yeshey et al. note that a major aspect of the shift from direct mural painting to marouflage is that in the latter mode, some or all of the painting work can be executed off-site. This opens up a range of possibilities for the location and organisation of craftwork. Textile supports can be prepared off-site and then fixed in position prior to the start of the painting work, or at the other extreme, the entirety of the painting can be completed on the textile support elsewhere (such as in an artist's studio), before the finished article is installed in its intended location. Other approaches involve some combination of on-site and off-site activities. The authors note that these modes have different implications for the social organisation of craft practice, the commissioning and planning of mural works, and the use of materials, which they explore from several perspectives.

Historical and comparative sections consider the origins of marouflage techniques in Bhutan, notably with reference to the regional textile trade, as well as assessing comparable developments in other parts of Asia and beyond. The central part of the chapter then draws upon detailed case studies to illustrate the range of purposes for which marouflage techniques were used in the past, from the complete replacement or partial covering of existing murals to various forms of repair and modification. Despite these variable applications, a unifying feature of historical marouflage craft is located in attempts to integrate the paintings into "their architectural space and conceal the edges of any canvas elements".

The latter part of the chapter focuses on the contemporary production of marouflage wall paintings within the wider field of Bhutan's 13 traditional crafts. We learn how family lineages and master-disciple modes of transmission concerning *lhazo* (painting) have largely given way to formal college training, in which a surprisingly large number of young people are currently enrolled. This contrasts sharply with the complete absence of formal craft-related training opportunities highlighted in other chapters,[9] showing the relatively high status accorded to traditional crafts in Bhutan compared to its neighbours. We are then taken through the entire process of making marouflage paintings from commissioning to completion, including some important reflections on social organisation, location, and the main materials and techniques employed.

In conclusion, this chapter provides valuable insights into a hitherto under-researched aspect of craft-based mural production in

9 See the chapters by Harrison, Thakkar and Shah, Tiwari et al., Weise and Joshi, and Wozniak.

Bhutan, while also highlighting areas where further investigations are required. It shows how a largely technological shift was linked to the industrial production and trade of certain kinds of fabric, how this led to changes in the social organisation of training and location of practice, and has contributed to the use of new painting and adhesive materials. Yeshey et al. thus demonstrate how dynamism and adaptation, as well as ongoing state support, have ensured the continued vibrancy of painting crafts in today's Bhutan. This, in turn, facilitates the important role that religious buildings, and the scenes and figures represented therein, continue to play in Bhutanese life through a period of major transformation.

APPROACHING BUILDING CRAFTS

The concluding chapter to this volume expands upon several key themes and arguments raised in the individual contributions outlined above. It clarifies our use of the term "building craft traditions" and positions it within the broader descriptive and theoretical literature. Without pre-empting these discussions too much, let us briefly draw out a number of observations that emerge from the above summary, in order to set the scene more fully for both close and comparative readings of the chapters that follow.

Firstly, the contributions outlined above all share an approach to buildings and their component parts as being both useful material objects and socially significant entities. Buildings are intentionally constructed to have distinct physical forms which fulfil a range of mundane or special functions, but they also possess various layers of meaning and value that extend far beyond immediate functionality and alter according to the positioning and orientation of the observer. Similarly, the many active processes implied by the terms "making" and "building" are understood to be fundamentally social and cultural activities as well as technical and material practices. The construction, maintenance, and alteration of built structures thus emerge as complex processes of assemblage involving many heterogeneous components: landscapes, people, knowledge and social relationships as well as financial resources, raw materials and supply networks, tools and technical procedures. These observations underscore the importance of a multidisciplinary approach to this topic, as well as the need for a holistic analytical framework that includes historical, social and economic as well as technical and material axes. Although not every contribution attempts holistic analysis of a defined building culture as Marc Dujardin does for Bhutan, they all consider the interplay of diverse factors in the shaping of building craft traditions and thus of the built environment itself.

Secondly, it is clear that the building craft traditions in question are diverse, involving various locations, building types and scales, as well as different forms of organisation, modes of training and practice, degrees of engagement, and levels of expertise. Most of the craftspeople discussed here work on their own dwellings, on those of their kin and neighbours, or on larger buildings to which they have spatial, cultural or religious connections. They largely work without architects or detailed blueprints, relying on their accumulated knowledge of traditional forms, rough plans worked out during on-site discussions, and a readiness to improvise whenever problems arise. Although many of the builders are generalists or engage in construction activities on a part-time basis, we also see evidence of highly specialised, professional craftspeople working to an advanced technical level. These varied modes of practice demand careful study in their own right, but are united by a reliance on manual tools and locally sourced, natural raw materials such as earth, wood, and stone, as well as their strong grounding in localised building cultures. On this basis, we argue that there are sufficient similarities and parallels across the cases to merit their consideration as a distinct sociotechnical category and thus to pursue both site-specific and comparative forms of research into the building craft traditions of the Tibetan Plateau and the Himalayas. We also note that while this volume speaks directly to the body of literature that has mushroomed around the concept of "vernacular architecture" over recent decades (Asquith and Vellinga 2006; Frey 2010; Oliver 2003), it also addresses the gaps and biases apparent in some of this work. These include the widespread neglect of craftwork and craftspeople in favour of focusing on the built form itself (Özkan 2006), as well as a tendency to-

ward romanticised imaginings of tradition or exaggerated claims of climatic performance and ecological sustainability (Vellinga 2013).

Thirdly, while the focus of this volume is fixed on architectural traditions with deep roots and enduring cultural significance, the contributions do not support conceptualisations of tradition as inherently static and resistant to innovation. The fact that building craft traditions often cohere around a strong sense of continuity need not imply resistance to new materials, techniques, or designs, or to assumptions that change will automatically be seen as negative. As the chapters by Dujardin, Wozniak, and Kalantari show particularly clearly, continual change is arguably intrinsic to the building cultures of these regions. This makes understandings of tradition as dynamic, resilient, integrative, and emergent much more resonant than assumptions of insularity, fragility, and conservatism, or indeed dichotomous conceptualisations that starkly contrast tradition with modernity.

This observation leads to our fourth point of conclusion, which concerns the centrality of processes of transformation and adaptation to many of the contributing chapters. Building craft traditions are clearly facing serious challenges or existential crises across much of the Himalayas and the Tibetan plateau. Demand for craft-based building services is declining and incomes for craftspeople are falling in many places as industrially-produced materials, generic designs, and modern construction methods proliferate. This volume not only draws attention to these challenges, but also closely examines their causes and consequences, focusing on the responses of crafting communities to the difficulties they face as well as the adapted, hybrid building forms that are currently emerging.

Focusing on the processual, adaptive, and integrative characteristics of building craft traditions also opens analysis up to the roles that changing socioeconomic, regulatory, and political conditions play in shaping construction activities and thus in altering the built environment. This encourages the contributors to examine the impacts of governance regimes, planning guidelines and building codes, forestry laws, resource management regulations and heritage conservation practices, as well as the construction and tourism industries. This allows us to tap into the huge potential that studies of craft and craftspeople hold as the basis for critically engaged analysis of broader social patterns, which might include ethnic majority-minority relations, technological, economic and environmental change, the evolution of labour, gender and human rights, and the emerging dynamics connecting urban and rural spaces or local and global processes (Campbell 2020; Greiner and Pröpper 2016; Ko 2021; Lucie-Smith 1981; Wilkinson-Weber and DeNicola 2016).

As the first edited volume to focus explicitly on the crafts and craftspeople involved in making and maintaining the built environment of the Tibetan plateau and the Himalayas, this book both breaks new ground and encourages fresh perspectives on existing scholarly work. The case studies presented here complement the extensive literature available on the landscapes, architectures, societies, and religions of these regions, but also invite renewed reflection upon the relationships between these (and other) fields through the lenses of craft, craftwork, and craftspeople. Our hope is that this collection contributes to the empirical documentation of the architecture of these regions while foregrounding its social, practical and dynamic aspects, inspires others to reflect on the questions it raises, and lays the foundations for further research into this important yet neglected topic in future.

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I

The Black Tent: Construction, Use, and Transformation among the Nomadic Pastoralists of Eastern Ladakh

Monisha Ahmed

Name: Monisha Ahmed
Designation: Executive Director
Affiliation (Institute): Ladakh Arts and Media Organisation
E-mail address for correspondence: ahmed.monisha@gmail.com

Biography

Monisha Ahmed

is Co-founder and Executive Director of Ladakh Arts and Media Organisation, Leh. She is an independent researcher, writer and curator whose work focuses on art practices and material culture in Ladakh. Her doctoral degree from Oxford University developed into the book *Living Fabric: Weaving among the Nomads of Ladakh Himalaya* (Orchid Press, 2002). She has co-edited *Ladakh: Culture at the Crossroads* (Mārg Publications, 2005), and collaborated on *Pashmina: The Kashmir Shawl and Beyond* (Mārg Publications, 2009, second, revised edition 2017), and published several articles on textile arts of the Himalayan Buddhist world, as well as other parts of India.

> The black tent is something we inherit from our fathers; it is passed down and not something that will be made in one generation. I got this tent from my father, who got it from his father. Some sections of it are very old, probably more than 100 years, but other parts have been woven much more recently by me. Tent building goes on like this.[1]

Weaving is an integral part of life amongst the nomadic pastoralists of eastern Ladakh. Both men and women weave on different looms, using locally available resources of wool and hair from their livestock (Fig. 1-2 and Fig. 1-3). Women largely weave with sheep and yak wool, making fabrics for clothing, coverings, and containers. Men weave with goat and yak hair to make their traditional black tents, along with the saddlebags and rough blankets they use when travelling. Men weave with fibres in natural colours and do most of the cutting and stitching, while women generally dye the yarn they weave with.

While other types of crafts are also practiced among Ladakhi nomads such as working with leather and stone, making appliqué or patchwork textiles, these tend to be specific trades carried out by professionals in the field. Weaving, on the other hand, is taught to everyone barring monks from a young age and is by far the most central and frequently practiced craft activity in this region. This is arguably because weaving is crucial to sustaining life on the Changthang plateau, from the tents that are essential as dwellings to the warm clothes and thick blankets required to withstand the extremely cold temperatures, as well as the variety of bags used to transport personal belongings, food items, and trade products (Fig. 1-4).

While men's weaving reinforces ideas of strength and durability, in contrast, women's weaving is examined for the fine and neat execution of their skills and for their ability to combine various colours and introduce attractive designs. The craft of weaving also extends far beyond material concerns to express kinship, descent, gender, status, and social relations. The black tent encompasses all these factors, while continuing to demonstrate its crucial importance to life on the high desert plateau of Changthang.



Fig. 1-1 Tibetan (Ladakhi) nomads in the Rupshu highlands, 1911/12.
A yak hair tent in Rupshu, eastern Ladakh. On the right is a backstrap loom stretched on the ground beside the woman seated in the centre.
Source: Otto Honigmann (1911/12), courtesy Museum Fünf Kontinente, Munich.



Fig. 1-2 Changpa women weaving on backstrap looms.
The woman on the left is making a pile-faced rug, while the woman on the right is weaving woollen fabric (*snam bu*) used to make robes for men and women.
Source: Monisha Ahmed (2006).



Fig. 1-3 Changpa man weaving on a fixed-heddle loom.
He is making a strip for a saddlebag using goat hair.
Source: Monisha Ahmed (1994).

1 Meme Nawang Chogyal (personal communication, June 1994, Rupshu).



Fig. 1-4 Pack animals carrying a variety of saddlebags approach the campsite of Debring in Rupshu, eastern Changthang.
Source: Rupert Wilmot (1934), courtesy Roger Bates and Nicky Harman.

This chapter examines the craft of weaving amongst the nomadic pastoralists of eastern Ladakh, with special emphasis on the black tent. It explores the origins of this craft as well as the prevalent contemporary traditional weaving systems, looking at their symbolic representations and interpretations in the lives of the nomads. It examines tent construction and the recent transformations taking place in the structure and fabrics used for tents, asking what these changes mean for nomads' lives, especially as they move towards permanent dwellings and some to a sedentary life. It also examines the inheritance of tents and spatial relations within the tent, particularly focusing on gender, as well as decisions surrounding their location at campsites. The concluding sections reflect upon what all this means for the future of tent weaving and use.

From 1992 to 1996, I conducted fieldwork in Rupshu, eastern Ladakh, for my doctoral dissertation in Social Anthropology from Oxford University. During this time, I stayed with Nawang Tharchen, his younger brother Sonam Angchuk, their wife Tashi Zangmo and five children.[2] Tharchen was a proficient craftsman and highly skilled tailor, who regularly received orders from other people to make brocade hats for weddings, appliqué and patchwork saddle cloths, or to help construct their tents. He was also a well-respected religious man and in the absence of a lama (Buddhist monk) in Rupshu, he often officiated as one. Tharchen's mother and sister were also prolific weavers and highly knowledgeable about the craft. Most of my learning on the craft of weaving came from Tharchen and his family members, both through informal interactions and through written and visual documentation of their work. I further conducted extensive interviews with other people living in Rupshu on the history of weaving and textiles, the trade in fibres, and the learning and practice of the craft. I often asked people to show me the textiles they made and, in some cases commissioned people to make specific textile items for me (for instance, a pair of leather boots), so that I could document the process.

LOCATING CHANGTHANG

Changthang (*byang thang*), or the "Northern Plateau", forms a complex natural, cultural, and economic landscape.[3] It is located in the Himalayan and Karakoram Mountain ranges and its inhabitants are known as Changpas (northerners). While "Changpa" is a generic term used for all pastoralists resident on the Changthang plateau, they are not a single homogeneous community and are divided into groups, based on their place of origin, with each having their social hierarchy and specified grazing areas (Ahmed and Ghosal 2017: 334).

The Changthang constitutes the largest landscape zone of Ladakh, covering an area of approximately 21,000 km^2. Altitudes in this region range from 3,600 m to 5,500 m above sea level, although most of the nomads live no higher than 4,200 m to 4,600 m. It is an extremely harsh and arid region, with very little rainfall and winter temperatures that can sometimes fall to –50 °C. The high altitude and short summers make agriculture difficult, but the climate is also changing on the Changthang. In recent years, rainfall has increased in the summer months and there have been several exceptionally cold winters, with heavy snowfalls wiping out entire herds.[4] The eastern part of Changthang also has one of the highest motorable roads in the world, which crosses the Taglang La pass at an altitude of 5,360 m (Fig. 1-5).

Changthang is divided into four administrative blocks: Nyoma, Durbuk, Rupsho [Rupshu] and Rong Chu-rgut. Rupsho block is situated in eastern Ladakh and includes the nomadic pastoralist groups of Rusphu, Kharnak, Korzok, and Angkung. While in other parts of Changthang, communities practice a mix of agriculture and pastoralism, Rupsho block is inhabited solely by nomadic pastoralists. The nomads' herds consist of sheep (*lug*), pashmina goats (*ra ma*), yaks, and female yaks (*dimo*). Each family also keeps a dog (*byang khyi*) or two to protect their livestock, and those who can afford to keep horses (*rta*) also. The Changpa have traditionally relied on their herds of goat, sheep, and yak for subsistence, grazing them on the high-altitude steppe of Changthang (Fig. 1-6). They have also traded their livestock and livestock products with settled populations, and while barter was common in the past, they now rely primarily on cash-mediated forms of exchange. Apart from

2 Though polyandry was formally banned in Ladakh in 1941, the custom continued well into the 1980s. By the 1990s, there were only five families in Rupshu still practicing fraternal polyandry, but it is no longer practiced by the younger generation in the present day.

3 The Changthang stretches for 16,000 km from the Chinese province of Qinghai in the west, through western Tibet and into eastern Ladakh.

4 The last exceptionally heavy snowstorm took place in 2013.

Fig. 1-5 View of the Changthang from the Taglang La pass, which lies at an altitude of 5,360 m.
Source: Monisha Ahmed (2016).



livestock rearing, the Changpa also used to take part in the salt trade, bringing salt from western Tibet and trading it across Ladakh and even in distant parts of northern India and Baltistan, which today lies in Pakistan (Ahmed 1999).

Contemporary Changpa groups follow reasonably well established transhumance routes, returning to the same camping grounds cyclically each year. They move on to a new campsite when all the grazing grass in one place is denuded, or the water supply is down to a trickle. Decisions over precisely when to move are then taken by the *goba* (*mgo ba*, chief) and the elder men. While some moves are effected over a single day, others may take longer depending on the distance between campsites. However, it is mandatory that everyone brings their tents down together and moves on the same day. (Fig. 1-7)



Fig. 1-6 Sheep and goats grazing near the Debring campsite, which lies below the Taglang La pass at an altitude of 4,200–4,600 m.
Source: Tsering Wangchuk Fargo (2016).



Fig. 1-7 The Changpa moving camp. Wooden tent poles are visible on the backs of the yaks (centre), who are also carrying one half of a yak hair tent. Yaks usually travel in the front, followed by the horses. The sheep and goats leave earlier for the high pastures and re-join the others at the new campsite that evening.
Source: Monisha Ahmed (2006).



Fig. 1-8 A 1930s view of women gathered in Leh bazaar wearing capes made from goatskin (*slog pa*).
Source: Rupert Wilmot (1934), Courtesy Roger Bates and Nicky Harman

TEXTILES AND WEAVING IN LADAKH

Ladakh has a highly diverse array of textile traditions that reflect its varied physical, socio-economic, and cultural environment. The range of fabrics used extends from simple homespun materials produced from locally available resources of wool and pashmina, to elaborately patterned prestige garments made from imported textiles such as silk brocades, ikats, and velvet. Situated at a major crossroads of trade for northern India and Central Asia (Rizvi 1999), goods and ideas came in from many different locations. These all influenced textile traditions in Ladakh and markers of these diverse influences are clearly visible still.[5] During his one-year stay in Ladakh in the early 19th century, the British officer William Moorcroft recorded a number of imported textiles, including European broadcloths, Russian velvets, Chinese satins and brocades, cotton stockings from Kashmir and Kabul, ornamented leather boots from Lhasa, and felts from Yarkand (Moorcroft 1841: 322–326). While some of these goods passed through Ladakh, others were purchased by the inhabitants of the region. Elijah Joldan mentions that items from Central Asia mainly meant for Ladakhi customers were "rough cotton cloth and some silk cloth, ready-made garments, mostly cotton-padded, long shoes called charoks, […] warm sheep-skin garments and big cotton bags and saddle bags" (1985: 70). From Sinkiang there was raw-silk thread, felt, carpets, cured lamb-skins, and manufactured silk cloth; from India there came chemical dyes of all colours, mostly German made, indigo, muslin, velvet, cotton, otter fur, sewing machine needles, and thread (ibid. 71f.).

Although appliqué and patchwork, felt making, braiding, and embroidery are carried out in some areas, weaving is the predominant textile craft practiced throughout the region. Ladakhis believe that their styles of weaving are modelled on the mythical loom of Duguma, the wife of King Gesar of Ling.[6] Oral versions of the Gesar saga, which are recited throughout Ladakh, claim that she weaves one row a year and when she completes the fabric on her loom, the world will come to an end (Ahmed 2002: 14).

However, no one is able to say for certain what kind of loom she works on. There were some who thought it might be a backstrap loom since women in the north and eastern parts of Ladakh usually weave on such looms.[7] However, in parts of lower and central Ladakh, where agriculture is practiced, men weave on foot looms whose origin is generally attributed to the Kashmir valley.

Ladakhis know that the tradition of weaving is an ancient craft. They talk of a time before the weaving of cloth, when their ancestors wore clothes made from animal skins, straw and the bark of trees. Later they learnt how to spin and weave their own clothes. Animal skins are still used in Ladakh to make clothes and most probably, this dates back to their earlier traditions. Hats (*ti bi*) worn by both men and women are lined with goatskin. In Leh and Sham areas, women still wear goatskins on their back, known as *slog pa* (Fig. 1-8). In Kargil, a similar garment made from a sheepskin is worn, known as *sthak pa*. In winter, among the nomadic pastoralists of the north-east, women wear felt capes (*yo sgar*) lined with skin from lambs or kids, while men wear a robe (*shan lag*) made from several sheepskins stitched together, with the fur side turned to the body for warmth. They also use skins at night to cover themselves while sleeping. However, skins are being used less across Ladakh over recent years. The Buddhist clergy tell people it is sinful to adorn themselves with animal skins, so imitation skins are now much more common.

Among the various sources available on the history of textiles in Ladakh, visual ones are of primary importance. Some of the most visible markers include the deep-relief rock engravings found at Dras, Mulbekh, and the Suru valley. These date from the 8th century, when the warrior-king Lalitaditya-Muktapida exerted his power throughout the Kashmir valley and beyond (Petech 1977: 14). The carvings are largely of Buddhist deities and their devotees; most of them clad in the costume of Indian ascetics, usually a *dhoti* (a loose *sarong*), which is an unlikely garment to have been worn in Ladakh. However, at the feet of the Avalokiteshvara image at Mulbekh, while the female devotees are wearing a half-sari, the male devotees are wearing long robes with sashes, similar to those worn in Ladakh today, and one wears a hat similar to the *ti bi* (Fig. 1-9). Just before the village of Dras, along the road from Kargil, there is a group of four stone carvings (Fig. 1-10). One of them is the figure of a horseman wearing a long-sleeved, short jacket over trousers and boots, and holding a sword in his right hand (Fig. 1-11).

5 Nowhere is this more apparent than at the Munshi Aziz Bhatt Museum of Central Asian and Kargil Trade Artifacts, Kargil. The museum collection boasts of a wide range of items, including many textile-related ones that came to Ladakh through trade, from assorted fabrics to carpets, saddle covers, a variety of buttons, sewing needles and measuring tapes. Textile items are also evident at the Central Asian Museum in Leh.

6 King Gesar is regarded as a legendary mythical hero-god in the Buddhist world of the Western Himalayas, Tibet, and Mongolia .

7 Unfortunately, little is known about the historical development of weaving in Ladakh, and few, if any, early sources and records exist on this subject. Efforts to date the origin of the loom, weaving, and textiles in Ladakh are difficult as archaeological excavations have yielded little information. Clay spindle whorls have been found at Neolithic sites on the Tibetan plateau, suggesting that weaving of some sort probably existed during that time (Myers 1984: 21). In Tibet, popular tradition says that the Chinese wife of King Songtsen Gampo introduced looms there in the 7th century (Ibid.: 26).



Fig. 1-9 Feet of Avalokiteshvara at Mulbekh.
Male and female devotees at the feet of the deep-relief carving of Avalokiteshvara at Mulbekh. While the women, on the right, are shown wearing half-saris, the male figure on the left is wearing a robe and hat reminiscent of those worn by men in Ladakh today.
Source: Monisha Ahmed (2015).



Fig. 1-10 Rock carvings at Dras.
A group of four stone carvings near the village of Dras in Kargil District showing the Buddhist deities Maitreya and Avalokiteshvara, with smaller designs of a lotus flower and a *stupa*.
Source: Monisha Ahmed (2012).

Fig. 1-11 Horseman, Dras.
On the reverse of the Avalokiteshvara block is this figure of a horseman. Although badly worn down, it is possible to discern the man's attire of a short jacket over trousers.
Source: Monisha Ahmed (2012).



This is most likely the outfit of a Central Asian soldier and does not replicate the garments worn in Ladakh at that time.[8] However, Central Asia probably did influence the development of the trouser in Ladakh where horse-riding is popular, especially amongst the nomads (Fig. 1-12).

Another valuable source of information on the history of textiles in Ladakh are wall paintings. In a cave above the village of Saspol are paintings of the 84 Mahāsiddhas (disciples of Buddha) in rows, each engaged in a different activity. In the uppermost register there is a Mahāsiddha known as "Tantipa", the weaver (Fig. 1-13). He works on a foot-loom very similar in appearance to that used by male weavers in Ladakh (Fig. 1-14). He has a shuttle in his right hand and appears to be weaving white woollen fabric, locally known as *nambu* (*snam bu*) and widely used for making clothes worn in the region. Scholars are not sure about who painted the cave and when. Due to certain stylistic similarities, some think they may have been inhabited by artisans who were working at the monastery of Alchi, across the river from Saspol, in the 12th and 13th centuries (Khosa 1984: 76). Others think that the paintings date to the 14th century and were executed by Buddhist monks who inhabited the caves during that time.

At Alchi itself, the wall paintings document the flourishing trade history of Indian and Central Asian textiles as they demonstrate a variety of techniques, motifs, and styles with roots in Central Asia, India, Iran, and the Near East. At the three-storey Sumtsek temple, men and women wrapped in woollen shawls, clearly a product of Kashmir, are evident along with men wearing cotton turbans and long robes adorned with chequered ornamentation or Sasanian roundels (Ahmed 2005: 70). Central Asian influence is also evident in the long kaftans, trousers, and short boots that can be seen in the paintings (Goepper 1996: 266). The ceiling of the Sumtsek consists of forty-eight panels that reproduce textiles with various techniques of manufacture, some of which were produced in Ladakh others that came in through trade, such as brocade, lampas, and embroidered fabrics.[9] The textile patterns which cover the ceilings are also shown on garments worn by the deities, aristocracy and donors as portrayed in the murals, providing confirmation that these reproductions of textiles are not a figment of the painters imagination, but that they were in actual use at the time when Alchi was being built and decorated, or at least had been seen in person by the artists of the 11th century and after.

8 It is likely that the trouser came to Ladakh from Central Asia, where the garment is said to have first been developed in the 3rd century BCE and was linked to the domestication of the horse (Anawalt 2007: 127).

9 The copying of textiles in paint on the ceilings probably derives from the custom of fixing actual pieces of cloth under the ceilings of rooms in Ladakhi buildings, partly as embellishment but also for the practical reason of preventing dust or mud particles from falling into the rooms below, see Kalantari (this volume).



Fig. 1-12 Changpa horse race.
Changpa men on horseback, participating in a race. Their trousers are visible under their long woollen robes.
Source: Monisha Ahmed (2006).

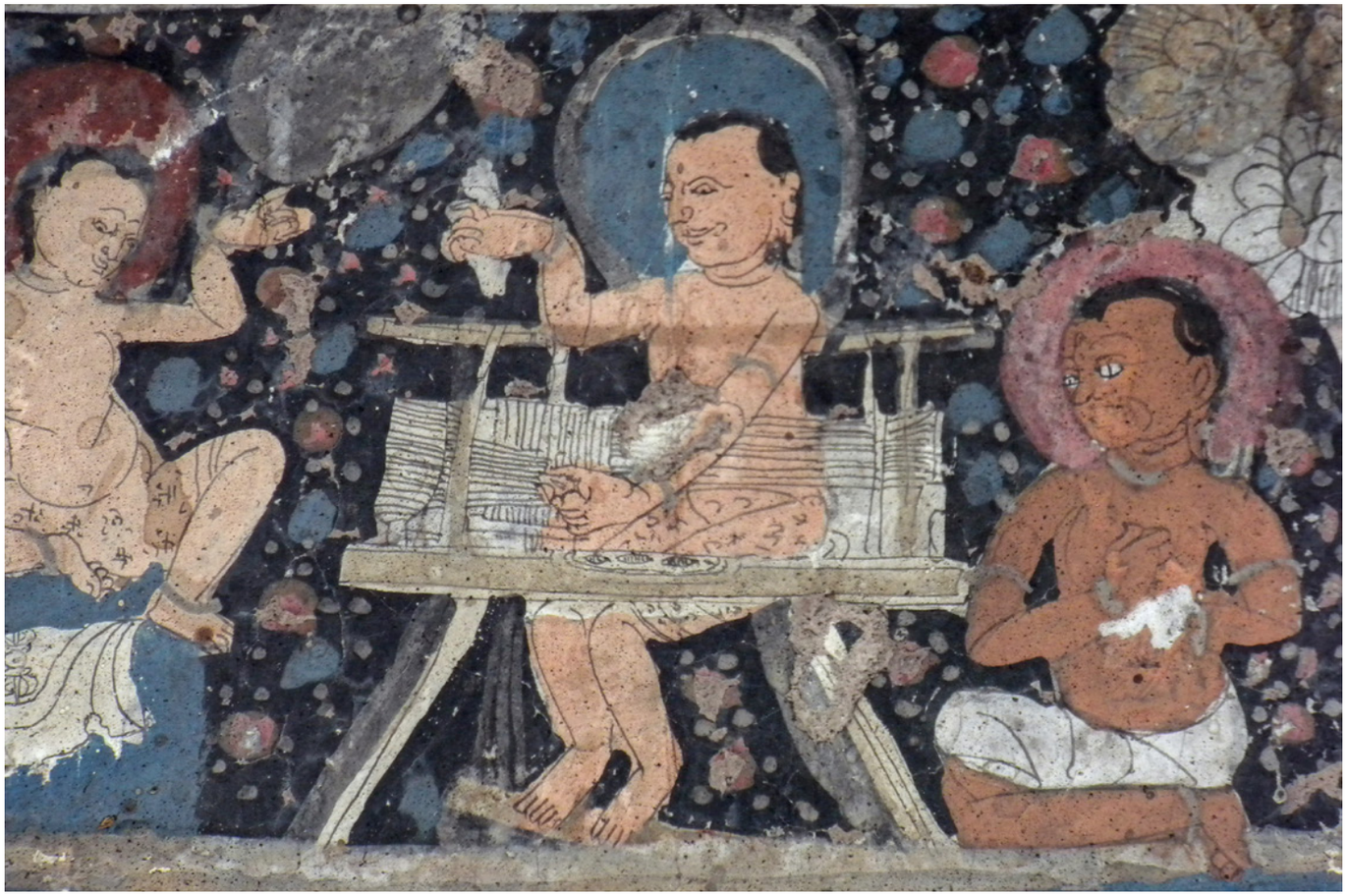


Fig. 1-13 Cave painting, Saspol.
Tantipa, the weaver, weaving on a foot-loom. This detail is from a 14th century painting at a cave in Saspol showing the 84 Mahāsiddhas.
Source: Monisha Ahmed (2009).

ORIGIN OF WEAVING IN EASTERN LADAKH

Throughout Ladakh the loom is known as *'thags cha* and the weaver as *'thags mkhan*. Weaving is widely practised throughout the region, but variations exist. In central and western parts of Leh District, as well as in Kargil, weaving is exclusively men's work and is done using a foot-loom. These looms are portable and can be dismantled and reassembled in minutes (Fig. 1-14). The craft is generally passed down from father to son, but there are no strict rules prescribing this. Weavers are generally itinerant, going from village to village, where they are called to weave with the wool spun by the women, usually during the long, cold winters. Women are prohibited from weaving in these regions, although they are mainly responsible for the preparation of the fibres.[10] Male weavers allege that if a woman were to weave, her hands would burst into flames, or that the mountains would collapse (Ahmed 2002: 14). It is also said that if a woman should even touch a loom, she would become infertile or if she comes into contact with her husband's loom there would be terrible fights between them.

In the northern and eastern parts of Ladakh, which are largely inhabited by nomadic pastoralists, both men and women weave. Women weave using a backstrap loom (Fig. 1-2), men a fixed-heddle loom (Fig. 1-3). Here, it is mandatory that all women, including nuns, weave, but it is not essential for a man to weave and monks are not permitted to engage in the craft at all. A local narrative talks about this and also refers to the origins of the craft amongst the nomads of eastern Ladakh:

> In the beginning, the world was populated by gigantic demons. These demons were very strong and powerful; they destroyed everything in sight and even ate their own children. Some even say that the female demons ate the male demons. One

10 Similar to weaving, dyeing and tailoring were traditionally predominantly male occupations.

day a big lama came and told these demons that they must stop their bad ways and live peacefully with all living creatures.[11] The lama then taught religion to them. The male demons, who were wiser, listened to the lama. But the female demons did not. They still went around doing bad things. So, the lama taught the female demons how to weave. Then they became women. However, in order to stop them from becoming demons again and going back to their wicked ways, they had to keep weaving. That is why, even today, women are kept busy weaving the whole day so that they do not stray back to their bad ways.

Perhaps as a bid to draw women into the sphere of religious activities, which their ancestors the demons rejected, religious beliefs are thus recognised and reinforced through women's weaving. This is not the case with men's weaving and perhaps this is because the men listened to the lama and learnt religion. The same attitude prevails in Bhutan, where the value accorded to a male weaver's work manifests the tension between women's esteemed role as weavers and their spiritual inferiority to men (Myers 1994: 86). This is also supported by the fact that Buddhism recognises men to be more spiritually advanced than women.[12]

An interesting association between Buddhism and weaving is made through the female loom, where the weaving process is associated with Buddhist beliefs and the world of spirituality (Ahmed 2002: 93f.). There is a song in which analogies are drawn between the parts of a woman's loom and various Buddhist teachings and religious objects. For instance, women are told to conceive of the loom as the main shrine room in a monastery and the square mat they sit on while weaving as a meditation cushion. The backstrap, which holds the loom around their back, is conceived as the casting of *samsara* behind them, and the sound of the beater is said to be the voice of Buddha reciting prayers. The raising of the heddle is said to be akin to ascending in this world after death; the lowering of the heddle as pushing all sin down with your feet. And finally, the warp stretched out in front is seen as the path to liberation.



Fig. 1-14 Weaver on a foot loom.
Similar foot looms are used by male weavers in villages in many parts of Ladakh.
Source: Monisha Ahmed (2009).

11 While no one was sure who this lama was, some said he may have been the great Indian yogi Padmasambhava, who is well known for bringing Buddhism to Tibet and "quelling the demons" that formerly inhabited these regions.

12 According to Buddhist principles, men are superior to women in the hierarchy of life forms. "They are born in this life as males because of good deeds in previous lives; they have more 'spiritual merit' than women" (Myers and Pommaret 1994: 143).

WEAVING THE THREADS OF LIFE

Amongst nomadic pastoralists, the loom and act of weaving are also tied in with the creation of life. The metaphors associated with the backstrap loom used by women and the weaving process itself are symbolic of the birth of a child, where the warp is said to be the mother and the weft she inserts to make her cloth is like the child conceived within her womb. As her cloth is made, so the child inside her grows (Ahmed 2002: 76). In the male loom, the warp, which is strong and tightly twisted, is said to represent the man. The weft, which is weak and loose in comparison, represents the woman. However, the two are said to support each other and work together towards a common goal: the eventual birth of a "child".

As a result of the craft's association with birth and life, the importance of weaving in a woman's life is a measure of her ability to procreate. Many men's choice of a wife is influenced by evidence of her accomplishments as a weaver. A skilful weaver is always highly commended by others, and they will praise her by saying that she weaves quickly and neatly, and pays attention to detail. Those who do not weave are thought of as useless and unproductive. It is for this reason that it is imperative that women learn the skill of weaving, as it becomes a significant indicator in their general growth. Acquiring skill at the craft is an essential measure of the maturity and character of the developing girl, and good weavers are coveted brides.

It is perhaps interesting at this point to emphasise the weaving done by nuns. It is said that not only are nuns inferior to monks, they are also inferior to married women who owe their value to their birth-giving ability (Ahmed 2002: 92). At one level then, a nun's weaving may be one way through which she bridges this gap and accommodates to this disparity in her value. It can be said that a nun weaves the "threads of life" and thereby plays out the act of reproduction, which she is forbidden from participating in. In contrast, monks amongst the nomads are not allowed to weave and a reason for this could be that the weaving process in the male loom is symbolic of the sexual union between a man and a woman, whereas celibacy is mandatory among monks.

At the time of a woman's marriage, a gift-giving ceremony is held where her brothers fashion a rope out of *khatak* (white ceremonial scarves) and white cotton cloth. In tents, this is tied between the inner tent poles stretching outside if necessary, and in houses from the central pillar in the kitchen. The length is determined by the number of gifts a bride receives, and is the subject of much interest and speculation. Almost all the gifts are made of cloth—some woven by the bride's mother with help from the bride, others from relatives on her father's and mother's side. These are usually specified by the bride's parents to their relatives well in advance of the wedding, the proximity of a relative to the bride usually determines the type and size of the gift, from a piece of elaborately patterned silk fabric to a simple homespun bag.[13] Thus, cloth moves within and reaffirms the most reliable reciprocal networks of affection and mutual obligation, and establishes ties between people. It also cuts across households, demonstrating the links between members.

Once married, a woman continues to forge relations within her new home by weaving for her husband and his family. At the same time, she maintains links with her natal home through gifts of fabric on various occasions. It is said that women distribute their textiles to tie them in to the widest possible web of social relations. Even in areas where women do not weave, it is said they spin threads that hold together the fabric of society (Aggarwal 1994: 229f.).

While women use textiles to widen their social circles, men's textiles demonstrate lineage, defining the ties that establish the continuity and imperishable nature of the male line. Amongst the Changpa, men inherit the tent from their fathers, as well as a pattern of identification known as the *yud* (Ahmed 2002: 152–156). These patterns usually consist of stripes woven in various combinations in a natural colour that contrasts with the base colour. Some *yud* patterns consist of rectangular blocks, but these are less common than stripes. Woven in various combinations and sizes, each pattern has a name and enables patrilineal identification (Fig. 1-15). The *yud* is woven into saddlebags and the rough blankets (*chal li*) men use when they travel (Fig. 1-16).

Yud are read from right to left. Basic patterns are limited and generally the *yud* is a combination or one or more of these. The most typical is the sheep's eye (*lug mig*), and this is represented by two black or brown stripes with a white stripe in the middle. Here the central line is one warp length wide, while the outer colour can be one or two warp lengths in width. Then there is the single straight line (*jar kang*), generally a width of one warp length.

13 A record is kept of the gifts a bride receives. When a marriage occurs in another family the list is consulted so that an appropriate return gift may be made. Another purpose is, should a woman divorce then all the goods mentioned in the list belong to her and she can take them with her when she leaves.

Fig. 1-15 Laying the warp.
Laying the warp for a saddle-bag. The striped pattern is the *yud*, which is read from right to left and shows "one sheep eye, one brown line".
Source: Monisha Ahmed (2006).





Fig. 1-16 Man's blanket, *chal li*.
A man's blanket (*chal li*) is made from yak and goat hair. The repeat patterns on each strip are the weaver's *yud*, indicating his patrilineage.
Source: Monisha Ahmed (2016).

The other pattern used is a group of three stripes, known as *yud leb*, and the distance between the stripes can be two, three or four warp lengths. The fourth pattern is the "*re so*": alternating rectangular blocks woven from black and white or brown and white fibres.

Modifications to these four patterns result in the variety of *yud* encountered. Diversity thus arises from the manner in which these patterns are used, separately or in combination with one another, and from the width of the stripes. Some *yud* may consist of two or three sheep eyes, or there may be two sheep eyes with a single line in the middle. The necessity of weaving the *yud*, apart from determining descent, is that it enables men to identify their belongings. In the past especially, when men went on long trading journeys, there would be hundreds of saddlebags strewn around the campsite and these patterns enabled each man to easily discern which saddlebag was his.

The eldest son generally inherits his father's *yud* along with the tent, it is said that the *yud* belongs to, or is a part of, the tent. At this time, his father would move to a smaller tent and make a slight alteration to the *yud*, which in turn would be inherited by his younger son. The practice usually followed by men who are related is to make minor alterations to their father's *yud*.

Fig. 1-17 The black tent.
The black tent is woven in strips from goat and yak hair, which are later stitched side-by-side. The black yak tails on opposite sides of the tent are said to indicate descendance from Rupshu's original families.
Source: Monisha Ahmed (2016).



THE TENT

Tent weaving is exclusive to men in eastern Ladakh and it is widely asserted that such weaving can never be done by women. However, among the Tibetan refugees who have been living in the region since the 1960s, it is women and not men who weave the tent.[14] Ekvall (1968: 63) noted that Tibetan women weave the tent panels, but it is men who stitch them together, because the stitches must be extremely tight and women are said not to be able to achieve this. The tent is thus the only item a Ladakhi Changpa woman is not permitted to weave, whereas she can weave saddlebags if necessary. The reason for this is that strength and tightness are attributes said to be contained in a man's weaving, but not in a woman's, and these are crucial elements for withstanding life in Changthang. Therefore, it is essential for a tent to achieve these qualities in order for it to be a suitable dwelling (Fig. 1-17).

An entire tent is seldom woven at one time, instead the structure is gradually built up over the years. One section of the tent can be many generations old, sometimes more than a hundred years, while other parts will be brand new. As sections of the tent get old, they tear and fray, so the tent is constantly under repair. New strips are perpetually being woven and stitched together to replace old ones. In a sense then, tents can never really be seen as finished structures as they are in a constant state of change both over generations and within a single generation.[15] This is seldom the case with the white tent, made from canvas, which has emerged in the last few decades and is generally constructed at one time. The impacts these new-style white tents are having on the learning and practice of weaving crafts in the Changthang requires further research.

14 During fieldwork in Rupshu, I rarely saw Tibetan women weaving tent panels. This can be explained in part by the fact that most of the Tibetan nomads' tents are now made from thick, white canvas fabric instead of animal hair.

15 While houses in Ladakh are certainly more permanent structures than tents, they are also subject to frequent maintenance and are often also expanded over time. A good example of this is the Munshi house in Leh — see Harrison and Ahmed (this volume).

Fig. 1-18 Inside of a tent.
The inside of a black tent, showing the two main poles on either side with the ridge pole extending between them. In the centre is the stove and above it, on the right, is the altar. The stone wall, behind the woman, is covered with sheep and yak wool blankets.
Source: Tsering Wangchuk Fargo (2016).



THE STRUCTURE OF THE TENT

The nomads' black tent is square (*gru bzhi*) in shape and has a flat roof (Fig. 1-17).[16] It is woven from goat or yak hair, or a combination of the two fibres. Yak hair is preferred because it is both warmer and stronger.[17] It is also said to be waterproof, due both to the natural greasiness of the hair and to the cumulative effects of the oily smoke from the yak dung burned inside.[18] However, men who do not own many yaks generally use a combination of the two fibres, and those who have no yaks at all weave the entire tent from goat hair.[19] The fibres are kept in their natural shades of brown and black. Other colours are not used for the tent, apart from a white strip (known as *ru nol*) which is used to mark the centre of the tent along the front and rear walls (Fig. 1-17).

The tent is made in two sections, with each half making up a full yak load. A whole tent may weigh as much as 120 kg, even more on wet days, which is too heavy for one yak to carry.[20] There does not appear to be a single standard size for the tent, but the average height is between 2.4–3 m, and the width ranges from 4.6–6.1 m. Actual tent size is determined by several factors, including the amount of fibre available and the size of the family inhabiting it. Status and wealth are also important factors determining the size of the tent, as is the length of the tent poles, which in turn depend on the availability of appropriate wood.[21] Weight is definitely an important limiting factor to be taken into consideration, as any tent above a certain weight would be too much for even a pair of yaks to carry.

Each time the tent is pitched anew, the rear wall is re-stitched down the middle, where the right side of the white strip and the black one meet. There is no need to stitch up the front wall as the door flap (*sgo yol*), which is attached to the left side of the tent, covers the gap. The roof (*thog*) is joined across the top with toggles (*char chung*) and loops (*rgyal tag*), leaving a smoke-hole (*gong kar*) a few feet wide across a section of it. Toggles are made of horn (usually yak) or wood. The smoke-hole is usually covered with a thick piece of cloth, such as felt, in case of snow or rain.

The tent is held up from inside by two vertical poles (*ka*)[22] that support a ridge pole (*thi ka*) which runs the length of the tent (Fig. 1-18).[23] The pole nearest the entrance is known as *nang ka yog ma* (lower inside pole), and the pole farthest from the door is *nang ka mgo ma* (upper inside pole). There are eight poles that support the tent from the outside. The tent cloth is stretched by means of rope stays, attached directly to the edge of the tent cloth (where roof and wall meet) at the four corners and midway between each corner. Ropes are generally made of horse hair, as this is stronger than both yak and goat hair. Each rope is looped around one of the eight prop poles and then extended out and tied around a large rock. The external poles and ropes pull the roof out so that it is practically flat, with the walls hanging vertically. These poles can be shifted in distance and angle to give any desired pull on the tent roof, which is hung between them.

The tent, similar to the rugs and blankets woven by women, consists of several narrow strips of cloth (*num ba*) which are stitched together side-by-side to form the finished piece (Fig. 1-19). These strips, just as most fabric lengths in Ladakh, are measured in terms of spans (*mtho*): the distance from the extended thumb to the top of the middle finger. The breadth of each strip is a standard 12 inches (appr. 30 cm), which is determined by the width of the looms. The height of a large tent would be 12 spans, a smaller one ten spans, but lengths generally vary with the heights of the individual men who are weaving the tent.[24] Tent sizes also vary with the number of strips sewn into them: a particularly large tent may have 14 strips along one wall, while a smaller one may have 12. As mentioned above, the total size of each tent also depends on the amount of goat and yak hair available to the household, the size of the household, and their relative wealth and status.

The warp laid for a tent consists of 34 to 40 warp length threads in double-ply. At the time of weaving, the warp is laid to weave one long strip and it may be used in its entirety or cut into smaller strips, depending on their position within the tent, and used accordingly. At other times, three strips of equal length may be woven with a break in the warp between each of them.

The joints inside the black tent are trimmed with narrow white bands (*rgyel dag*), woven from wool or made from a thick cotton fabric. Some men claim that these are there to enhance the appearance of the tent and are thus "only for show". However, as well as accentuating the look of the tent, these bands actually serve to make the tent stronger from within. They work as tension bands and reinforce the joints along the roof where the ropes, attached

16 The ideal tent would be square in shape, but this is rarely the case and most are actually rectangular. Faegre notes that the shape of black tents can be square, rectangular or hexagonal, depending on how they are pitched (1979: 59).

17 It is said that the warmth of a black tent depends on the thickness of the fabric, where thickness is determined by both the twisting of the fibres and the weaving of the cloth.

18 Black tents are not always completely waterproof. Faegre maintains that when wet, the yarn swells, thereby closing the holes, and the natural oiliness of the hair prevents the rain from coming in for a while, although the tents will leak in prolonged rain (1979: 12). I was told that the rain came in through the gaps in the seams and not through the cloth. Snow, however, if removed from the tent before it melts to water, will not penetrate.

19 For comparison with Damzhung in central Tibet, see Feiglstorfer, Pfeifer and Drongshar (2024).

20 *Dimo* (*'bri mo*, female yaks) are seldom used to transport heavy loads, as they cannot carry more than 50 to 60 kg. In contrast, yaks can carry about 80 kg. The yaks that carry the tent generally have only one other heavy item placed on their backs along with it, usually the stone hand-mill or a large steel trunk.

21 In the past, traders from lower or western Ladakh would bring lengths of wood to trade with the Changpa for wool, fibre or other animal products. This wood was used for tent poles, loom parts, and spindles, amongst other essential items.

22 *Ka* is also the word for "pillar" in Ladakhi houses.

23 For comparison with Damzhung in central Tibet, see Feiglstorfer, Pfeifer and Drongshar (2024).

24 For comparison with Damzhung in central Tibet, see Feiglstorfer, Pfeifer and Drongshar (2024).

to the poles, pull at the tent shell in order to hold it up.

The tent is erected around a *rtsig pa* (stone wall enclosure), and the area circumscribed by this wall is known as *tsher sa* (Fig. 1-20). It is said that a good *tsher sa* must fit a tent exactly, and one that is too big or too small does not speak well of its maker. The size of the *tsher sa* actually depends on the stone wall that has been built around it, which in turn is determined by the size of the original tent that was present at the time of its construction. While individual families return to the same stone wall enclosure at each campsite, this does not mean that the relative dimensions of the wall and tent are always constant. Dimensions change when walls are broken and rebuilt, or when new tents are stitched.

The height of the stone wall can vary from a few centimeters to as much as 70–100 cm. The latter is usually the case where a pit has been dug into the ground and the walls built within this. The wall serves two purposes: it protects the residents of the tent from the fierce winds and also offers makeshift platforms upon which the family's food, clothes, and other belongings can be stored. On the left side of the tent, facing in from the door, shelves are built into the stone wall (Fig. 1-21). There is usually one towards the front, known as *la kung*, and three at the rear called *khyir ku*. These shelves are mainly used to store perishable items such as meat, butter and cheese, as they are fairly cool inside. Each tent also has a small platform built from stone that protrudes from the centre of the back wall, which serves as the family's altar, or *chos sdag* (Fig. 1-18). The number, type and variety of prayer boxes, butter lamps and offering cups arranged on the altar are often an immediate sign of a household's wealth. A large number, including some made of silver, speak of prosperity, while a



Fig. 1-20 Tent site before pitching.
Top right: The inside area of the tent, demarcated by the stone wall running around the four sides, is known as the *tsher sa*. The large vertical stone on the left marks the position for the door, the two standing in the centre mark where the stove will be positioned, and the platform on the right is for the altar.
Source: Monisha Ahmed (2006).



Fig. 1-19 Tent strips.
Left: The seams of the tent strips, stitched side-by-side, are visible across the body of this tent.
Source: Monisha Ahmed (2013).

Fig. 1-21 Shelves in the tent.
Bottom right: On the left of the altar, three shelves are built into the wall which are used to store dry or perishable food items. Here, Tashi Zangmo is putting on her turquoise-studded headdress (*pad rag*) as she prepares to move camp.
Source: Monisha Ahmed (2006).



smaller array of votive items made of copper or brass suggests a less wealthy household.

Amongst the Tibetan refugees living in nomadic areas of eastern Ladakh, the floor of the tent is covered with tiny stones.[25] This practice is now being followed by some of the Ladakhis as well, who call such flooring *shag ma*. Water is thrown over the stones each morning to keep the floor clean and reduce dust. However, because the process of collecting the tiny stones is lengthy and involves considerable hard work, some say they only make such floors at encampments where they are going to be staying for a long period of time.

25 Tibetans practice this in their homes as well, where the floors are packed down with earth mixed with water and a layer of tiny stones scattered over the top (Pommaret-Imaeda 1980: 250).



Fig. 1-22 White tent.
A white tent, seen from the back.
Source: Tsering Wangchuk Fargo (2016).



Fig. 1-23 Tent with a black roof.
A white tent with a black roof woven from goat and yak hair, with two more white tents visible in the distance. Most Changpa use vehicles to move camp in the present day.
Source: Monisha Ahmed (2007).

THE WHITE TENT

White tents (*gur*) are a fairly recent phenomenon in eastern Ladakh. They have been around since the 1960s but became common from the 1980s onwards (Fig. 1-22). They are not mentioned in the accounts of earlier travellers to the region, and nor does the visual record show them. The fabric used to make these tents is a thick white cotton or canvas, which comes from the markets in Leh town. Material from used or abandoned parachutes belonging to the Indian army is also often stitched into nomad tents. Similarly, old tents purchased from the army are reassembled so that they are structurally similar to the tents traditionally made by the Changpa. In recent years, government bodies such as the Animal Husbandry Department have also started distributing white tents directly to nomadic groups.

The cutting and stitching of white tents is done by specialised tailors, who have emerged amongst the nomads over recent decades. These tents are structurally very similar to the black ones, except that they are always made in one piece and are much lighter, weighing approximately 40 kg. Furthermore, there is no horizontal ridge pole tied between the two vertical poles inside the tent. As a result, the opening over the hearth is larger in black tents than in white ones. However, there are several variations to white tent composition. While some are made entirely from white cotton fabric, others are assembled from a combination of the white material and the same woven strips used in the black tents. It is more common to see tents in the latter combination, with white walls, a black roof, and a black door flap (Fig. 1-23). These are known as *thog gnag* (black roof), as opposed to the all-white *gur*. A black roof is preferred because yak hair is stronger and can withstand the weight of the snow and the buffeting from the fierce winds. It is also more durable than cotton and therefore lasts longer.

Weight is an essential criterion for nomads' tents. Since white tents are made and carried in one piece, they are easier to transport for families that do not have many (or any) yaks, as they can also be carried by horses. Size is another factor taken into consideration. One advantage of the white tent is that it can be made as big as one wants due to its lesser weight. In contrast, black tents are probably made smaller than would be considered ideal, in order to minimise weight and increase warmth. Their size is also restricted by the amount of animal hair available. Though cost is a factor influencing the amount of fabric a household can buy to make a white tent, this was not mentioned by the nomads as particularly significant.

While the benefits of the white tent are lower weight and larger size, greater strength and longevity remain the strong points of the black tent. A white tent lasts for about four to five years, because the fabric cannot withstand the rigours of the climate, especially the fierce winds. It is also said the fabric of the white tent is further weakened by the presence of an open fire, as the smoke from within and the strong sun from on top weather the fabric much more rapidly than woven yak or goat hair.

More prosperous families take advantage of the benefits of both types and own two tents: a

Fig. 1-24 More white tents at campsite.
Morning at the Debring campsite, where there are more white tents visible than black.
Source: Monisha Ahmed (2016).



white one for summer and a black one for winter. On a hot summer day, it is just too warm to sit inside a black tent, so the white ones are preferred because they are cooler. In winter, it is the opposite and the black tent keeps the family much warmer. In addition, moving camp over long distances is usually done in stages and black tents are usually kept rolled up for the short stay at the intermediary campsite, while the white one is put up instead.

The final advantage of the white tent is that its raw materials are easier to come by and less work is involved in its manufacture. This may be one of the main reasons for the presence of increasing numbers of them at nomadic campsites in the present day (Fig. 1-24). The fact that the fabric is far easier to come by also makes it relatively simpler for families to split up and live as separate, nuclear units rather than as joint families, which is much more common nowadays. Architecture involves not just the provision of shelter from the elements, but the creation of a social and symbolic space which both mirrors and moulds the world view of its inhabitants (Waterson 1991: XV). In Changthang, spatial organisation within the tent is a crucial element to understanding spaces inhabited by the gods, as well as male and female principals.

SPATIAL ORGANISATION WITHIN THE TENT

> We were sitting around the hearth one evening, talking of the day's events, and Rinchen was drawing on a piece of paper. She drew the inside of a tent with the stone wall running around the edge, the shelves at the front and back, the stove in the middle and utensils scattered around. She drew a line down the middle, from the back of the tent to the door, and said, pointing to the left of her drawing, "This is my mother's side". Then pointing to the right side, she said, "This is my father's side".[26] (Ahmed 2002: 142)

Spatial organisation within the tent is crucial to establishing differences between genders and individuals. Bourdieu states that through rules about how space is to be used, people are obliged to act out their relations to each other in a particularly personal and immediate way (1973: 99–102). Through his analysis of the Berber house, Bourdieu contends that the child growing up there automatically absorbs Berber notions and values about human relationships, and in particular the relation between genders, as Rinchen did through her drawing in the quote above. According to Carsten and Hugh-Jones (1995: 2f.), while people tend to construct houses in their own image, they also use their houses and house-images to construct themselves as individuals and as groups. Thus houses, or in this case tents, can be understood as prime agents of socialisation.

The nomad tent is divided into two realms, the female and the male. Standing at the door facing inwards, the left side of the tent is referred as *bo mo 'do* (female side) and the right side as *bu tsha 'do* (male side).[27] Thus, the two sides of the tent reflect gender specific associations. This is further accentuated by the articles kept and the work performed on each side. However, the Changpa assert that the altar, hearth and door should remain in a straight line down the centre of the tent, as these are domains to which both genders require and merit equal access (Fig. 1-18).

The women of the house, including those who visit, inhabit the left side of the tent. It is here that women give birth and babies are nursed, attended to, and put to sleep. After a mother stops nursing a boy child, he moves to sleep on the right side of the tent, although it is said that the husband and wife generally sleep on the left side of the tent. All cooking is done on this side and food, cooking utensils and the tea churner are stored here, as are most of the family's clothes and jewellery, as well as the blankets made by women (Fig. 1-18). It is said that shelves are only constructed on the left and not the right side of the tent because women have so much more to store, especially food items and the various textiles they weave. These include their clothes, saddlebags, and blankets (Fig. 1-25), as well as the loom, balls of wool, and jewellery including the *pad rag* (large, turquoise-studded headdresses; Fig. 1-21). Large warp-striped textiles (*phug shar*), are made to cover all the goods placed on the tent walls, but in the absence of these, simple blankets may also be used for this purpose (Fig. 1-18).

The right side of the tent is the male sphere. All male family members and male visitors sit here. Religious items, such as prayer books,

26 Rinchen was Tharchen's daughter, who at the time [1994] was about 14 or 15 years old.

27 Among Mongolian nomads, this practice is reversed. The male side of the tent, considered to be ritually pure, is on the left, and the female (impure) side is to the right of the door (Humphrey 1974: 273).

Fig. 1-25 Tashi Zangmo with Saddlebags.
Tashi Zangmo rests against her saddlebags as she packs up her family's belongings before the camp moves. The bags contain personal possessions such as clothes and shoes.
Source: Monisha Ahmed (2006).



incense, and prayer wheels are kept here, along with saddles, saddle covers, stirrups and bridles, as well as the saddlebags and blankets woven by men. Items for trade are also kept here, especially the high-value pashmina wool (Fig. 1-26). The line between the two sides of the tent is fairly rigid for women, while male members move easily between both sides. The rules are also more strictly observed when it comes to the movement of "female" goods, as they are rarely, if ever, allowed on the male side.[28]

Gender divisions extend outside the tent as well. On the left side of the area surrounding the tent, items associated with the women are kept. These can be food items such as cheese or wet clothes drying in the sun, the backstrap loom, or an extra gas cylinder. The right side of this external area is an extension of the male space and it is here that items for trade are kept, such as large bags filled with wool or pashmina.

The nomad tent is thus a representation not just of family unity, but also of various kinds of hierarchy and division. In Ladakh there is a well-ordered, ranked, and ritually defined seating arrangement around the hearth known as *gral* (Dollfus 1989: 133f.; Aggarwal 1994: 84–91). The seating is arranged in order of importance and status, and it is customary for those highest in rank to sit closer to the top of the tent, near the altar, while those lower in rank sit towards the bottom of the tent. The uppermost seat (*gral mgo*) is usually inhabited by the head of the household. The best carpets will always be laid here, and all other male members of agnatic descent seat themselves in order of seniority after him, ending at the lowest seat (*gral zug*). The head of the household would only forsake his seat for a man higher in rank than him, a monk or another respected guest. The same ordering principle is practiced by the women on the left side of the tent. The wife of the household sits closest to the altar, facing her husband across the hearth. The eldest son's wife would occupy a seat below her mother-in-law, and would only acquire the former's seat when the older woman left the tent. Children sit in a semicircle around the bottom of the hearth, close to the entrance.

Apart from the hierarchical division of humans, the tent also exemplifies the three-tier division of the world, inhabited at the highest level by the *lha* (gods), in the middle by humans and the *btsan* (demons), and at the lowest by the *klu* (spirits that inhabit the aquatic and subterranean world).[29] In the tent, the uppermost realm is called the *lha phu la*, where the altar resides, the centre is *btsan bar la,* and the lowest level is known as *klu yog la*. In houses throughout Ladakh, the three levels of the world are believed to be connected through the central pillar (*sbas ka*), which is also known as "soul wood" (Day 1989: 78). This is of great ritual and symbolic significance as it represents the "world tree", the centre of the universe, and the communication channel between the three worlds (Corlin 1980: 87). In tents, the uppermost tent pole serves to represent this crucial link between the three worlds. Amongst Tibetan nomads, the opening above the hearth in the tent, from where the smoke escapes, is seen as the apex and corresponds to the highest gate at the summit of the world, which opens into the unbound space where sun and moon describe their eternal courses (Tucci 1970: 188).

The *phug lha* or "tent god" (tutelary deity of each *pha spun*)[30] is housed in the uppermost portion of the tent. Although it belongs to the male lineage, it is kept on the left side of the tent—the female side.[31] Most people had no explanation for this, simply asserting that it had been like that "from the beginning". Every morning and evening, the head of the family propitiates the *phug lha* through offerings of incense and a lit butter lamp. Whenever a fresh batch of butter is churned, a little is first offered to the *phug lha*, followed by the upper tent pole, the lower one and then the hearth. The blessings of the *phug lha* assure the family's well-being, good fortune for a flourishing herd, and success for their trade in pashmina and wool.

28 While the family seated me on the male side of the tent when only they were around, as soon as guests came in, I was asked to move to the left side.

29 In Ladakhi houses, this three-tier division is depicted vertically, whereas in tents this representation takes place on the horizontal plane (Murdoch 1981: 264; Dollfus 1989: 131).

30 The *pha spun* refers to a patri-fraternal group. Throughout Ladakh, *pha spun* members are called to help out at birth, death and wedding ceremonies.

31 Tucci also mentions that amongst nomads in Tibet, the *phug lha* is associated with women and has its place in precisely that part of the tent where the women's life mostly takes place (1970: 188).



Fig. 1-26 The white tent is pitched beside the pen on its left.
In the foreground, men are combing pashmina from their goats.
Source: Monisha Ahmed (2005).

SEPARATION AND FORMATION OF NEW TENTS

Tents are divided into *reb chen* (big tent) and *reb chung* (small tent). *Reb chen* and *reb chung* represent the two parts of an extended family where some relatives, usually the elderly parents and their unmarried children, have moved into the smaller tent, leaving the big tent to their eldest son and his family.[32] Although separate entities, the two tents are pitched nearby as the eldest son is expected to look after his parents. There are also "new tents" (*grong gsar*) which form when younger sons leave their father's tent, but these are seldom appendages of the big tent and tend towards greater autonomy.

The separation and formation of tents continues to be a feature of life in Changthang. Tents, like houses, are dynamic entities and are constantly undergoing transformation. At the same time, particular features within these spaces serve as signs of the inhabitants' identity. In most of Ladakh, individuals do not have surnames but tag their house names (*grong ming*) to identify themselves in public (Aggarwal 1994: 72). However, amongst the nomads there are no house names, perhaps because tents, unlike houses, are not permanent and enduring. Instead, black yak tails, known as *thug*, hang from the poles on either side of the tent to signify the inhabitants' identity (Fig. 1-17 and Fig. 1-19). In some nomadic communities, such as Rupshu, it is said that in the beginning there were only 15 tents and these tents can still be identified by the black yak tails hanging outside them. It is only their descendants by primogeniture who can hang the yak tails outside their tents, and when one tail wears out another replaces it.

Tents thus embody kinship systems and links between tents stretch across family groups. This is demonstrated through the partition and formation of new tents on the occasion of the *phog srod* (literally "to take charge"). Amongst the feasting and gift-giving, the main part of the *phog srod* is characterised by the father leaving his tent to his eldest son and moving into a smaller one nearby. This is only performed when the eldest child is married and has offspring of his own.

The *phog srod* is also known as *khag gnyis* (two groups). Although separate structures, the big and small tents continue to be an extension of each other and are always interacting and helping one another. What is important is that their hearths are separate. As a man's younger sons marry and leave their father's tent to establish *grong gsar* (new tents), similar celebrations are only held if the family is extremely wealthy.

The separation and formation of new tents are not always marked with large ceremonies held for the occasion. In some families, such feasts have not been held for many years, even though new tents have been formed. Tent division generally occurs when married sons put pressure on their fathers, and often when there is friction between the daughter and mother-in-law. The other reason cited for division is when the *reb chen* tent becomes too crowded. Some Changpa said if there were too many people living in a tent at one time, it was not good because it led to fights. However, the positive side to this was that there were always a lot of people to share the workload. Often parents can be reluctant to relinquish their tents and try to delay the ceremony. In some cases, they may give the tent but hold on to most of their wealth, as in livestock.

When a man has no sons, then a husband is brought into the tent for his eldest or youngest daughter and the tent is "symbolically" left to him.[33] The son-in-law (*mak pa*) is said to stand in as a surrogate son.[34] The one requirement of the change of residence of a man to his wife's tent is that he has to change his *phug lha*, in the same manner that women do when they marry and enter their husband's tent. In cases of fraternal polyandrous marriage, the property and wealth are not jointly owned by both brothers but belong solely to the eldest. In the event that the younger brother decides to leave and form his own family, the decision to give him something from the tent is the older sibling's prerogative.

The distribution of wealth is public knowledge, as all gifts are announced at ceremonies held to mark the occasion. If ceremonies are not held, then these announcements may be made at public meetings or amongst family members, where word gradually goes around. People observe and comment on the father's degree of generosity. If he has been magnanimous, they will praise him for his largeness of heart, but if he has been miserly, they may scorn him.

Thus, the manner in which tents separate and new ones are formed is not fixed but is compliant with the needs of each situation. Elders state that in the past the *phog srod* did not occur with the same frequency as it does today. Several reasons are given for this, ranging from the fact that there are far fewer polyandrous marriages taking place today to

32 This practice is followed throughout Ladakh, where houses (*khang pa*) are known as *khang chen* (big house) or *khang chung* (small house) (Dollfus 1989: 150-158).

33 The same practice is followed by settled populations in Ladakh, where the house is left to the son-in-law.

34 While *mak pa* is the Ladakhi word for husband, it is also used derogatorily to insinuate the inferior position of a husband who comes to his wife's home.

the fact that fewer sons are becoming monks. This leads to more marriages and an increasing population. In addition, it is far easier to make a tent these days because fabric can be purchased from the market or old tents can be procured from the army. Weaving a tent took far more time in the old days and was also dependent on the available stock of yak and goat hair.



Fig. 1-27 Rolling up the tent.
Once the tent has been taken down and folded, it is rolled up along with the tent poles.
Source: Monisha Ahmed (2006).

SETTLEMENT PATTERNS WITHIN THE CAMPSITE

The upper part of the valley is full of willow trees,
that is not a good place.

In the lower part of the valley there is a blue lake,
that is not a good place.

In the middle of the valley there is a clear space,
that is a good place.

That is where the square pens must be built,
it has been like that from the beginning.[35]

The underlying order in the location and orientation of campsites is depicted in this song, since tents are typically pitched beside the pens meant for livestock (Fig. 1-26). Tents are always positioned with their doors facing east as described in the phrase "*gyes sgo shar la, rlung po nub la*" (the door is to the east, the wind comes from the west). It is considered inauspicious for tent doors to open towards the west, as this is where the wind usually comes from.[36] Tent doors must open towards the rising sun. Thus, in a campsite, tents are usually strung out in a line along a mountain valley and rarely does a camp consist of a circle of tents.

When moving camp, all tents must come down and be folded away at around the same time (Fig. 1-27). It is considered unpropitious if a family brings their tent down a day earlier or later than the allocated day. The reason given for this is that the area within one's tent, the *tsher sa*, must not be seen by others before the time of moving and therefore everyone must bring their tents down together. This rule is mandatory and is reinforced by the *goba* (chief), who fines families that do not comply. Perhaps that is why moves are done early in the morning when it is still dark. It is said to bring bad luck and misfortune to the camp if all the tents do not move together. Exceptions can only be made for tents where a death has recently taken place and there are rituals still to complete, or if a baby has recently been born and it is difficult for the mother to move.

Once they reach a new campsite, each family moves towards their tent site. These sites are largely established through hereditary rights, but there are also some campsites where there are no hereditary placements for tents. In many such cases, the chief makes the final decisions but, in some places, such as Rupshu, they turn to dice (*cho lo*). Here, three tents, generally of a patrilineal extended family, get together and one dice is rolled for every group of three tents. The group that rolls the highest number has first say in where they pitch their tent. Coveted areas are those higher up in the campsite or close to a stream.

Men pitch the tent, with women and children helping out. First, the ground is levelled and cleared of stones and shrubs. The stone wall around the tent is built or repaired and the stone shelves reconstructed if the old ones have given way. The tent is then unrolled and spread over the stone wall, and the ropes stretched over the tent poles and tied to the rocks (Fig. 1-28). Once the tent is in place, the women move in and arrange their belongings. The stove is usually the first thing to be set up, so that tea can be made.



Fig. 1-28 Erecting the tent.
Once a new campsite is reached, the tent is quickly erected. It is stretched over the tent walls, the poles are put in and then moved out to create the right height.
Source: Monisha Ahmed (2006).

35 Trees do not grow in Changthang because it lies above the tree line, but Nawang Tharchen, who sang this song, said it was about the past, and believed that perhaps there were trees then (personal communication, 1994, Rupshu).

36 The orientation is similar in houses in Ladakh.

TRANSFORMATIONS IN NOMADIC LIFE

Over recent decades, much has changed in Changthang and many aspects of the Changpa way of life are today under threat. The region has witnessed rapid changes that have had a bearing on their cultural, economic and socio-ecological practices. As the Changpa are integrated into larger developmental processes, which are largely oriented towards a sedentary lifestyle, the youth are increasingly alienated from their traditional knowledge systems and ecological understanding of the landscape (Ahmed and Ghosal 2017: 335f.).

This period of accelerating change on the Changthang can be traced back to 1947, the year India gained her independence and national borders were drawn up. The new borders significantly impacted cross-border trade between Tibet (now the Tibetan Autonomous Region) and Ladakh, which gradually came to a halt in the early 1960s. In 1959, His Holiness the Dalai Lama fled Tibet as the Chinese took over the county, and along with him several thousand Tibetan refugees migrated to India, many walking over the border into Ladakh's Changthang with their herds of livestock. This put severe pressure on pastureland, and raised several issues that remain to be resolved.[37] The Indo-Chinese war of 1962 saw Ladakh lose vast tracts of pastureland in Changthang to the Chinese, severely restricting grazing access to winter pastures. In 1994, restrictions on travel for tourists into most parts of the Changthang were lifted and this saw the construction of guesthouses and homestays, amongst other amenities for visitors. The formation of the Union Territory of Ladakh took place in 2019 and while it is too soon to say what the changes brought about by this will mean for the Changthang, many development projects are planned for the region. One includes a 7,500 MW solar project at Pang (eastern Changthang) that it is said will occupy 2,000 acres of pastureland.[38] The impact of such projects needs to be carefully studied and understood before they are implemented, especially if there is a concern to conserve natural resources, agriculture and pastureland in Changthang.

The 1990s also saw a growing demand for raw pashmina, which continues to be high today. This has led to an increase in the number of goats and a proportionate decrease in the number of sheep. This has its own challenges, but has been little studied to date. Together these changes, spread over the last 75 years, have literally brought the "outside world" into the Changpas' tents in this formerly remote and inaccessible area. Pashmina is one of the most important livestock products and livelihood sources for the Changpas, and is arguably the only product that continues to make life on the Changthang viable for the nomads. Nevertheless, almost every aspect of life is changing for them and these changes look set to continue into the future.

Many Changpa are migrating away from the Changthang to settle down in Leh and neighbouring areas.[39] Many reasons are given for this, often involving the wish for better education and health facilities, and wider employment opportunities.[40] Those who remain on the Changthang have also entered into other areas of employment, from working for the army to daily wage-labour in construction projects or the tourism sector. This is changing Changpa livestock management practices, familial relations, and culture more broadly. For instance, activities such as taking livestock out to pasture were traditionally conducted primarily by younger adults, but because many of them have moved out of the area in search of new work opportunities or education, the older generation now has to cover these tasks also, or hire-in labour from outside the community.

While the social and economic landscape of Changthang has changed drastically, the impact of these changes on textile traditions and crafts such as weaving needs to be studied in more detail. Some Changpa say they now have less time to weave, especially those who work as daily wage labour. Many men have stopped weaving altogether as they have taken up alternative employment with the army or in the tourism sector. The situation is slightly different for Changpa women, arguably because these crafts have a closer bearing to beliefs regarding spirituality, procreation, and birth. Thus, weaving still remains a prerequisite for women. However, government-sponsored handicraft centres in Leh and local non-government organisations have all tried to introduce foot-looms among the women as part of income generation schemes. They tell the women of the many advantages of weaving on foot-looms, such as being able to weave faster and to produce a broader width of fabric. This would allow them to weave many more textiles, some of which they could sell to augment their cash incomes. While the additional income certainly appeals to the women, many remain reluctant to adopt the new technology

37 Ahmed, M. "Negotiating Place on Ladakh's Changthang — What Happened after 1959?" Lecture at "The Himalayan Impasse" conference at University of Bonn, January 2013.

38 Another such project is the Bilaspur to Leh high-elevation, all-weather, broad-gauge railway track that planned to cut through parts of the landscape of Changthang and proposed a railway station at Taglang la, in the heart of Changpa lands. While this plan was scrapped due to the terrain being considered too difficult to traverse, the very fact of its conception shows the risks that the region and pastoralist livelihoods are facing in the present day.

39 Perhaps the largest settlement of Changpa is at Kharnakling, situated on the outskirts of Choglamsar about 10 km from Leh town. Many families have acquired land here and built homes, and while their children attend school the parents have taken up alternative occupations.

40 See Blaikie (2022) and Goodall (2004) for detailed discussion of the causes, patterns, and implications of rural-urban migration from the Changthang.

because weaving and the loom are considered sacred. Women often state that cloth should not be made with the feet—considered the "lowest" and most impure part of ones' body—but should only be made with the hands. Cloth is pure they say, connected to the gods and the ancestors, so how can they make it with their feet?[41]

Undeniably, some of these changes have brought with them a certain amount of benefit and prosperity for the Changpa, prime among these would be formal education and better medical care facilities. However, other aspects of these changes have been detrimental to the Changpa way of life, especially in terms of social and cultural practices, while putting mounting strain on the availability of natural resources.

41 A similar situation exists in Dolpo, Nepal, where women also weave on backstrap looms. Dunsmore (1993: 161) reports that when the Tibetan frame-treadle loom was introduced, it was opposed on religious grounds. The women considered that weaving on the *khri 'thags* (literally "seat loom", the seat being part of the frame), constituted a grave religious error because only lamas have the right to use raised seats.

TENTS IN EASTERN LADAKH TODAY

Today, the landscape of eastern Changthang is dotted with as many white tents as there are black ones, if not more (Fig. 1-29). It is much cheaper and easier to acquire the white fabric and stitch it into a tent than it is to amass sufficient animal hair and weave the panels needed to make a traditional black tent. Many contemporary Changpa families prefer to live as separate nuclear units in white tents, instead of crowding into a single black tent. These decisions are said to be more common in cases where the mother in-law and daughter in-law do not get on, and so the latter persuades her husband to separate and set up their own tent.

At the same time, weaving a black tent requires large quantities of yak hair; a fibre that is much less easily available than in former times due to the declining number of yaks being kept. One of the main reasons given for this is decreasing pasture availability. Yaks consume far greater quantities of grass than sheep and goats, with one yak said to eat the equivalent of about five sheep, so increasing pressure on pastureland leads families to keep less yaks. Another reason for keeping fewer yaks is that nowadays many Changpa use vehicles while moving camp, so are no longer reliant on yaks to transport their possessions. While goat hair is still widely available, goats provide much less hair than yaks and a family would need a very large herd of goats to enable them to weave an entire black tent. The other reason given is that men have practically stopped weaving now, and it is much easier to acquire a white tent.[42] Furthermore, the government's Animal Husbandry department has also been giving tents to the Changpa. However, the colours of these have also changed and light blue and khaki green tents are also visible. White tents have also found new uses, as make-shift restaurants for tourists (Fig. 1-30).

As more and more Changpa migrate out of Changthang, the total number of livestock is falling. In a bid to counter this trend and ensure

42 Personal communication, Nawang Tharchen, June 2022, Rupshu.



Fig. 1-29 White tents on the Changthang.
Bottom left: Today, more white than black tents are visible at Changpa campsites.
Source: Monisha Ahmed (2005).

Fig. 1-30 Tent "restaurants".
Bottom right: White tents can have several uses, such as this restaurant along National Highway 1 where tourists can stop and rest.
Source: Tsering Wangchuk Fargo (2016).



that the production of pashmina continues, government agencies have started suggesting that the Changpa settle in one or two places and build permanent homes there, leaving part of the population to continue moving with the herds. The notion of settlement amongst nomadic pastoralists is not new to Ladakh's Changthang, as one visitor to the area observed in 1930: "At the edge of Ladakh these Changpa, as all nomadic shepherds eventually do, have begun to settle and lead a sedentary life. They have abandoned their tents and taken to living in houses" (Dainelli 1933: 257).

Many Changpa remain ambivalent about settling in one place and there are mixed reactions to the changes underway within the community. Some point to the advantages of living in houses, or comment that access to a good school in one place would benefit their children. However, others reject ideas of a sedentary life, asking "how can we live in one place when we have to follow our sheep and goats?" Tashi Targyas retorted that there was really nothing to think about: "If you have sheep and goats then it's good to live in a tent, and if you have a field then it's good to live in a house. But where are our fields?"[43]

On 9.4.2022, the Administration of the Union Territory of Ladakh introduced a new model of a *rebo* (tent) with an emphasis on bringing innovations in tent design (Fig. 1-31). This new design was made by the Department of Animal Husbandry in collaboration with the Yak Herder Cooperative Ltd and with the help of women's self-help groups (SHGs) of the Changthang area. Its round shape and slightly sloping roof, though made from goat and yak hair, gave some similarity to Mongolian tents. It also comes with a wooden door. How the Changpas respond to this innovation remains to be seen, but as yet no tents of this design can be seen on the Changthang.

Urbanisation and livelihood changes, as well as shifting familial relations and living patterns, have certainly had significant implications for the craft traditions involved in tent construction on the Changthang. Far fewer men are weaving tents, as time constraints with new job opportunities and the easy availability of white fabric make it less viable to spend long hours weaving and stitching tents. In addition, the younger generation of boys, most of whom live away from their parents as they attend schools in other parts of Changthang or Leh, no longer learn the craft from their fathers or feel it is necessary to be taught. Over time, it seems that knowledge of the craft may die out or only be confined to a select few weavers.

43 Personal communication, June 1995, Rupshu.



Fig. 1-31 New design for a tent, Leh.
New tent design introduced by the Administration of the Union Territory of Ladakh.
Source: Morup Stanzin (2022).

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II

Kath-khuni Architecture of Himachal Pradesh: Continuity, Change, and Challenges

Jay Thakkar and Mansi Shah

Name: Jay Thakkar
Designation: Senior Associate Professor
Affiliation (Institute): CEPT University
E-mail address for correspondence: jaythakkar@cept.ac.in / jayrajeshthakkar@gmail.com

Name: Mansi Shah
Designation: Adjunct Professor
Affiliation (Institute): CEPT University
E-mail address for correspondence: mansi.shah@cept.ac.in / mansi.arch@gmail.com

Biography

Jay Thakkar

is a Senior Associate Professor at the Faculty of Design, and Co-founder and Ex-director of the Design Innovation and Craft Resource Centre (DICRC) at CEPT University, Ahmedabad, India. Jay is working on various craft and design projects in India, Europe and Australia. He is co-authoring his fifth book *Smarya: Vernacular Furniture of Punjab and Haryana*, as part of the larger project Vernacular Furniture of India. He is also developing a third toolkit for craft-design-architecture collaborative pedagogy.

Mansi Shah

is an urban designer. She is an Adjunct Professor in the Faculty of Planning at CEPT University. With teaching, she works on her independent research projects on different subjects under the "Ahmedabad Mapping Project", "City Water Walks", and "Productive urbanism" (research and practice based on productive and edible cities) projects. She has a keen interest in pedagogy and research and has carried out several publications and workshops to explore innovative ways to support her research and learning for students.

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INTRODUCTION

Human societies and built environments share intimate relationships and long histories. Vernacular buildings and the craft traditions involved in their making have continuously evolved worldwide through empirical practices that draw upon local resources and respond directly and efficiently to contextual demands. Many such practices have remained somewhat outside of formal recognition and serious academic study. Paul Oliver (1999) notes that, at the dawn of the new century, vernacular architecture still occupies a marginal position and continues to be associated with the past, underdevelopment, and poverty. There is little interest among planners, architects or politicians in the achievements, experiences and skills of the world's vernacular builders, or in the environmentally and culturally appropriate qualities of the buildings they produce (Asquith and Vellinga 2006). Nevertheless, vernacular architecture still holds a laudable position as a reservoir of craft knowledge and skill, a mode of apprenticeship and a source of community participation, as well as a potentially sustainable basis for new building construction (Steenkamp and Whitfield 2011). A multitude of building craft practices worldwide demonstrate inherent principles of ecological sustainability, social adaptation, and cultural continuity, including many in India.

One such practice is the *kath-khuni* construction system found in the state of Himachal Pradesh, North India. This is a "cator and cribbage" technique, where local wood is used as the primary element in a series of horizontal interlocked bands along with stone infill, lending it distinct structural, visual and spatial characteristics. This building practice has matured over a long period and been honed into a highly efficient structural assembly. It is carried out by hereditary *mistri* (craftspeople) who have never had formal education in building science, but have acquired the knowledge and skills to build in this way from their forefathers. The chain of transmission has continued through oral lore and hands-on experience, along with subtle evolution over time. The patterns of patronage and growth of key centres of craftsmanship vary in time and space across the valleys of Himachal Pradesh. The most significant among those who work on the construction of *kath-khuni* buildings such as houses and temples are families of *mistri*, craftspeople who pass knowledge and skill down from generation to generation orally and empirically, primarily through long-term apprenticeships. As stated by Stella Kramrisch (1958), crafts in India are hereditary but succession can only actually take place through apprenticeship or adoption, because skill itself cannot be inherited. Members of Indian craft traditions tend to share not only an occupation but also a belief in a common origin or mythical ancestor. Many Indian craftspeople conceive of their abilities not as their own, nor only as the accumulated skill of long ages, but as originating with the divine skill of Vishwakarma, the Hindu craftsman deity also known as "the divine architect".

Himachali *mistri* are typically adept at working with both wood and stone and are a veritable treasure house of knowledge concerning these materials and the techniques associated with them. The epigraphic evidence suggests a historically long presence and recognition of identifiable communities and individuals who practiced various building crafts in Himachal Pradesh (Thakur 1996). Some of the temples, *darbargadh* (princely homes), granaries, and ordinary houses that we came across during our research (2005–2011) were 100 or more years old. The significance of this was particularly evident in our studies of multi-storied *kath-khuni* buildings such as the Bhimakali temple in Sarahan, the fort in Kamru, and the *darbargadh* in Kot-khai, which stand tall as a testament to their makers' sophisticated knowledge and skill. They have achieved near-perfect building structures, especially in a seismically active context. Even as modern-day builders struggle to find solutions for earthquake-resistant buildings, *kath-khuni* demonstrates design detailing that enables the structure to flex, complying with the lateral forces associated with seismic activity. This resilience to seismic forces is an important feature of the *kath-khuni* style of vernacular buildings in Himachal Pradesh. It arises from a composite construction of wood, which acts as the tension member, and stone, which takes the compression. Wood-and-stone walls not only resist the racking forces of an earthquake, but are also configured to resist sliding or overturning (Thakkar 2008). They effectively help in dissipating the energy of the earthquake without letting the walls split apart and fall. The structural framework and the various other assemblies of *kath-khuni* (detailed in the next section) reflect profound native innovations and artisanal sensibilities.

In Himachal Pradesh today, however, this vernacular practice is fast disappearing, particularly in cities where the introduction of

new materials such as concrete and steel has been most evident and where socioeconomic change is accelerating fastest, but increasingly in the villages also. These changes have necessarily adversely affected the artisans who have been practicing these building crafts for many generations. While the changes reflect contemporary technological, social and economic trends as well as broader policy decisions, there is also mounting evidence that structures built with steel and reinforced concrete have relatively poor climatic performance and greater vulnerability to earthquakes. This further encourages us to look again at the traditional materials, techniques, and structures of the region.

The primary aim of this chapter is to document *kath-khuni* building practices and disseminate the insights gained from the study of them, while establishing in detail the reasons behind their current decline. A secondary aim is to shed light on new amalgamations and hybrid forms involving elements of *kath-khuni*, which have the potential to enable this tradition to adapt to changing technological, social, and economic conditions and thus continue to hold relevance into the future.



Fig. 2-1 ***Kath-khuni*** **construction in different scales in Himachal Pradesh.**
Top left: Darbargadh in Sainj; **top centre:** Tower temple in Balag, and **top right:** small stand-alone granaries in Chitkul. **Bottom left:** House in Sarahan; **bottom right:** Double storey house in Gavas village.
Source: *Prathaa: Kath-khuni architecture of Himachal Pradesh* (2011).

KATH-KHUNI CONSTRUCTION PRACTICE: CRAFT TRADITION AND SUSTAINABILITY

Kath-khuni is a regional dialect term that describes a particular from of wood-and-stone construction: *kath* means wood and *khuni* refers to an angle or corner. The interlocked layering of wood-and-stone courses is one of the most discernible features of this building practice. It is both practically and aesthetically pleasing, articulating these locally-available materials in a systematic process of layering. The *kath-khuni* construction technique is used for many kinds of buildings, ranging from small stand-alone granaries and ordinary houses to large *darbargadh* (princely homes) and temples that can stand up to nine storeys high. (Fig. 2-1) Houses constitute the most numerous instances of vernacular architecture in this region and are also the most prone to changes and adaptations; hence our focus here is from this perspective.

A typical village house using *kath-khuni* is two to three storeys high and is constructed around a simple rectangular plan following the natural site contour that makes for a stable geometry. When abstracted into architectural plans, each house can be seen as a stack of cuboidal modules. The optimum space needed for various functions and the size of the timber members available predominantly determines the size of the cuboid. Each unit of the house is commonly composed of a single room on each floor with a vertically distributed usage pattern. The smallest houses are single cuboids stacked in two or three layers (ground level, first level, second level). The size of the house increases by placing cuboids side-by-side and then extending the larger rectangular units up by one or two levels. The largest houses we encountered are three side-by-side stacked cuboids extending up to three levels (Thakkar and Morrison 2008). Variations in house design mainly arise from the presence/absence and positioning of balconies on the first and second floors, as well as the myriad options in terms of staircase design and placement. For example, balconies can be open, semi-covered or completely covered, depending on their intended usage and they may enclose one, two, three or four sides of the house. They are an extension of semi-private living space and are used for receiving guests, drying clothes, pre-cooking preparation, and most importantly, relaxing and interacting with the passersby.

Life in these houses is broadly divided into three levels. The lower floor is used as a *gaushala* (cowshed) and is where humans and domesticated nature meet. Cattle are kept in *gaushala* for food, security, wealth and warmth, as cattle fodder is not only sustenance for the animals but also provides insulation for the home. The middle level of the house (usually the first floor, but in some cases a split-level room) is primarily used for the storage of practical items. If the house is large enough, there will also be an indoor granary on this level. The top-level, or second floor, is the centre of the house and is used for cooking, living, and sleeping. In larger houses, this floor also holds formal spaces for entertaining guests. The structure as well as the spaces of the house are heavy at the bottom due to the extensive use of stone, while the upper floors are lighter, with more wood and cantilevered balconies. The roof sits on the top floor and often includes an attic for the storage of day-to-day items.

Most of the craftspeople involved in *kath-khuni* construction belong to hereditary families of *mistri* and follow long-standing but unwritten rules concerning their training and practice. Skilled at working with both wood and stone, these craftspeople generally operate within particular sociocultural zones and rarely cross the boundaries between them. Only after undergoing long apprenticeships with established masters can they handle jobs on their own. Craft knowledge and techniques are thus passed on from generation to generation through oral and practical instruction. Although there is no formal canon used to guide the planning process, they all follow the same basic rules of geometric proportion when laying out various building structures. During fieldwork, we observed that odd-numbered divisions are primarily used for the layout of temple buildings, whereas even-numbered divisions are preferred for other types of buildings such as houses and granaries, although it is difficult to verify the extent to which such rules of thumb hold across different building types and sub-regions. Until very recently, external, intermediate representations such as drawings or projections were not used at all, so all planning and construction work was carried out as a contingent practice, on the site, using rules of thumb and *farma* (templates) at one to one scale (Dave 2013).

Houses are built by the local *mistri* and his team, often with help from the house owners and their relatives. Construction follows a systematic and sequential process. The mas-

ter-builder (*thauvi*) decides the layout and orientation in consultation with the *chela* (diviner) and marks the house profile on the site. Depending on the region, sometimes the *chela* also decides certain stylistic as well as functional features of the house. For example, in 2005, during a field visit in Chamba region, we noticed a few houses in Chhatrari village that had atypical arched windows. On inquiry with the priest Shri Om Prakash Sharma and a local resident, Shri Chaman Sharma, we came to know that the local people visit the *chela* before they begin the construction of house and on the basis of local spiritual knowledge, he may advise residents to incorporate certain design features, such as arched windows.

Following the site layout and profile, a trench is dug about 60–100 cm deep in order to lay the foundations of loose rubble stones up to the ground level and then dry masonry is erected up to the plinth level. The base of the structure is two parallel layers of stones installed flat. Depending on the size of the stone, the gap in the middle is filled in with random bits of rubble. The larger stones are stacked up on the outer edge and the corners of the plinth wall to provide stability. The stone wall at the base provides a heavy foundation for the building. The stones are stacked on each other without the use of mortar. Gravity is the glue that holds the stone in place.

A peculiar feature of Himachali *kath-khuni* construction we observed was a single projecting carved stone in one corner of the house (and sometimes more than one). Placed on the top of the first intersection of timber beams, it has a structural purpose of safeguarding the projecting beams, but is also a very important marker in the construction process signified by a special *puja:* a ceremony or ritual that can range from a simple affair of lighting a lamp to an elaborate, full-day process. These rituals are performed to ensure the safety and security of houses, showing how cornerstones form part of the local belief system. Similarly, several other stages in the construction process have rituals associated with them, which vary according to particularity of the community, owner, and region in question.

Following the trench and foundation phases, construction of the walls commences, which provides the key feature of *kath-khuni* architecture. Walls are constructed with alternate courses of dry stone masonry and wood, without any cementing mortar. Construction involves laying two wooden wall beams longitudinally parallel to each other with a gap in between. The gap is filled with loose rubble, and the two longitudinal wooden beams are held together by double dovetailed joinery called *maanvi* at certain intervals along the beams. The structure is reinforced at the corner (at the overlap of two wooden beams) with a *kadil* (wooden peg) at four points. These interconnection points are important features that provide general stability and hold the house together during earthquakes. The wood used for both vertical and horizontal framing is flexible and able to withstand moisture and motion variations. Thus the wood strongly but flexibly frames the stone that anchors the structure to gravitational forces (Thakkar 2008). "This helps in the strengthening of corners and distributing the load vertically, and also in preventing the wall from splitting under high compressive force. These beams act as tie bands and connect the superstructure, helping the building resist tension and lateral forces" (Bhardwaj and Singh 2020). As the construction proceeds vertically, the height of the stone layer decreases until ultimately it is only one wood frame stacked upon another wood frame. The distribution of mass in the construction of these *kath-khuni* houses is such that at the lower floor, the usage of stone is greater and therefore heavier, while much lighter wood is used in larger proportions on the upper floors. The building is also adequately secured to the foundations due to the heavy stone mass.

On the ground level, the floor is of stone but on all the upper levels the floors are made up of wooden planks. There are several types of stairs used to access different spaces in these houses. The primary staircase tends to be relatively elaborate, while the remaining ones are smaller. On the outside, either stone steps or sturdy wooden stairs take people up the mountainside to enter the living space. Interior spaces have a regular wooden staircase, ladder-stairs or actual ladders linking different areas. Balconies are cantilevered from the wall and built along the periphery on the first floor, either on one side of the house only, or in an "L" or "C" shape along two or three exterior walls. Some balconies on the uppermost floor circumnavigate the entire house. These balconies act as intermediate zones between the interior, private rooms and the outside, public spaces. The balcony space is either open from the side or has a wooden parapet with openings in it, or else is completely closed in, with smaller openings in the corners and along the sides of the wall panels. These wooden balconies act as a second skin to the house and help

to maintain conducive temperatures within the interior spaces (Thakkar 2008).

Other important features of these houses include the doors and the small windows (*tiriya*), in-built storage elements (*almari*), niches, and stoves (*chulha*) for cooking and heating. The doors and windows are an integral part of the construction system. The doors in the ground-floor *gaushala* are low in height, allowing for the movement of cattle but not allowing the heat to dissipate. While the doors are wider and taller on the upper floors, they still require the occupants to bend down in order to enter the room. They are also staggered, so that during earthquakes or land movements, cracks cannot travel upward in a single line. The windows are small but are carefully located to allow for good circulation of fresh air. The sizes of the openings are relatively small and are articulated within the horizontal tie beams. This configuration not only helps to provide stability against seismic forces but also provides a consistent spatial articulation and commonality of aesthetics among all the buildings.

There are many traditional ways of storing and displaying objects in *kath-khuni* houses including arched niches, locked cupboards with flushed doors, and metal hooks or nails for hanging cooking utensils. The walls are often mud-plastered, but have depressions in them to accommodate key kitchen utensils. The *chulha* stove is the heart of the house. Fashioned from mud on a raised, mud-covered stone base to protect the wooden floor, *chulha* are made according to the style of the maker, who would have learned how to build a stove and how to cook from her mother, mother-in-law or other older female relatives.

The last stage of construction is the roof, which is the most striking feature in the landscape from a distance. It is laid onto a wooden frame structure that rests on the structural walls and is typically topped with slate stone. Roof forms have several variations, from simple gable roofs and more elaborate pent-and-gable forms, to pure pent or flat roofs, or sometimes even composite forms. For pent-and-gable roofs, the wooden beams are laid horizontally to create a curved surface in the roof with a high pitch, which helps in shedding snow. The slate shingles are usually nailed at a single point onto the wooden frame structure, which allows for a degree of movement. As the roof sheds its load during an earthquake, pivoting pegged shingles fall outside the perimeter of the main structure rather than collapsing inwards. The overhang of the roof creates a stabilizing pressure on the walls as well as providing protection to the walls. Overhangs are also used for various daily functions such as drying crops, grains or large pieces of clothing.

A house is considered complete when all the different components are attached and integrated within the host shell. They settle and blend seamlessly, echoing the colours and moods of the surrounding landscape. The inherent qualities of this construction method demonstrate the sheer ingenuity of craftspeople who have, with the limited resources available, arrived at structural forms that have sustained, thrived and performed extremely well in the often unforgiving Himalayan landscape. The nuances and variations within *kath-khuni* techniques and forms show that building craft knowledge and practice cannot easily be compartmentalised and is deeply embedded within the religious and cultural practices of the region. However, the outcomes in terms of structure, stability, and use of space are practical and effective in a way that complements and supports a scientific basis of development. Even though decisions concerning house orientation, design, fenestration and other features may have religious and cultural underpinnings, they also demonstrate a clear grasp of local conditions, practical needs and available resources, as well as an understanding of environmental and seismic variables, which draws from a longstanding, time-tested, and yet continuously evolving information base.

SUSTAINABLE AND RESILIENT FEATURES OF *KATH-KHUNI* ARCHITECTURE

STRUCTURAL RESILIENCE

Himachal Pradesh lies in an active earthquake zone and one important feature of *kath-khuni* buildings in the region are their resilience to seismic forces. The composite construction of wood (acting as the tension member) and stone (taking the compression) is key to this. Wood-and-stone walls not only resist the racking forces of an earthquake, but also are configured to resist sliding or overturning. The stones in the walls are laid without any cementing mortar, and the wooden framework is non-rigid. The entire system helps in dissipating the stresses developed without extensive cracking. During an earthquake, stones placed on each other without mortar undulate within a flexible wooden framework, allowing for quicker dissipation of energy. Dry masonry allows the walls to move with the flow of seismic shifts, but not to crumble apart. At such times, surface layers of mud wall plaster and false wooden ceilings will collapse but the main structure remains intact. Timber lacing and a strong tie between the timbers in the walls and the floors serve to restrain the walls from spreading and hold the building together while still allowing the system as a whole to flex (Langenbach 2015). The roofs, made of wooden beams with heavy slate tiles, overhang the entire structure. The overhang of the roof creates a stabilising pressure on the walls. As the roof sheds its load during an earthquake, pivoting pegged stone tiles will fall outside the perimeter of the main structure rather than imploding to destroy the building. During several earthquakes, a significant proportion of vernacular buildings have been recorded as withstanding the seismic events and surviving in good enough condition to be repaired and re-used. These buildings respond to seismic forces by swaying with them, rather than by resisting them with rigid materials and connections. Significantly, this is not an elastic response but a plastic one. When these structures lean in an earthquake, they do so with incremental low-level cracking that is distributed throughout the wall by the interaction of the timber structural elements with the confined masonry infill (Langenbach 2002).

ENERGY-EFFICIENCY AND CLIMATIC RESILIENCE

The vast majority of *kath-khuni* houses are oriented with their longest side facing the valley below and the back side facing up the mountain. The structure thus sits parallel to the mountain. Practically speaking, a perpendicular orientation is more susceptible to seismic forces and exposes a greater proportion of the structure to the severity of natural forces. Because the terrain is steep and stepped, the houses are scattered across and up the mountainside. The houses are not lined up in a row, so that maximum advantage can be taken of sun and space. With this logical yet organic orientation, houses will not be as likely to suffer from the "domino effect" and fall on top of each other in the case of a natural disaster. Balconies are oriented to catch the maximum sun at the same time as sheltering the occupants from the weather. They act as a climatic buffer space, protecting the interior from cold winds and preventing loss of heat emanating from the cooking area by reducing air movement. Also, livestock kept in the ground floor *gaushala* further warms the upper floor as the animals' body heat drifts upwards. In all but the smallest houses, there are ladders and trap doors inside the *gaushala* to allow direct access to this space in cold weather, thus saving energy and keeping householders warm and dry. Trap doors are kept as small as possible, allowing only one person to access at a time and thus reducing dispersal of the internal warmth of the room. Furthermore, local materials perform better than their imported modern equivalents in terms of climatic conditions, particularly as the construction of walls with infill rubble creates an insulation zone. This prevents heat loss during cold winters, keeping interior spaces warm. The variations in roof forms reflect different ways to shed snow and rain while maintaining a buffer between internal and external environments. For example, a curved roof allows the snow to settle and provides warmth in winter. The pitch and geometry of roofs changes as one climbs to higher altitudes in Himachal Pradesh, no doubt in response to the changing patterns and intensity of precipitation in different areas. A steeper sloping roof allows snow to fall off, whereas a flatter part at the end of the roof retains some

snow to act as an insulation layer. During summer months, roofs are used for drying and storage purposes and so often include design features that facilitate this.

RESOURCE EFFICIENCY

The construction of vernacular houses revolves around the use of locally available and naturally biodegradable materials, with very limited use of metal and no fixing agents like mortar or any other synthetic materials. Wood and stone are locally abundant and do not require transportation over large distances, so can be accessed as needed, providing a more convenient alternative to imported and slow setting mortar. The use of simple hand and power tools, as well as the reuse of the rubble and wood wastage as infill, means limited energy is need for construction and no material wastage is left on the site once the building is complete.

BUILT FORM AND EVERYDAY USAGE

Collective typologies and repetitions create a visible lexicon and an identifiable visual fabric while also reflecting practical needs. For example, the balcony of a *kath-khuni* house becomes an efficient envelope that supports an array of activities as a meeting area, a working space for family in the winter afternoons, and a visually accessible space of communication. This layout also creates an active edge on the street, as the plinths on the ground floor and verandah spaces on the top floor create semi-public zones while the inner spaces are kept strictly private. These features have evidently evolved over long periods of time as the result of local cultural frameworks and usage patterns, which are reflected in the various levels of access to the house, the placement of the deity within the house, and the programming of interior and exterior spaces.

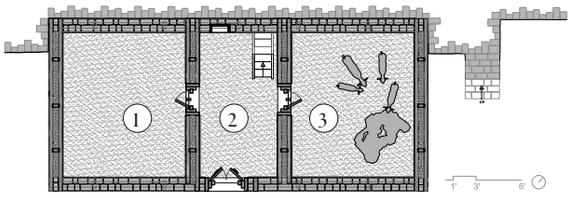
LOW MAINTENANCE AND RESOURCE REUSE

Traditional buildings in Himachal Pradesh require relatively less money, effort, and skill to maintain and repair than buildings made with modern materials such as concrete and steel. Because the local people are often involved in the construction process themselves and can usually conduct their own maintenance activities, house-related costs can also be lowered in the long run. For example, during tremors stones may become dislodged from the frame, but they can simply be hammered back into the intact mesh of the house. There is hardly any wastage of materials either, since construction involves unfinished and finished materials that do not deteriorate much over time, so can easily be reused elsewhere. Owners of these houses have good knowledge of their construction and maintenance, playing active roles in the commissioning of work and the procurement of materials, as well as being involved in overseeing construction projects. Therefore, they are also well able to actively maintain the structure. An example of one such house that is still inhabited and maintained by its owner is shown in Fig. 2-2.

These buildings' relationship with local natural resources and terrain goes far beyond technical and structural aspects, however. For example, they share direct relationships with the surrounding forest and trees. Sacred groves, or *devban*, are one example of forest areas being protected by the local villagers, where locally variable restrictions limit access to the procurement of wood, or restrict timber harvesting for temple construction. On an individual level, we also met villagers who said that in earlier times, people planted 30 to 40 trees around their house every time a child was born. Such traditions can be seen as a way of investing back into nature in return for all the wood taken from the forest. These cultural traits espouse a more holistic relationship towards natural surroundings—treating resources with care and with the understanding that they are limited and easily depleted. Such approaches to community forestry are elaborated in an essay by Sudha Vasan (2001), in which she elucidates the "institutional aspects of these historical protection systems" and highlights their "relevance to current and future initiatives". It is beyond the scope of this chapter to go deeply into local resource management practices and collective rules, but suffice it to say that for many generations they were vital to sustaining the development, construction, and maintenance of Himachali *kath-khuni* houses.

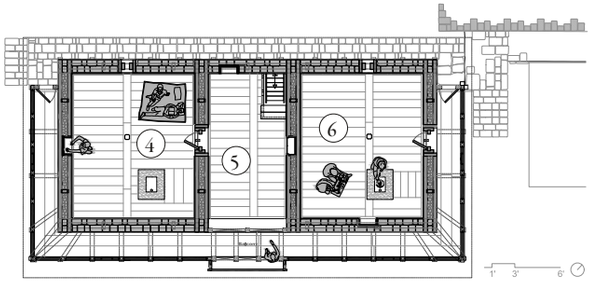
Ground floor plan (*Gaushala*)

1	Livestocks & Storage room (*Gaushala*)	16'2" × 19'2"
2	Central Circulation Lobby	10'3" × 20'4"
3	Livestocks & Storage room (*Gaushala*)	16'2" × 19'2"



First Floor Plan (**living and kitchen spaces**)

4	Living + Kitchen space	16'2" × 19'2"
5	Central Circulation Lobby	10'3" × 20'4"
6	Living cum Kitchen Room	16'2" × 19'2"



A Trench and foundation
Loose stones are filled without any binding mortar. Stones are laid until the plinth level.

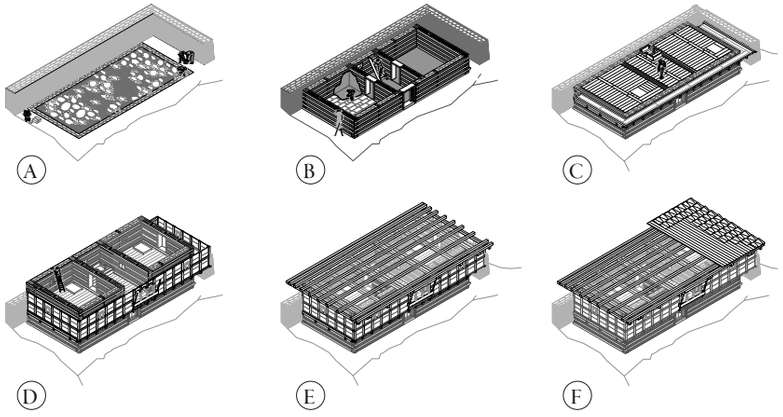
B wall construction
The wall begins by placement of two wooden members side by side and filling the space between them with random rubble in alternating layers.

C Floor construction
Wooden floor boards are placed on the wooden beams supported within the wall.

D First floor construction
First floor is used for living and kitchen spaces. Small windows and storage units are embedded within the wall itself enclosed in wooden planks.

E Roof structure
The roof consists of placing wooden planks on joists which are connected with wooden beams with a lap joint.

F Roof fixed with slate stones
Over these planks there is a layer of birch bark (Bhoj Patra) which acts as a water proofing layer. Stones are placed over it, layered with mud plaster on the top.



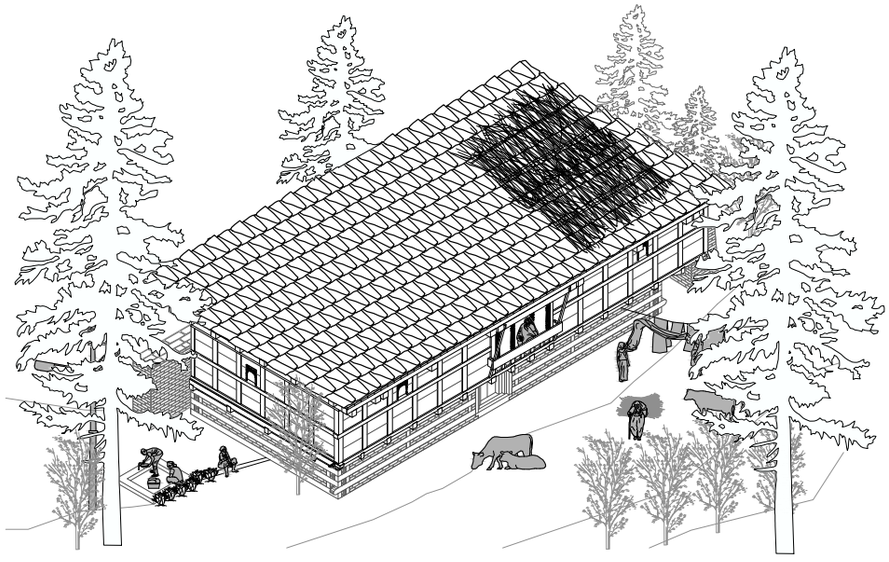


Fig. 2-2 Shows step-by-step construction of a *kath-khuni* house in Kalpa (Kinnaur region).
The house was built around 1922 and is still inhabited by the owner (Shaam Sharan Negi), 99 years after its construction. It sits on a stepped platform and has two floors. The ground floor is used as storage space, while the two rooms on the upper floors are used as everyday living and cooking space. The drawing highlights the spatial configuration and construction details.
Source: Documented by R. Bhushan (2016), drawings compiled and re-produced by V. Undaviya.

LOCAL MATERIALS, CRAFTSPEOPLE, AND ARTISTRY

The three types of materials extensively used in *kath-khuni* construction are wood, stone, and slate. The ample availability of these materials clearly had a direct bearing on the construction forms that evolved in this region. In this section, we briefly consider each of these materials in terms of their sources, qualities, and uses.

Wood: Wood is the one of the primary building materials and is sourced from the nearby forests. Over 60 % of the land in the state is under thick forest cover, including the Moist Deodar Forest (significant to our research), Ban Oak Forest, Western Mixed Coniferous Forest, Moist Temperate Deciduous Forest, Himalayan Alpine Pastures, and Rhododendron Scrub Forest. Among many other trees in this region, the most famous for building purposes is "Deodar" (*Cedrus Deodara*)[1]. It is very durable and used for structural works of all kinds, such as posts, beams, floorboards, window and door frames, shutters, and panelling. Woodcrafts are one of the most commonly found crafts in this region.

Stone: The stones that are mostly used for building are commonly referred across the region simply as "building stone". Building stones are naturally occurring rocks of igneous, sedimentary or metamorphic origin which are sufficiently consolidated to enable them to be cut or shaped into blocks or slabs for use as walling or paving materials in construction. Most of the building stones mined in Himachal Pradesh are sandstone, quartzite or river-borne materials (boulders, cobbles, etc.).[2] Sandstone and quartzite deposits suitable for building occur throughout the geological column and have a statewide distribution. The stones for constructing buildings are obtained from local quarries or hauled from riverbanks (Sood 2013), or often from the site itself, then used to make foundations and walls. The crudely foliated varieties have been used locally as masonry in traditional *kath-khuni* architecture (Kaur 2020). Walls are made with partially dressed stones on the outer edge with the wooden bands in between and hollow cavity walls are filled with leftover rubble. Local stone-masons are employed for shaping and finishing the stone for wall construction, using traditional skills and hand-made tools.

Slate: This metamorphic rock is heavy but lends itself to being cut into thin sheets, which are widely used as roof and floor tiles. Proterozoic Himachal Pradesh "slate" has been used extensively in the architectonic heritage of the Himalayan region of India. The deposits occurring in Chamba, Kangra, Mandi, Kullu, Shimla, Sirmour, Kinnaur, and Solan districts have been quarried as building material since time immemorial and utilised for roofing and flooring as key elements of regional building heritage (Kaur 2020). The slates are cut into rectangular or triangular units and typically placed on roofs in overlapping rows. An alternative technique is to drive a single nail to fasten each slate to the wooden roof frame underneath. The deadweight of the slate is enough to keep it in place. Due to its high quartz content this slate is relatively durable, reflects sunlight, and is frost and moisture resistant, while its dark colour absorbs heat and gives it excellent thermal properties.

Metal: Metals are used in relatively small quantities as hardware and accessories in Himachali architecture, but demand was sufficient to allow for the development of metal embossing and forging crafts in this mountainous region. During our field research, two kinds of metal were observed in regular usage: brass and silver. Metals were chosen according to the place and purpose of application. A limited range of metal objects and components are employed in houses, mostly as door handles, hinges, and locks, all of which are made from brass. In temples, the use of silver as well as brass metal crafts is observed, giving the items a special aesthetic character. It must be noted that in recent times, the use of metals in construction has increased significantly, as we can observe not only roofs but also ornamentation, such as friezes and beam-end components, being made from galvanised iron sheets.

A common thread running through many facets of life in Himachal Pradesh is that even the smallest object crafted by hand becomes a potential site for creative experimentation. Each material has been explored to the fullest at both structural as well as ornamental levels. Ingenious and effective application of such crafts have been observed in all local building forms. Temples have received the most attention, followed by *darbargadh* (princely homes), large houses, and finally granaries. This is in direct proportion to the size of the structure and the resources available to employ master craftspeople.

1 One of the strongest Indian conifers, it is extensively found in the western and central Himalayan region on the mountain slopes between heights of 1,370–3,350 m above sea level.

2 According to rough estimates, there is approximately 75,000 million tons of sandstone/quartzite reserve in Himachal Pradesh, calculated up to a depth of 20 m, see Sharma et al (2004).



Fig. 2-3 Fieldwork and interactions with craftspeople.
Top: Craftsmen working on temple construction in Devidhar village in 2011, which was started three years ealier.
Bottom: Craftsman in Devidhar village showing us the house he constructed and materials that were obtained from nearby areas.
Source: *Prathaa: Kath-khuni architecture of Himachal Pradesh* (2011).

CRAFTSPEOPLE AND THEIR ARTISTRY

The construction as well as ornamentation of *kath-khuni* buildings has always relied upon the excellent skills of families of *mistri* and other local artisans, many of whom identified themselves with the Hindu god *Vishwakarma,* known as the "universal architect". These artisans have acquired knowledge and skills passed down with small refinements from generation to generation in an oral and empirical tradition, usually by working as an apprentice to an established master for several years. Although in former times this knowledge was hereditarily transferred, with the recent socio-economic developments taking place in the region bringing many changes to the social structure, master artisans today tend to have several apprentices and helpers from across the region and the social strata, most often lacking in blood relations. During our 2011 fieldwork we met several craftspeople who encapsulated the prevalent mode of knowledge transmission in the oft-repeated words *prathaa* and *parampara*, which refer to persistent ways of learning, enacting, and passing on knowledge.

The master craftsmen typically oversee the whole construction process and possess a wide range of knowledge and skills, from planning and structural design through to aesthetics and ornamentation. This would entail, for example, sourcing the wood, treating and preparing the materials, assembling the entire framework into stable forms, and integrating a variety of craft forms within the building. The master craftsman works as the leader of a team of woodworkers, stone masons, carvers, and metalworkers to build a *kath-khuni* building. The execution from mind to materials is direct and unmediated, rarely requiring externalised drawings or detailed plans. These crafts remain intimately linked to the method of making with the hands, the cultivation of specific skills and dexterity, which give the ability to execute the necessary activities directly on site. As we noticed in our fieldwork, the isolation of the hills—sometimes being cut off from other communities and villages for long periods of winter snows—appears to have encouraged the honing of artisanal activities such as woodcarving, weaving, embroidery, and brass-work, resulting in a highly refined aesthetic sense which serves both pragmatic and expressive purposes in the life of local communities.

Building crafts are also closely tied to the materials, methods, and techniques of construction, relying on the development of specific skills to execute construction and detailing. Ornamentation of large wood-and-stone built forms is an artistic testament to the sustainable, local natural resources and the people's ability to create visual narratives from them. Even the hand tools used by the artisans are as unique as the hands themselves. The crafts that are integral to *kath-khuni* architecture are wood crafts (carving, turning, stamping, and carpentry), stone crafts (carving and dressing), and metal crafts (embossing and casting), with each having its own distribution, sourcing, and demand patterns, as well as an associated range of tools.

Woodcraft flourished and still thrives in a number of valleys in Himachal Pradesh. The gently swaying rows of *jhalar* (hanging pendants along roof edges), the motifs that adorn wooden panels on walls and balconies, and the door frames and windows are all intricately carved. No surface is too small and no element unworthy of creative treatment by skilled woodcarvers. Talking to craftspeople during our field work revealed the main tools and techniques used during the four stages of wood carving. The basic woodcarving tools include the *aari* (handsaw), *basola* (adze), *randa* (plane), *nehan* (chisel), and *hathodi* (hammer). The first phase of production is wood preparation, when the craftsmen measure and cut the wood to the desired size with the help of their carpentry tools. The second phase is to draw the pattern on the wood with pencil or pen (elaborate and repetitive designs are achieved with the use of stencils). The third phase of creating ornamentation in wood is the actual carving. This is when the carver's technical skills really come into play and when he relies on the quality of the locally made tools to get the job done. The fourth and final phase of carving is finishing. No preservatives are used, so the surface is made smooth with sandpaper. Any metal parts required such as door handles, knobs or hinges, are fashioned by a local blacksmith and added by the woodcarver.

The themes applied in woodcarving range from classical and folk motifs to abstract, geometric and natural ones, depending on the purpose and location of the building, as well as the identity and preferences of the individual artisan. They are used sometimes as standalone motifs and at other times as part of a continuous frieze or panel (Dave 2013). Interspersed with the classical depictions in the great temples and *darbargadh* are examples of

folk carving, a parallel art form that is distinctive to Himachal Pradesh. There is a juxtaposition of classical and folk forms in the temples and *darbargadh*, while in the houses and granaries, folk carving dominates. Through local woodcraft, artisans present to the community concepts of the importance of particular local deities, as well as integrating natural forms and narratives of secular human activity. Renowned communities of skilled woodcarvers evolved in pockets across the hills, but it is mainly those based in the Sangla and Pabbar valleys who carry on these excellent woodcarving traditions today. For example, we witnessed very fine woodcarving of floral friezes and narrative panels using only manual techniques at the temple construction site in Devidhar village. One renowned master craftsman in Devidhar explained to us the varying durability of different materials, pointing to different wood and stone samples lying around the site and showing us which would last well and which wouldn't. Many such instances revealed to us the deep understanding that comes from generations of transmission combined with years of practical experience.

Stone has been extensively used for construction in Himachali architecture, but local stonework does not reflect the same level of rich expression or intricate execution as woodcarving. One of the main reasons may be that the stone available in Himachal Pradesh is very hard for carving, whereas wood is abundantly available and much easier to work, requiring significantly less force. Nevertheless, those craftspeople working with stone have developed their skills and techniques to a high level and remain important contributors to both the region's contemporary built environment and its architectural heritage.

Despite the relative isolation and inaccessibility of the mountainous terrain, various signs point to the growth of knowledge about metals and associated crafts in Himachal Pradesh. The remarkable craft of brass and silver metal embossing is visible on many doors, to which decorative metal panels are nailed. The motifs used and the finesse with which they are executed suggest a robust tradition and continued support for metal crafts in the Himachal hills.

A Host structure and the components
1 Slate stones
2 Wooden beams supporting roof
3 Wooden post
4 Floor beam
5 Wooden beam
6 Rubble in-fill
7 1" thick mud plaster
8 2" compressed mud plaster
9 Deodar wood threshold
10 Trench for foundation

B Wood-and-stone wall joinery
11 *Maanvi*
12 Loose rubble
13 Stone blocks (mononlithic and dressed)
14 *Kadil* (interconnected at four points at the corners)
15 2' thick wall
16 Timber corner

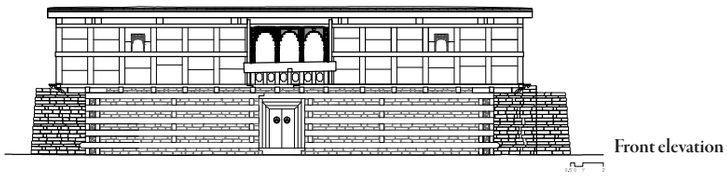
C Staircase
17 Stone landing
18 Wooden planks

D Door detail
19 Wooden pinned lap joint (between horizontal and vertical member)
20 Wooden shutter (connected with tongue and groove joint)
21 Mortise and tenon joint

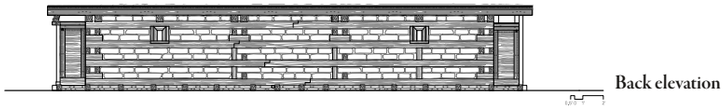
E Cantilevered balcony
22 Roof joist
23 Wooden balcony roof beam
24 Wooden post

F Wooden floor
25 Wooden floor planks
26 Wooden floor joist

G Slate roof
27 Slate stone — nailed onto the wooden panel



Front elevation

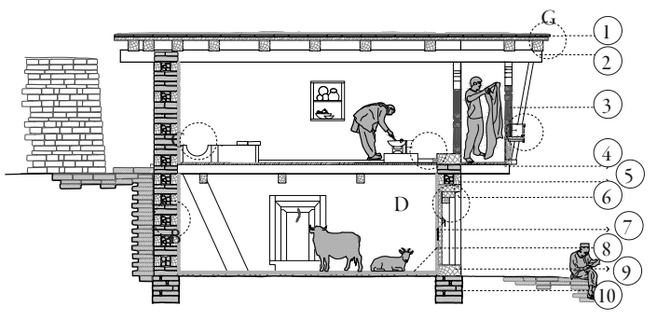


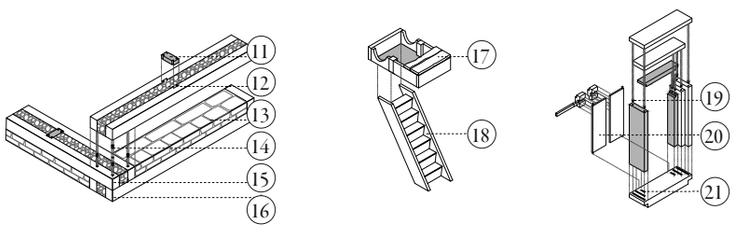
Back elevation

Materiality and visual language



Small openings in balcony panels | Door detail | Small windows | Staircase | Door and wall





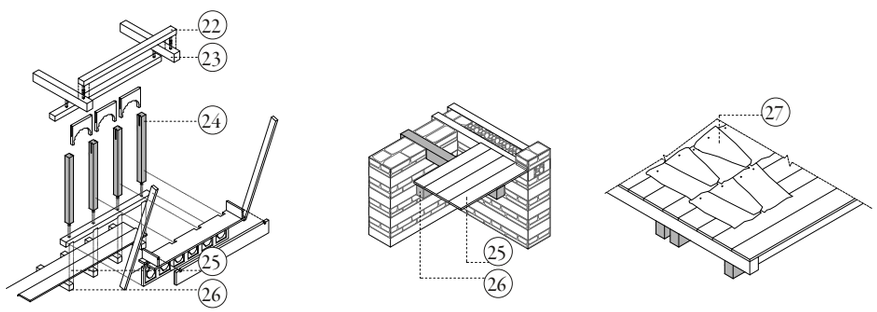


Fig. 2-4 Various construction details and assemblies, mostly made with hand tools such as adze, vice, saw, and hand drill.

Even though these features are fashioned using limited and simple tools, they display remarkable complexity, knowledge of materials, and artisanal ingenuity. Each of these components exhibits functionality and richness in execution. The details include the wall assembly, door and window details, floor, staircase and roof construction, all achieved with different joinery systems but maintaining a thematic unity.

Source: Documented by R. Bhushan (2016), with drawings compiled and re-produced by V. Undaviya.

CURRENT PRACTICES IN HIMACHAL PRADESH AND THE DECLINE OF *KATH-KHUNI*

Some places in Himachal, particularly the more remote and interior villages such as Gawas and Devidhar, retained a strong *kath-khuni* tradition in 2011, which allowed us to see incredible constructions and meet many active craftspeople. In Devidhar village, however, we also saw subtle changes in house construction such as wider window proportions and other adaptations, which showed how new facets are entering *kath-khuni* practice. At the same time, we also saw several out-of-context developments (Fig. 2-5) which are the consequence of many interlinked factors such as changing urban and rural lifestyles, advances in technology, and new infrastructure projects that have together accelerated the influx of alien materials and techniques. Furthermore, recent state policies on timber felling and building regulations have also tilted construction trends towards these newer materials. These changes were most evident in the plains, but are slowly and inexorably inching higher and farther into the Himalayan interior. We expand on these factors below, seeking to properly understand these shifts and their material consequences, without simply adopting *a priori* critical positions.









Fig. 2-5 New constructions.
Top: This panoramic image of Chitkul village shows the majority of houses topped with metal sheet roofing that no longer blend with the context and entails the disappearance of many activities associated with slate roofing. **Bottom left:** House in Sarahan showing post and beam construction in brick and concrete; **bottom centre:** House in Kamru with brick and concrete beams and finished with the effect of stone and wood; **bottom right:** House in Chitkul village showing concrete blocks and wooden frame.
Source: *Prathaa: Kath-khuni architecture of Himachal Pradesh* (2011).

THE EMERGENCE OF INDUSTRIAL MATERIAL AND DECLINE OF LOCAL MATERIALS

Due to the unscrupulous cutting of forests over recent decades, the Himachal state forest policy introduced stringent rules and regulations related to felling and distributing trees. In earlier times, villagers could just bring back the wood they required from nearby forests at no or relatively low cost. Because timber has such a high value today, the rules are much tighter and heavy penalties have been introduced for illegal felling. The rule on obtaining wood from the forest was amended in 2013 to meet the demands of local residents, stating that:"timber is being granted to the right holders who have their recorded rights in the concerned forest settlement reports for grant of timber for construction, repair and addition or alteration of residential house, cowsheds for bonafide domestic use" (HP Forest Manual 2014). Further to this amendment, another clause states that: "For the construction of new house, up to seven cubic meters standing volume is being granted instead of earlier provision of three cubic meters in converted form and for repair, addition or alteration up to three cubic meters standing volume is being granted which earlier was one cubic meter. Trees are being given from salvage (fallen, dry standing) trees, but if salvage trees are not available, then only silviculturally green trees will be given to the right holders" (ibid.).

Although these amendments increase the possibilities for local people to avail themselves of local timber supplies and are thus widely seen as beneficial, the quantities allowed (i.e. seven cubic meters) are woefully insufficient for building a typical three-storey *kath-khuni* house, which requires approximately 96 m^3. Furthermore, market prices for additional wood are very steep, far beyond the means of most households. For instance, as R. Bhushan told us: "One ten foot sleeper measuring ten by five inches (roughly 25 cm by 13 cm) costs approximately INR 9,000 (EUR 100), which is too expensive for an average villager to afford when building a three-storey house". In our interviews with locals in interior villages, many residents echoed that they would prefer to build their houses using wood and not concrete. Wood keeps the houses warm, especially on the upper floors where they spend most of their time, but wood is very expensive to purchase at market prices. Similarly, stone now has to be purchased at commercial rates and involves considerable work to finish, whereas new materials such as concrete blocks (which are widely available at the same rate as stone) are ready to use without finishing, making them simply more economically viable today. Slate tiles also require hauling, cutting and finishing, which is increasingly leading to metal sheet roofing becoming the most popular choice. This combination of restricted access to local resources on the one hand, and cheaper and easier access to newer materials on the other hand, has inevitably resulted in significant changes to the built environment of the region, most notably the declining popularity of new *kath-khuni* buildings.

LIFESTYLE CHANGES AND VISIBLE IMPACT ON SPATIAL REQUIREMENTS

The *kath-khuni* house and its spatial organisation were closely linked to agrarian lifestyles. A large percentage of the total house area was dedicated to livestock, the storage of grains and fodder, and the routines revolving around everyday farming activities. Nowadays, younger people often move to the cities to pursue education or non-farming professions, while in many ways village lifestyles, family structures, and spatial needs are changing. In addition, practical requirements such as flushable toilets, plumbed washing areas, and a whole range of new amenities are now considered fundamental. With the increasing availability and use of modern construction materials, these services and conveniences can be easily incorporated into new buildings. As seen in Fig. 2-5, the new house typologies resemble city homes in many parts of India and beyond, with larger window and door openings, balconies and verandahs, all made from an overall palette of materials that has largely shifted towards concrete blocks, bricks, and metal sheet roofing.

BREAKDOWN IN KNOWLEDGE TRANSMISSION

With rapid and far-reaching shifts taking place in educational, social, and economic systems, life in Himachal Pradesh is changing in many ways. The value assigned to craftwork in general within the Indian subcontinent is unquestionably in decline. Our conversations with craftspeople revealed their own sense of ambivalence concerning the changes underway. On one hand, they wished for continu-

ation of their knowledge and skills, but many also hoped that their children would move away to study in the city and have the opportunity to pursue other professions. As R. Bhushan pointed out:

"Most younger professionals and craftspeople today prefer to learn and engage with materials and methods of construction in reinforced concrete and bricks […] In Naggar village, hardly any new construction is done using *kath-khuni* as 90 % of craftspeople are working in concrete and there has been a definite up-scaling of the use of modern materials […] religious buildings however still employ traditional practices and rely on artisans who are well versed with the craft, but those are very few."

Further to this, in most design and architectural colleges the designers, architects, and engineers are trained in methods of construction using new materials such as concrete and metal, with their associated assumptions of adaptability, low cost, and durability. Thus traditional materials and methods remain peripheral to mainstream training in the field. Building craft knowledge has not become part of the architecture curriculum due to the lack of sufficient academic interest and technical data on the subject. At the same time, there are no formal centres where local technical knowledge can be transferred from the master artisans to the younger generation in an organised, structured, and socially acceptable manner. However, there remains some scope for continuation of these skilled practices, as R. Bhushan pointed out "there is a renewed interest in *kath-khuni* because of the tourism industry, which gives hope to different adaptations and possibilities".



Fig. 2-6 Hybrid productions.
Top left: House in Chitkul, walls with concrete blocks and wooden beams, partially finished with mud and cow-dung plaster and metal sheet roof; **top right:** House in Chitkul built with concrete blocks with other components of a typical *kath-khuni* house. **Bottom left:** Single storey structure in Chitkul with alternate courses of concrete blocks and wooden beams; **bottom right:** house in Gawas comprising a composite structure with concrete columns and wooden beams, with the core of the house having alternate courses of brick and wood, finished with a pent-and-gable slate stone roof.
Source: *Prathaa: Kath-khuni architecture of Himachal Pradesh* (2011).

THE WAY FORWARD — ADAPTATION AND CONTINUITY

As discussed above, we understand the rapid transformations taking place in the built landscape of Himachal Pradesh as an inevitable consequence of societal change. However, the kind of built form changes underway can also have detrimental economic and ecological effects in the long run, especially in an area prone to seismic tremors. In many ways, *kath-khuni* remains the most appropriate and well-adapted architectural form in this region, especially from a climatic viewpoint and in terms of earthquake resilience. This form should not, however, be seen as static and unchanging, as several modifications have transpired over the generations and different Himalayan regions have fostered variations based on the material resources available and the needs pertaining to the local people.[3] For example, *taq* and *bhatar*[4] constructions primarily found in Kashmir and Pakistan keep timber lacing to a minimum, yet achieve good earthquake resilience with significantly less wood in the wall construction than is utilised in traditional *kath-khuni* buildings.

In our view, *kath-khuni* also holds the capacity to develop further, to hybridise, modify, and adapt itself to new conditions, material limitations, and the demands of modern living. The built environment, just like the landscape, is inherently dynamic, continuously changing and evolving. People will always find ways to materialise and express their aspirations in response to the times. Within these shifting expressions, there is considerable scope for new research and action that can keep building craft traditions viable, implementable and relevant for future generations. This quote from Melissa Belz (2012) particularly resonates with our thoughts on this matter: "Through adaptation and by embracing new representations that appeal to younger generations—that is, through change—the connection to vernacular traditions will be maintained by the people who value them. The spirit of collective adaptation adds to the permanence".

Our fieldwork in 2011 gave rise to a seemingly contrasted picture. On the one hand were the *kath-khuni* constructions that were essentially the focus of our study. On the other hand, we found many ad hoc, modern post-and-beam concrete productions that seemed in many ways out of place and poorly adapted to the region. However, between these extremes we also found numerous local adjustments and small changes through which new materials such as concrete blocks or bricks were incorporated, but fused within existing timber frame systems. As seen in Fig. 2-6, several hybrid innovations have emerged that strive to meet the present needs by combining modern materials with traditional technology. Whether these practices take place at individual or collective levels, if they prove to be workable, viable, and effective over time, they may be sufficient to drive a process of revitalising local building culture. This could potentially offer a sustainable, locally adapted and yet contemporary mode of construction, which combines the best of both worlds and enables the continuation of local craft traditions, albeit in a new, hybrid form.

Fig. 2-7 shows some of these contemporary assemblages, built by locals themselves using *dhajji dewari*[5] (top), or brick-and-wood combinations (bottom). These composites require further study and analysis to see how they would perform under different climatic conditions and seismic pressures, but they invite us to think about possible scenarios that can bring together new technologies, materials, and sensibilities in unison with *kath-khuni*, or indeed other vernacular construction systems.

3 Many chapters in the current volume support this assertion, notably those by Dujardin, Norboo et al., and Wozniak.

4 *Taq* (or *bhatar*) consists of load-bearing masonry walls with horizontal timbers embedded in them. These timbers are tied together like horizontal ladders that are laid into the walls at each floor level and at the window lintel level. They serve to hold the masonry walls together and tie them to the floors (Langenbach 2015).

5 *Dhajji dewari* is a variation of a mixed timber and masonry construction type. It comes from Persian and literally means "patchwork quilt wall" (Langenbach 2015).

CONCLUSION

To conclude, *kath-khuni* offers an excellent example of an architectural form that unites artisans and craft traditions, specific skills, knowledge, materials, and practices into a sustainable and well-adapted system. Local people have built communities in this landscape by using all of the available natural resources, avoiding wastage, and struggling with the extreme topography and climate to make peace with nature in beautiful, safe, and secure villages integrated with the landscape. Through this chapter, we wanted to bring forth the core tenets of *kath-khuni*, the craftspeople and artistry behind this vernacular building mode, and to disseminate these insights that have been accumulated over the years and, we suggest, should not be lost. In light of the enormous changes taking place today, there are even more reasons to cultivate new, sensitive, and alternative ways to think about and construct buildings that do not dispense entirely with the wisdom and skills accumulated over the centuries. Beyond the basic material and structural components of buildings, questions of scale, orientation, composition, stacking, and usage of space are equally critical to the overall performance envisaged for houses and other buildings alike. We have shown how contemporary social, economic, regulatory, demographic, and material circumstances have led to declining use of *kath-khuni*. However, we also argue that *kath-khuni* offers an array of techniques that can be blended with modern materials and construction methods to result in hybrid forms that enable the spirit, values, and aesthetics of *kath-khuni* to continue, as well as for new buildings to benefit from the seismic and climatic advantages it undoubtedly offers.



Fig. 2-7 Extensions, amalgamations, and continuation.
Top: Sohan lal house in Chachogi village in Naggar, with extended spaces built on old *kath-khuni* structure, addition of new materials and techniques such as *dhajji diwari*. **Bottom:** Vedram house. A local *kath-khuni* house flanked by new rooms in brick-and-wood and metal sheet roofing. The interior spaces are finished with wooden panelling.
Source: North (2021).

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III

"Making" in Contemporary Bhutan: Balancing on the Cutting Edge of Culture Transfer and Culture Rupture from the Perspective of the Thirteen Traditional Crafts (*zorig chusum*)

Marc Dujardin

Name: Marc Dujardin
Designation: Professor
Affiliation (Institute): KU Leuven university, Faculty of Architecture, Campus Sint-Lucas Ghent.
E-mail address for correspondence: marc.dujardin@kuleuven.be

Biography

Marc Dujardin

is a Belgian architect, professor at the Faculty of Architecture, KU Leuven, Belgium. Founder of the faculty's international Master of Architecture and the arCsus (architecture, CULTURE, sustainability) Lab. Extensive international (UN-HABITAT) expertise in planning, design and building in Africa and Asia. Senior expert in Designing for Spatiocultural Sustainability from the perspective of Architectural and Design Anthropology, Designing for Multi-Sensoriality from the perspective of "Enabling" Disabilities. His PhD (2000) and related publications research the dynamics of Bhutan's "living" architectural tradition.

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I am gratified and indebted to so many Bhutanese citizens no matter the social status or position they had or have to making this place on earth my second home. However, I would like to dedicate this book chapter to two personalities who gave me full confidence and appreciation for my professional and academic skills, but above all for my personal attitude towards this sensitive dwelling culture in motion: Bhutan's former Foreign Minister Lyonpo Ugyen Tshering and Tibetologist Dr Françoise Pommaret.

INTRODUCTION

The cultural matrix investigated in this chapter is that of Bhutan, one of the world's most secluded, hitherto well-preserved and uncharted "living" architectural traditions. Bhutan is a small, independent Himalayan Buddhist kingdom where one can still observe a blend of centuries-old (rural) architectural traditions alongside early attempts to introduce and structure urban space as the materialisation of its unprecedented "modern" (urban) condition. Leaving aside the fact that in Bhutan the tension field of tradition and modernity is historically embodied by distinct architectural figures of "village" and "city" respectively, my real fascination for Bhutan as contextual framework arises from the observation that some of the faculties associated with western "transitory" concepts of modernity are more likely to be found in Bhutan's "traditional" condition than in its imported version of built space. Indeed, in Bhutan factors such as change, impermanence, ambiguity, tolerance, deconstruction, and reconstruction are celebrated as exponents of Bhutanese traditionalism. The contemporary processes of negotiation underway are facilitated by the fact that Bhutanese tradition is not a fossilised body of habits and conventions, but is rather based on an outlook that permits and even stimulates change (Dujardin 2000a: 14). Reporting contemporary Bhutan's "living" architectural tradition can no longer be approached from romanticised "Shangri la" or "National Geographic" type perspectives. The title "balancing on the cutting edge" may represent a more precarious but plausible contextual framework to approach Bhutan's traditional craftsmanship from a more praxeological perspective, focusing on the process of "making".

The first part of this chapter describes Bhutan's contemporary dwelling culture as existing at the interface of converging and diverging space definitions. Thereafter the "synergic" morpho-typological palette, consisting of a limited number of constituent "built" elements associated with Bhutan's Drukpa architecture, is briefly outlined, followed by a more conceptual interpretation of the roles these interrelated building types play in "making" this fraction of the immense "uninhabitable" Himalayan landscape "inhabitable". This provides the spatiocultural background for the introduction of the "13 traditional crafts" (*zorig chusum*), from which we primarily explore the craft that perhaps best represents Bhutan's quest for cultural uniqueness through building for "merit"—the "art of woodwork" (*shing zo*). Rather than presenting a catalogical account of Bhutan's rich variety of region-specific wooden building elements, I have opted to focus on one traditional house, the making of which was mapped, studied and followed-up on almost a daily basis (Dujardin 1990). This detailed account serves as the backcloth against which I will discuss culture-geared processes of transformation, as implemented in the Rural Housing Demonstration Project, a testing ground for understanding how resilient traditional Bhutanese architecture truly is amidst the plethora of divergent forces that increasingly pressurise this unique "living" architectural tradition, handed down over many centuries. However, in making Bhutanese architecture the site of a "struggle" between identity and difference, or expediency and continuity from the perspective of the *zorig chusum*, the reader may end up with the question: where do we go from here and what lies ahead for this sophisticated toolbox of building crafts, as it balances on the cutting edge of cultural transfer and culture rupture? In all humility, the most appropriate way for me to shed some light on this all-encompassing, precarious and open-ended question is to give the last word in the epilogue to the two key Bhutanese actors involved in the current reconstruction of Wangdue Phodrang Dzong: 51-year-old project director Kinley Wangchuk and the 71-year-old *shing zowpon* Dorji from Bjena Gewog, Bhutan's most qualified head carpenter, referred to as the "Wood Whisperer of Wangdue".

BHUTAN'S CONTEMPORARY DWELLING CULTURE: BUILT SUMMARY OF DIVERGING SPACE DEFINITIONS

Clinging to the roof of the world, Bhutan, locally referred to as "Druk-Yul" (Land of the Thunder Dragon) is literally sandwiched between political and cultural giants—China's Tibetan Autonomous Region to the north and India to the south. The country is the only surviving independent Himalayan Buddhist kingdom and here the encounter between a centuries-old rural architectural tradition and the first attempts to introduce and structure urban space is still in progress. It may well be the case that contemporary architectural practice in Bhutan evokes a sense of mimesis, which goes far beyond what is generally understood by copying, imitation or reproduction. Like various comparable Buddhist groups in the Himalayas, Bhutanese culture celebrates interactive processes of copying and innovation as an integral part of its authentic tradition, notably through a process of continuously demolishing and rebuilding most of its architectural heritage, ranging from historical politico-religious monuments to secular forms of rural and urban architecture.

Bhutan succeeded in escaping the big waves of industrialisation, colonisation, urbanisation, and globalisation that so profoundly shaped its neighbours right up to the early 1960s and survived quite well without them. Following the annexation of Tibet by China in 1951, the trade routes were closed and the main lines of socioeconomic and cultural exchange were redirected towards the south. It was at this juncture that new architectural paths began to be explored. If in 1990, around 80 % of the Bhutanese population (estimated at around 600,000) still adhered to traditional rural patterns of dwelling and traditional craftsmanship, its 20 % urban counterpart was confronted with the consequences of an accelerated modernisation process that rapidly affected not just incipient townships, but the whole of the country's built landscape.

Barely three decades later, in 2020, the proportion of rural to urban residents has substantially evolved to 50 % and is tipping even further in favour of the urban population[1]. Leaving aside the special case of Phuentsholing, Bhutan's main southern commercial border town and rapidly expanding urban district centre, the effects of urbanisation are still most visible in the drastically expanding urban valley of Thimphu, the capital and seat of government with an estimated 79,185 citizens in 2020. Fewer and fewer residents in Bhutan's urban centres were born or grew up in their villages of origin. No matter how strong the ties they maintain with rural Bhutan, the city gives rise to all kinds of blurred identities and cultural interactions. A more ambivalent interpretation of Bhutanese traditionality may be possible here, given the irreversible process of modernisation during the past seven decades.

Throughout these culture diverging interactions, however, Bhutanese people are concerned about preserving their cultural identity, or as the Bhutanese government official and scholar, Karma Ura, argues "politically, Bhutanese culture is regarded as indispensable to unique national identity […] and while development is being ushered in, by far the most ambitious national goal is that of cultural preservation" (Ura 1997: 247). Tradition is a living entity that the Bhutanese do not wish to simply give up on in favour of imported values or goods. They thus seek a negotiation between tradition and modernity at all levels and modes of cultural practice, which will allow them to preserve their identity while at the same time taking advantage of some selected aspects of modernisation.

Lacking an urban history of its own, Bhutan's architectural evolution relies entirely on an accelerating import of external concepts, typologies, and building practices originating in regional reinterpretations of all sorts of modernising conventions. For the average Bhutanese, the urban valley of Thimphu truly embodies modern Bhutan. From a western perspective however, Thimphu's urban identity compares with that of an average modernised village somewhere in Switzerland, or that of an incipient city in another developing country where it would never have occurred to the colonial and post-colonial planners to impose a Modernist agenda as the ultimate design parameter. Thus, no matter how "Bhutanised" the city of Thimphu may seem, the absence of a genuine urban history until the 1960s means that every imported idea, concept or form that differs from the centuries-old architectural tradition automatically gets associated with modernity, albeit necessarily subjected to a process of "Bhutanisation".

High-tech or ultra-modern architecture does exist in Bhutan according to Bhutanese perception, but it is not exposed as it is in the West. On the contrary, even as the first high-tech office complex was constructed in Thimphu—fitted with such unprecedented techni-

1 In 2020, Bhutan's total population was estimated at 770,731 of which already 50–73% (representing 385,000 to 564,000 inhabitants, respectively based on a growth rate of 4.6% or 7.3%) are registered as urban dwellers (MoWHS 2010: 2).

cal features as an elevator, basement parking, a central heating system, a fire alarm and a basic set of "home automisation" devices—yet another fortress or palace-type edifice made its appearance without any avant-garde intent.[2] To minimise the risk that such technical and other architectural innovations may obtrude from beneath the overlaid mask of "traditional decoration", to use Pierre Pichard's expression, stylistic decline in present-day Bhutan is seemingly arrested through the enforcement of a traditional design and building code deriving from the country's centuries-old architectural tradition. In practice, these amount to little more than facade control guidelines, which make every new building *look* like another instance of bold, ornamented and yet traditional timber architecture.[3] Since Bhutan had no local tradition of documenting aspects of either its material culture in general, or its architecture in particular, the question arises as to what is really at stake here—its traditionalist aesthetic, the revitalisation of its endangered building craft traditions, or the recovery of its built history through the Bhutanisation of its rapidly urbanising condition? What the census figures given above show about the distribution between rural and urban residents suggests that secular architecture in Bhutan is rapidly inclining towards a condition whereby the once all-encompassing set of traditional crafts may irrevocably lose strength as a "unifying" force, and in particular the unique skills associated with its nail-less timber architecture (*shing zo*). But before we delve deeper into the critical momentum of Bhutan's built history, the cutting edge between culture transfer and culture rupture, a more comprehensive framework is presented of the nation's traditional and predominantly "rural" dwelling culture, homeland of the 13 traditional crafts in general and timber architecture in particular.

2 See 'High-tech RICB building goes to tenants,' published in Bhutan's National Weekly of 15.6.2002.

3 Pichard (1999: 249). Pierre Pichard is a French expert in architectural heritage based in Pondicherry (India). Commended for the restoration works of Angkor Wat in Cambodia, he carried out measurements and restoration activities at Chapcha and Simthokha Dzong in Bhutan during the late 1980s and 1990s.

DRUKPA ARCHITECTURE AS A CULTURAL FORCE: BHUTAN'S MORPHO-TYPOLOGICAL PALETTE

The Ngalong Drukpa is the major ethnic group in Bhutan and it originally occupied western and central parts of the country. Drukpa architecture is associated with the country's national identity and is promoted as the unifying cultural force *par excellence*. The Drukpa architecture of Bhutan is associated with building types that are deeply rooted in Tibetan Buddhism—majestic and strategically positioned monastery-fortresses (*dzong*), dramatically located temples (*lhakhang*) and monasteries (*gompa*), various types of Buddhist votive structures (*chörten*), water driven prayer wheel structures (*mani chukhor*), prayer walls (*mani*), different types of spirit houses (*lukhang* and *tsenkhang*), picturesque clusters of village farmhouses (*gung chhim*) and, last but not least, the technical genius of its cantilever and chain bridges (*zam*). (Fig. 3-1 and Fig. 3-2) Irrespective of status, size, and function, all of these building types are still being used and rebuilt within a commonly shared building practice that has evolved over the centuries and is based on the body of knowledge (*zorig chusum*) and facilitated by a system of mutual help and the maximum use of locally available building materials.



Fig. 3-1 Paro Dzong.
View to Paro Dzong and its *ta-dzong* (watch tower) which serves as the National Museum.
Source: Marc Dujardin (1987).

THE REPRODUCTION OF CONCEPTS: BHUTAN'S THREE-TIERED WORLD (*LHA TSEN LU RAGSUM*)

At both conceptual and structural levels, Bhutan's traditionally built landscape displays a peculiar definition of space. From monastery-fortress to farmhouse, from spirit house to shrine, and from prayer flag to carved rock, each and every building, culturally significant object or natural phenomenon seems to partake in a game played out on the surface of a topsy-turvy chessboard—the landscape of the Himalayan range. Looking at the meticulous positioning of these edifices as landmarks, one soon realises that Bhutan's traditionally built environment contains a definition of space that allows for multiple interpretations. In Buddhist thought, the heavenly powers are perceived as presences in the natural environment and in the landscapes that emanate from an idealised spatial entity ruled by "order and harmony". This higher order can be transferred to the material, human level of building in analogy with that higher order. Indeed, it is a widespread phenomenon across Asia and in other cultures around the world that the built representation of a mental construction (world views, foundation myths and ideas about life and after-life) may evoke mimesis.

According to pre-Buddhist Bhutanese conceptions, the universe is structured as a three-tiered world, referred to as *Lha Tsen Lu Ragsum*. There is a heavenly upper world that begins with the highest mountain peaks, which is the realm of the gods (*lha*), and a middle world, where human beings live with their local deities (*tsen*). Finally there is the underworld of rivers, lakes and underground life, including a plethora of demons (*lu*). (Fig. 3-3)

If one takes a close look at the author's synoptic sketch, one may observe a spatial hierarchy (vertical and horizontal) between the most representative elements of Bhutan's repertoire of basic architectural elements (*dzong, lhakhang, chörten, chhim, zam*). The three-tiered division of the universe—as depicted in painted scrolls (*thangka*) and cosmic diagrams (*mandala*)—also gives ritual significance to religious and secular concepts of ordered space and buildings. A good example is the tripartite division of the traditional farmhouse, Bhutan's architectural archetype.

The fascinating thing about the Bhutanese approach to concepts and practices of architectural preservation—as demonstrated by the present wave of major reconstruction projects throughout the nation—is the range of reasons justifying an approach that goes way beyond what we normally mean by the notions of preservation, restoration, and renovation. There may be many reasons, for instance, why one might want to demolish and rebuild a monastery-fortress, a temple or a house—practical, technical, sociopolitical, cultural, religious, and cosmological. From a religious perspective, the Buddhist doctrine of the "impermanent" character and condition of all modes of existence has never associated buildings with eternity, as referred to in the introduction. Like other aspects of material culture, architecture is also subject to the wheel of existence—the cycle of life, death and rebirth (*samsara*).



Fig. 3-2 Throngsa Dzong.
A lateral view of Throngsa Dzong and its *ta-dzong* (upper right), as seen when approaching the district township of Throngsa from western Bhutan.
Source: Marc Dujardin (1987).

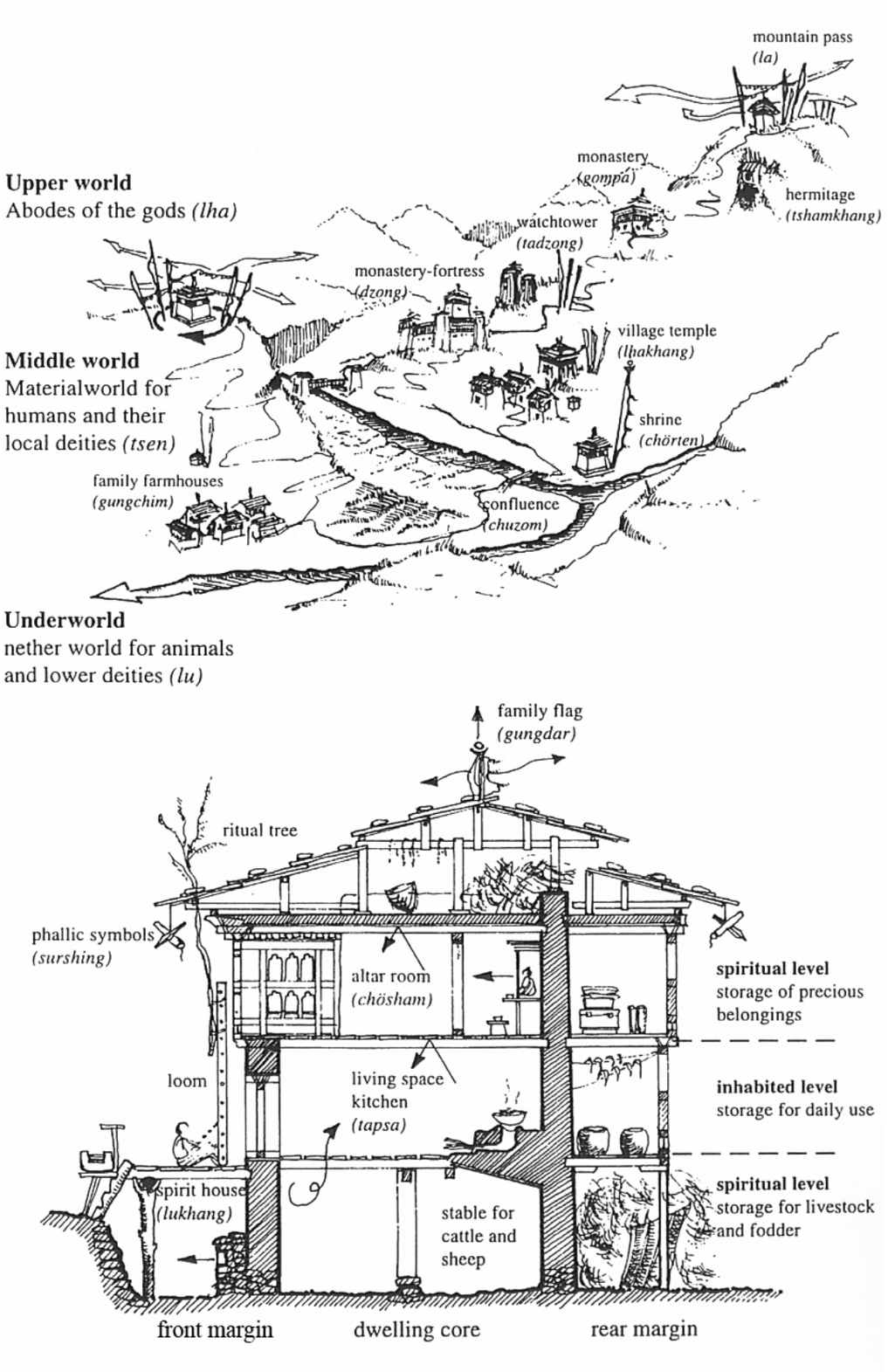


Fig. 3-3 Synoptic sketch of *Lha Tsen Lu Ragsum*.
Synoptic sketch mapping spatial and cultural relationships between the Bhutanese landscape, the three-tiered universe (*Lha Tsen Lu Ragsum*) and the vertical, tripartite division of the traditional farmhouse.
Source: Marc Dujardin (2000a).

THINKING, SHAPING, AND MAKING IN BHUTAN: NATION BUILDING ALONG THE EASTERN HIMALAYAS

From Bhutan's emergence as a nation during the first half of the 17th century onwards, it was widely accepted that an all-encompassing quest for "cultural uniqueness", ascribed to Shabdrung Ngawang Namgyel, Bhutan's founder and first politico-religious leader, entailed the fundamental rethinking of various aspects of culture, both material and immaterial, tangible and intangible. Bhutan's "science of crafts" (*zorig pa*), accounting for the nation's ability to think, shape and "make" its proper version of Himalayan architecture is locally referred to as the "13 traditional crafts" or *zorig chusum* (*bzo rig bcu gsum*). As Bhutan's "toolbox" of traditional knowledge, skill, and materials, this provides the core of building crafts needed to materialise a distinct dwelling culture within the sacred landscape of the Himalayas, while also being subject to change. Acknowledging that the monumental architecture of the monastery-fortress (*dzong*) most comprehensively represents an all-in one experience of the *zorig chusum*, this essay primarily focuses on woodwork crafts (*shing zo*), which allows an approach to Bhutan's "living" architectural tradition from a praxeological perspective. An abundance of forest enabled the Bhutanese to make wood crafting the most visible agent in literally shaping and building a national identity, increasingly deviating from its Tibetan origins in terms of definition of space and architectural form.

In contrast with the bare landscapes of the Tibetan plateaus above tree level, Bhutan's densely forested environment undoubtedly facilitated the "Bhutanisation" of culturally celebrated regional carpentry architectures, technologies, and artistic refinements. For instance, in Tibetan material culture the concept of *rabsel* (*rab* meaning "good" and *sel* "clarity") refers to the elaborate timber window frames that allow the most light into the main room. In most cases, the *rabsel* consists of a building's largest window frame imbedded into a solid wall construction. (Fig. 3-4)



Fig. 3-4 Abe House, Skurbuchan, Ladakh (India).
A typical Ladakhi *rabsel* window frame embedded into the massive walls of the house. The *rabsel* not only allows maximum light in the room behind, but also demonstrates social importance. The window frame is accentuated by its projecting lintel and plinth, as well as its peculiar two-tiered window frame pattern. Source: John Harrison (2012).

In Bhutan, however, the abundance of construction timber allowed the *rabsel* window frame to evolve into one of the most significant structural building components and to become deeply associated with Bhutanese architecture and mastery of carpentry. Covering the entirety of the facades of a building's upper floor(s) (*rabsel Go-Cham Thognyim*) and/or combined with detached projected oriels (*Nimchu rabsel*), seven categories of *rabsel* window frames are formally distinguished (MoWHS 2014: 114–134)[4]. The utmost characteristic feature of Bhutanese window frames is truly the "trefoil arch" window profile, referred to as *horzhu*. It is omnipresent in Bhutan's centuries-old vernacular morpho-typological palette, from religious and state-religious to domestic types of architecture[5]. Cut from one single wooden lintel profile, a traditional *horzhu* can comprise a series of two or multiple arches, depending on the frame's function, position in the facade and/or its aesthetic intent, which reveals the edifice's politico-religious and cultural status as well as its economic value. Either inserted in *Payab Gochu* type window frames[6] embedded in solid wall constructions made of rammed earth (*Jyang*) or dressed stone (*do*) on the one hand, and/or forming the most prominent feature of the *rabsel* window frames[7] on the other, the *horzhu* is the architectural design pattern most recognised by visitors and locals alike as an exponent of Bhutanese traditionality. (Fig. 3-5 and Fig. 3-6) However, with the emergence of unprecedented accelerated urban development from the 1960s onwards, urban architecture copies architectural features such as the *rabsel* and *payab gochu* window frames in brickwork and concrete. If the trefoil *horzhu* window frame pattern, once the unifying force par excellence, still appears in building construction in contemporary Bhutan (Fig. 3-7 and Fig. 3-8), it is rarely more than a gimmick. If not entirely omitted, the *horzhu* being inserted into modernised window frames are subsidiary plywood stencils—often cut from steel plates—aiming to comply with the minimum standards of the Royal Government's architecture and building regulations and surely not as tributes to a unique living architecture. Deprived of its structural and technological properties, tradition is abruptly brought down to the level of a cosmetic makeover. (Fig. 3-9)

With only superficial knowledge of Bhutan's distinctive elaborated nail-less wood crafting architecture, present-day construction skills and practices in both rural and urbanised contexts increasingly show how easily celebrated traditional designs and crafts can be debased, if not erased altogether. Even though Bhutanese architecture and craft traditions have always been open to change, current developments are pushing this to the limit.

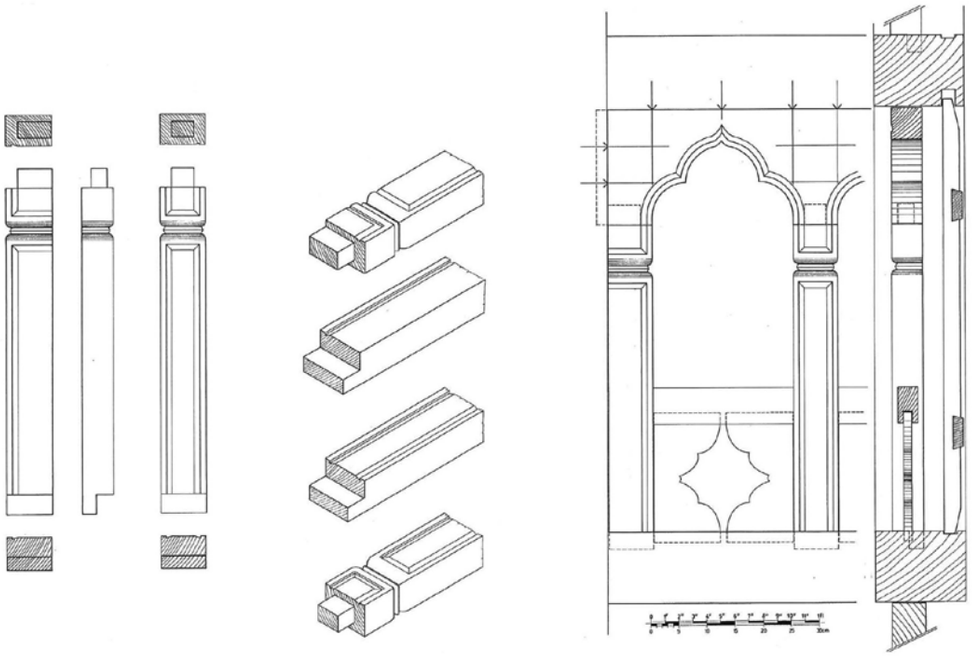


Fig. 3-5 Profiling *horzhu*.
Details of the timber profiling and proportions of a typical trefoil arched window frame (*horzhu*). Measurements and drawings were prepared for the construction of the Begana House.
Source: Marc Dujardin (1991).

4 This report is available for free online: https://www.mowhs.gov.bt/wp-content/uploads/2010/11/Bhutan-Arch-Guidelines-final-2014.pdf (accessed: 1.2.2024).

5 To date, the most complete architectonic and cultural documentation of traditional building practices in Bhutan is local scholar Chang Dorji's book *Clear Exposition of Bhutanese Architecture* (Dorji 2004).

6 The load bearing traditional Bhutanese window frame known as *Payab Gochu*, embedded within the facades of solid walls consist of three distinct types: *horgo payab*, *lingo payab*, and *gedkar payab*. Depending on their refinement with a wattle (*soma*) or daub (*shamig*) infill panel made of bamboo and mud plaster, such windows can for instance be renamed as *horgo payab-shamig* (MoWHS, 2014: 81–95). From the 1960s onwards, coinciding with the introduction of glazed windows in urban buildings, a more simplified window frame was developed known as the *byelgo payab* (ibid. 94f.).

7 The *rabsel* window frame consists of four main types, depending on the "secondary" timber profiles that are included or omitted from the base structure and the status of the building: 1. Rab – (*langna+drey zhu+gyetsa*), 2. Ding – (*sa+dung+pem+choetse*), 3. Tha – (*sa+dung+pem*), and 4. Thali tha – (jangu+budhen) (MoWHS, 2014: 119). Another eight categories, elaborated over Bhutan's built history, unveil their place of origin, age, and status: 1. *rabsel Go-Cham Thognyim*, 2. *Parop rabsel*, 3. *Byelgo rabsel*, 4. *Gyesargo rabsel*, 5. *Lingo rabsel*, 6. *Nimchu rabsel*, 7. *Gomang rabsel*, and 8. *Lobur rabsel*. For instance in the case of the *Parop rabsel*, originating from the Paro region, the facade structure consists of three tiers of *horzhu* windows instead of two as commonly observed across the country (MoWHS 2014: 120).



Fig. 3-6 A typical *horzu rabsel*.
Top left: A three-storied farmhouse in the valley of Paro, western Bhutan. The three-layered row of arched windows (*horzhu*), forming the elaborated timber frame (*rabsel*) is typical of this district (*dzongkhag*).
Source: Marc Dujardin (1987).

Fig. 3-8 *Horzu* Timphu.
Bottom left: Superficial "traditional" timber features match the modernising trends of urban architecture. The refurbished facade of this hotel in Thimphu uses mere stencils to redesign the *rabsel go-cham* and *horzhu* patterns.
Source: Marc Dujardin (2013).

Fig. 3-7 *Horzu* imitation city.
Bottom right: Cosmetic imitations of Bhutan's ornamental timber architecture are set into masonry and reinforced concrete buildings in the capital, Thimphu. The apartment block painted in yellow combines standardised window frames in timber with mimetic cornice elements cast in concrete. Despite strict facade control regulations, the prescribed typical trefoil window pattern has been omitted.
Source: Marc Dujardin (2013).







Fig. 3-9 Painted facades.
Traditional craftsmanship has been almost entirely erased from the urban construction industry. Forced to make this dull building in cement concrete look more "traditional", the builders subjected it to a cosmetic make-over. The only traditional craftsmanship involved was the paintwork, for which the artisan had to operate out of his comfort zone in terms of tactile materials, textures, and proportions.
Source: Marc Dujardin (1986).

THIRTEEN-A-DOZEN: BHUTAN'S 13 TRADITIONAL CRAFTS IN A NUTSHELL

Before exploring the Bhutanese craft of woodwork (*shing zo*) from a praxeological perspective by means of the concepts of *rabsel* and *horzhu* window frames, it is necessary to first introduce more fully the *zorig chusum* (13 traditional crafts), Bhutan's all-encompassing interactive body of craft knowledge. The best and liveliest introduction to the 13 traditional crafts to date was written by the Australian economic expert Barry Ison, with whom I contributed for the book and exhibition catalogue *Bhutan Mountain Fortress of the Gods*, edited and curated by Christian Schicklgruber and Françoise Pommaret (Schicklgruber and Pommaret 1997). Originating under the guidance of the founder of Bhutan, Shabdrung Ngawang Namgyel, and formally categorised under his successor, the 4th Desi (secular ruler) Tenzin Rabgye (1680–94), the *zorig chusum* forms an integral part of a "system of administration, law and worship, bringing elements of secular and religious life together, that aimed at creating unity and a sense of harmony out of extreme diversity" (Ison 1997: 102). According to Ison, the 13 traditional crafts represent one out of three "activities" associated with Bhutan's "science of arts" (*zorig pa*), which are: 1. the "physical" (*lü zo*), including the *zorig chusum*; 2. the "verbal" (*nag zo*), consisting of teaching, worship and words; and 3. the "mental" (*yid zo*), which includes meditation, clear thought, good values, and foretelling the future. The term *zorig chusum* is explained as follows: *Zo* refers to the ability to make, *rig* is the science or craft, and *chusum* means 13. Lacking comprehensive literary sources, Ison argues that there is broad consensus over the 13 groupings. Hereunder is Ison's complete list and brief description of the 13 crafts (Ison 1997: 102):

1. ***Shing zo:*** Woodwork, including the building of *dzong*, temples, palaces, houses, tools and other implements.

2. ***Do zo:*** Stone arts. This includes *stupa* (*chörten*), stone pots, stone tools, millstones, and has a special section called *tsigo*, which refers to the building of stone walls.

3. ***Par zo:*** Carving. Wood carving, slate carving and stone carving are included.

4. ***Lha zo:*** Painting of *thangka*, *mandala* and shrines; wall painting and house decoration.

5. ***Jin zo:*** Clay arts. This includes the making of statues, pottery, and masks, mortar/plastering,

rammed-earth construction (*dzam zo* locally referred to as *pa zo*) and moulded offerings (*torma*).

6. ***Lug zo:*** Casting, mainly bronze. Statues, bells, musical instruments, tools and kitchen utensils, as well as slip-casting for both pottery and jewellery.

7. ***Shag zo:*** Wood-turning. The craft of turning bowls from the precious knots and special parts of a tree or root. The *dapa* or serving dish, wooden plates, buckets, ladles and the small hand drums.

8. ***Gar zo:*** Blacksmithing. Craftsmanship to produce swords, knives, axes, ploughs, chains, utensils.

9. ***Tre zo:*** Goldsmithing, also silver or copper ornaments. Cut out, beaten, drawn or engraved.

10. ***Tshar zo:*** The art of cane and bamboo making. With differing names per region, there is the *banchung* to carry food, the *palang* to store beer or liquor, the *thesip* for storing grain, the *balep* or bamboo thatch and, of course the bow and arrow (archery is Bhutan's national sport).

11. ***De zo:*** Paper art. The word *de* refers to the Daphne plant from which traditional paper was, and still is, made. Today paper is also made from raw materials such as bamboo and rice stalks.

12. ***Tshem zo:*** This craft includes items that are stitched together or embroidered, made from cloth or leather, and which have a large variety of uses. There are two special categories: 1. *Tshemdrup*: Sewing and embroidery; and 2. *Lhendrup*: appliqué work and patchwork — items made by stitching cloth together. Hat-making and boot-making are also included.

13. ***Thag zo:*** Weaving. This also includes the preparation of the yarn, dyeing and the numerous designs. This is probably the largest grouping in terms of variety of products and number of craftspeople involved.

For each craft, Ison provides a detailed account of one representative craftsman-respondent he encountered, and all that the craft involves in terms of suitable raw materials, geo-economic and environmental considerations, the production process, and the skills involved. He ends each account by discussing the spiritual and cultural "merit" generated by these activities for all the stakeholders involved. While recognising the many spatial, cultural, and practical reciprocities, interdependencies and synergies between two or more of the 13 crafts, my primary concern is directed towards the craft identified with Bhutan's peculiar timber architecture — *shing zo*.

TRADITIONAL TIMBER ARCHITECTURE IN CONTEMPORARY BHUTAN: PRACTISING THE *SHING ZO* ART

Although I did not meet Barry Ison in person in Bhutan, his approach to introducing the 13 traditional crafts by narrating true craftsman stories, particularly concerning *shing zo*, *do zo* and *Jinzo* (*dzam zo* locally referred to as *pa zo*), encouraged me to revisit my own architectural and anthropological field notes recorded during my regular work and research visits to the same construction sites he wrote about in the 1980s. Indeed, some of Ison's respondents were also personally known to me, having acted as resource people on architectural and building construction matters. With their help, I was able to "learn from practice" both through my assigned design work for the Rural Housing Demonstration Project and my PhD research on the dynamics of Bhutan's living architectural tradition from the perspective of Architectural & Design Anthropology.

Ison (1997: 106f.) describes the intimate relation between the carpentry craftsman and the forest he depends on for the procurement of "raw material" for himself and his successors. These craftsmen develop a keen geo-ecological awareness of the raw material's finiteness, which prevents exponential expansion of collection areas and thus avoids overexploitation and excessive hillside erosion. He describes the artisanal production process and the role of the key actors involved in practicing the *shing zo* art. Finally, he considers the added spiritual and cultural "building for merit" values both for the end products and for all the stakeholders involved, from patrons and ritual masters to master-builders, and including the carpentry assistants and unskilled labourers who also partake in the construction process. Indeed, "knowing how to build, therefore also required and understanding of

sacred scriptures dealing with building construction and in so doing reflects a devotional act which links the craftsperson to his/her personal deity" (Ison 1997: 106). The basic knowledge of the *zorig chusum* and the specific skills associated with carpentry in particular are transmitted through extensive practice-based, on-the-job-training at various sites across the country (ibid.). Skill and experience levels increase as practitioners progress from helper (*lagshep*) to carpenter (*shing zo*) and from carpentry teacher (*shing zo lopon*) to senior master-carpenter (*zowpon*). To complete Ison's upscaling list of levels of expertise, the second highest rank of master-builder that I came across is *zorig lopon*, associated with the character of Dasho Khandro, the executive master-builder of the Fourth King of Bhutan.[8] As an apprentice, he worked under the auspices of Dasho Parpa Oezer, the *zorig lopon* who was commended for the reconstruction of the Tashichoedzong in Thimphu during the 1960s.

Upon completion of the major transformation of the former summer capital *dzong* as the seat of the third King and the Central Government, he was awarded the exceptional rank of *zorig chipchhab drepa* (*drep* means retired). (Fig. 3-10) Although *zorig lopon* Dasho Khandro is predominantly known as the highest practising authority of traditional Bhutanese architecture, it is important to note that he also displayed enormous curiosity about and eagerness to learn from modernised building concepts and technologies. This may well have inspired him to no longer claim the *zorig chusum* as the sole "toolbox" to draw upon during commissioned architectural works of historical importance. Indeed, I spotted Dasho Khandro (Fig. 3-11) on construction sites of urban apartment blocks in the capital, where as owner-cum-architect he made extensive use of imported, modern skills and techniques such as skeletal construction in reinforced concrete, adherence to Indian building regulations and standards for earthquake proofing, and superstructures made from industrially manufactured bricks or concrete building blocks. Most importantly, physical assessments reveal how easily traditional carpentry crafts are subjected to a process of simplification, industrialisation, and timber saving to address the present-day challenges of urban architecture. Consider, for instance, the technical transformation of the *payab gochu* window frame into its simplified version, known as *boego payab* (MoWHS, 2014: 94–96). Prior to describing the role of Bhutan's monastery-fortress (*dzong*) as setters of trends or "propelling monuments" through processes of regular deconstruction and re-erection, we first zoom in on how the practice of traditional craftsmanship works at the level of house construction. From multiple detailed studies of completed[9] as well as "ongoing" house building constructions to learning from practise myself, this offers perhaps the most complete and detailed account of Bhutanese building crafts as process and product.



Fig. 3-11 ***Zorig Lopon*** **Dasho Khandro.**
Dasho Khandro, the *zorig lopon* commended for the reconstruction of Punakha Dzong in the late 1980s, who was patronised by the fourth King of Bhutan. Here he is supervising the construction of one of his private, modern buildings in Thimphu, which includes *boego payab* window frames, the simplified version of the traditional *payab gochu*.
Source: Marc Dujardin (1990).

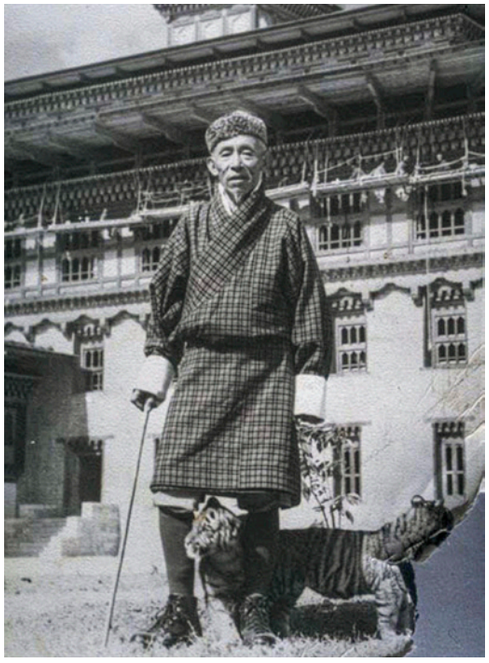


Fig. 3-10 A ***dzong*** **authority.**
Zorig chipchhab Dasho Parpa Oezer, the third King's highest-ranked master builder (*zorig lopon*), shown at the site of the reconstruction of the Tashichoedzong in Thimphu, for which he was highly commended. The two tiger cubs at his feet certainly contribute to expressing his authority as a most exceptional craftsman.
Source: Formal photographer of the palace, Wang Studio, Thimphu.

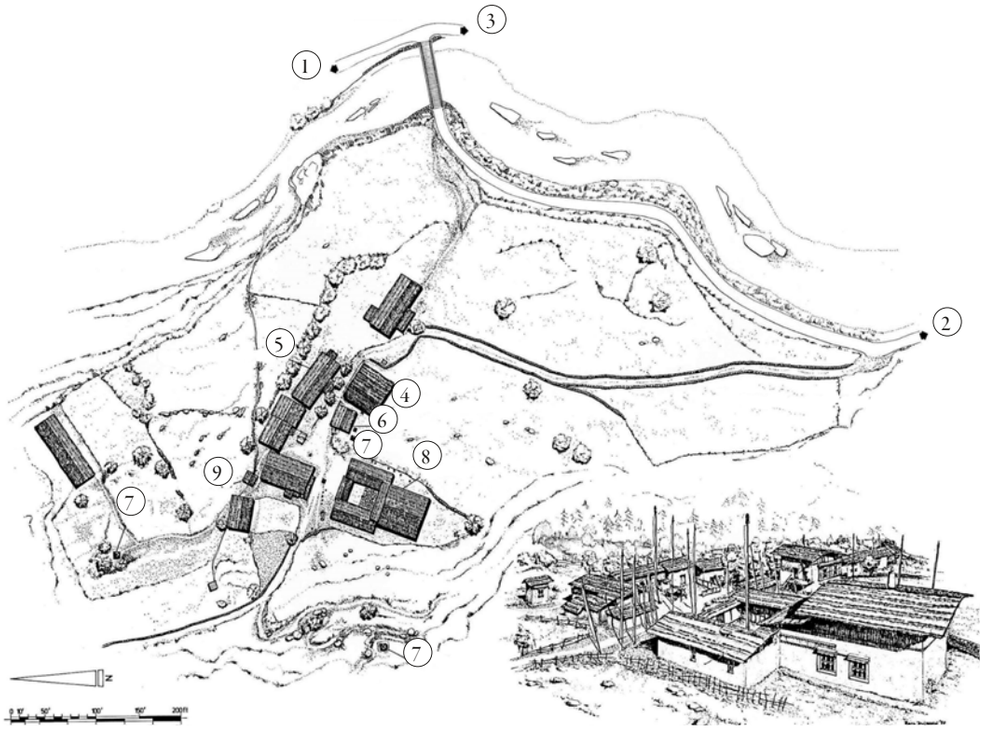
8 Dasho Kandro supervised the construction of the third temple building of the Kurje Lhakhang site, the major reconstruction of Punakha Dzong, and at a later stage served as cultural advisor to the Indian chief architect of the modernised construction of the SAARC Conference Centre, opposite the Tashichoedzong. The confidence that I seemingly earned from the Fourth King — he used to refer to me as "the European gentleman" – for my contribution to one of the spearheads of the Sixth National Development Plan, radiated from Dasho Kandro, to whom I am deeply indebted for trusting and initiating me into the basics of Bhutanese *shing zo*. Indeed, being introduced by Françoise Pommaret, a French Tibetologist and one of the most rewarding scholars of Bhutanese history and culture, to the figure of Dasho Shingkhar Lam Kunzang Wangchuk, a highly experienced expert in iconographic craftsmanship, encouraged me to become a culture inspired designer, simultaneously mapping and writing Bhutan's architecture as spatiocultural praxis.

9 Reference is made to: the complete measurement of the village of Rukubji (Dujardin 2000); two traditional farmhouses in Ura and Eutsa (Herrle & Wozniak 2017: 176–199); an architectural study of the township of Bumthang by the Swiss FHNW School of Architecture, Construction and Geomatics (Ackerman et al. 2013), a detailed survey and research report of "Traditional Bhutanese Houses" by the Japanese Chiba University (Furuichi 2010); and and Issue 2 of the *Architectural Heritage Journal* of the Ministry of Home and Cultural affairs (MoHCa 2011).

THE HOUSE OF SANGAY DORJI AT BEGANA: THE *ZORIG CHUSUM* ACTIVATED

Situated approximately 20 km north of the Thimphu valley along the motorable road to Cheri Monastery, Begana is known as a place of pilgrimage for Bhutanese with Tibetan affiliations. Begana was in fact developed as part of the "Tibetan Refugee Rehabilitation Scheme" initiated by the Royal Government of Bhutan following the annexation of Tibet by China in 1951. The tiny settlement comprises approximately seven buildings, clustered along a path leading to a small but magnificent temple (*lhakhang*). It was the temple, or more precisely the renovation works of the mural paintings undertaken in 1986, that fascinated me at first. The most uncommon mural is the representation of the Potala of Lhasa, painted to the right of the temple entrance. By chance, I came to know about a Government employee, called Sangay Dorji, planning to build his own house[10] on a plot bordering the village temple. (Fig. 3-12)

Fig. 3-12 Begana site drawing.
Site layout plan of Sangay Dorji's house at Begana. Many such small village settlements comprise little more than a few farmhouses and a temple (*lhakhang*).
Source: Marc Dujardin (1991).



FAMILY HISTORY

In 1987, Sangay Dorji was a 49 year old civil servant attached to the Department of Roads, where he was responsible as a sub-overseer for the maintenance of the Dechencholing-Cheri road. He was married and father to three young children, one boy and two girls. He originates from Adang Block (*gewog*) under Wangdiphodrang District (*dzongkhag*). His parents were farmers and both deceased. In 1972, Sangay joined the Royal Body Guards (RBG) and served his term at Dechencholing where the Royal Palace is located. He retired from the RBG service in 1977 and joined the Public Works Department as a *lagjab* (helper). He was posted to eastern Bhutan to look after the construction of the Drugsum-Trashiyangtse road, where he married Tashi Wangmo, a local girl. In 1981, Sangay was reassigned to look after the maintenance of the Lunana muletrack in Punakha *dzongkhag*. Apart from his official duties, he managed to run a shop for road workers, saving some money to buy a Mahindra jeep. During this assignment, he got to know about Tibetan refugees who were planning to migrate to India after having resided at Begana, a tiny village settlement.

With the help of his savings (originally for the jeep) and an interest-free loan of BTN 10,000 (USD 546) received from a friend, he was able to purchase a temporary house with five acres of land for BTN 35,000 (USD 1,912).[11] He immediately planted potatoes and recovered the cost of the land and more from one year of horticulture. Sangay Dorji's family was living in a Government-owned farmhouse, built for Tibetan refugees, opposite his present house. Apart from an annual Government tax amounting BTN 14 (USD 0.76) only, no rent was charged to him. He demolished the temporary structure and built a stable across the road, as he decided not to keep cattle on the ground floor of his future house as traditionally practiced. This decision had nothing to do with environmental considerations, but was inspired by the idea of opening a small grocery shop at Begana.

10 Mapping and discussion of first-hand experiences of the entire construction process of this traditional farmhouse was published by the author under the title *The traditional house of Sangay Dorji at Begana: case study documentation, Preservation of the architectural heritage of Bhutan* (Dujardin 1991).

11 The Bhutanese Ngultrum (BTN) is tied to a one-to-one basis to the Indian Rupee. The exchange rate to the US Dollar, noted during the final editing of the documentation in January 1991 was USD 1.00 = BTN 18.30.

THE INITIAL PLANNING

In 1983, Sangay Dorji started saving money for the construction of his present house. Despite the fact that maximum use is made of local available building materials, the procurement and processing of the raw materials remained a time and labour consuming activity. Rural house builders usually do not have access to processed sawn timber, due to a shortage of sawmills in the country. Transportation problems limit the supply of processed timber to areas bordering motor roads. To promote house construction in the rural areas, in the 1980s, the Royal Government of Bhutan entitled each eligible house builder to timber almost free of charge. Sangay Dorji applied to the Logging Division of the Forestry Department for a timber permit, valid for 50 trees. A Royalty of BTN 2 (USD 0.11) per tree was thereby charged to him. However, in addition to the BTN 100 (USD 5.46) paid for the permit, Sangay Dorji spent about BTN 25,000 (USD 1,366) and an additional BTN 6,000 (USD 328) to cover the actual cost of felling, rolling, sawing and transporting the logs to the site. He furthermore opted for a superstructure in stone instead of rammed earth (*pisé,* referred to as *pa*), the latter being commonly used for construction in the area. Stones and boulders were in abundance and could be collected from the surrounding fields and from the Thimphu river (*Wang chhu*) below the road. Fifteen people were hired for two months to collect the required amount of stones.

DESIGN ISSUES

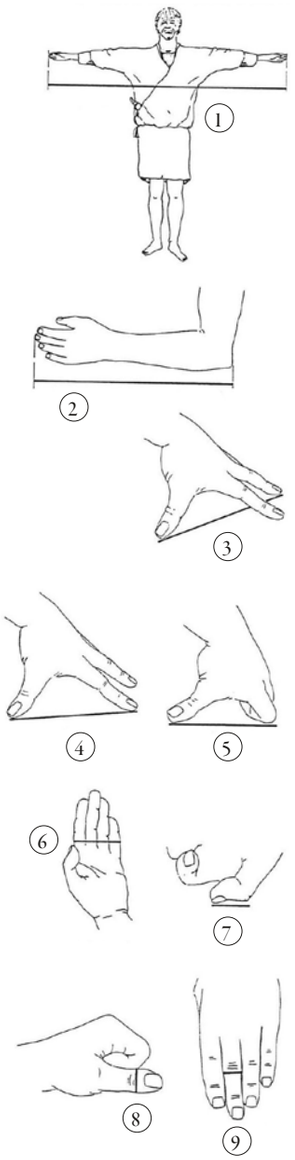
Bhutanese architecture is known to the outside world as a nail-less architecture that is designed and constructed without reference to drawings. However, this should never lead to the conclusion that the Bhutanese do not know exactly how the completed house will look. The design process consists of detailed discussions between the house builder and the head carpenter of the village or block (*gewog*). Existing farmhouses, built in various valleys, serve as models to discuss the general plan layout and overall architectural outlook of the future house. The plinth area of the house is fixed by measuring some of these existing houses using the *Tho-gang* and *Chu-gang* scale. (Fig. 3-13)

Apart from fixing the building materials (rammed earth or stone) for the loadbearing superstructure, the form of the roof structure and the architectural configuration of the *rabsel* timber frame are very important choices to be made. To plan and build his house, Sangay Dorji engaged Dawa Tsering, a relative and head carpenter (*zope*) of the same village from the Adang *gewog*. Sangay Dorji took his carpenter to an elaborate farmhouse located at Lobeysa, a small settlement bordering the junction, separating the road to Punakha and Wangdiphodrang District Centres. This house had attracted him ever since he was posted to Punakha, particularly the special shape of the *rabsel* and a number of extensively carved timber profiles, which are usually reserved for decorating *dzong*, monasteries, and buildings belonging to the Royal Family. This visit, along with the numerous discussions, were sufficient to enable the head carpenter not only to construct the house, but to roughly estimate the required quantity of timber and other building materials. To incorporate the special time consuming (and thus expensive) timber profiles into the main structure, Sangay Dorji had to reconsider the priorities in light of his financial situation. The construction of the semi-detached kitchen (*Thabsang*) and latrine (*Chabsang*) were postponed. The subdivision of the ground floor into three rooms and a grocery shop was no longer considered a priority. On the first floor, a wooden partition wall should be constructed in a later phase to accommodate a second bedroom and a living room giving access to the planned semi-attached kitchen.

THE CONSTRUCTION PROCESS AND MAIN STAKEHOLDERS

After having obtained a loan of BTN 15,000 (USD 820) at 5 % from a private party, the construction was planned to start around November 1987. They aimed to complete the superstructure and roofing works before the next monsoon, usually commencing around the month of May. The construction period is generally limited to the dry season, between October and April. During the monsoon, it is technically not advisable to undertake construction works based on traditional building techniques, such as the utilisation of earth as the main building material (*pisé*) or as a binder for stone masonry work. As the construction process is taken care of by the villagers themselves, breaks must be observed for sowing and harvesting during which all construction activities are suspended. To construct the house of Sangay Dorji, the head carpenter

Fig. 3-13 Anthropometric scales.
Anthropometric scales are used in traditional building construction. Lacking written sources at the time of research, these terms were phonetically recorded and varied from region to region.
Source: Marc Dujardin (1991).



1 Tho-gang
2 Chu-gang
3 Tho
4 Jatho
5 Ngi
6 Lhacc
7 Ka
8 Tson
9 Tsesu

(*zowpon*), Dawa Tsering, was assisted by three carpenters (*shing zo*), two masons/stone dressers (*do zope*) and ten helpers (*lagshep*).[12] (Fig. 3-14)

ROLE OF THE HOUSE BUILDER, OWNER AND PATRON

Sangay Dorji was charged with the logistical support, taking responsibility for the procurement of all the building materials and tools required by the helpers (*lagshep*) and occasional labourers. It is also common practice for the house builder to arrange meals four times a day for all those active on the construction site. During the construction of Sangay Dorji's house, 800 kg of rice were consumed by the laborers and 300 kg of wheat was required for the preparation of local beer (*chang*). In addition to these payments in kind, daily cash wages were fixed at the start. Of course a head carpenter gets better wages than the *shing zope* that are following his technical instructions. In this particular case, where patron and head carpenter were relatives, the *shing zowpon* wages differed little compared to other construction sites the author visited. Anno 1990, daily remunerations for head carpenters varied from BTN 45 up to BTN 65 (USD 2.57–3.72), in addition to presents in kind (e.g., clothing, tools, etc.). The head carpenter is usually treated as a guest of honour and his personal contentment considered an auspicious sign for the happiness of the future house dwellers.

ROLE OF THE MASTER-BUILDER WOODWORK (*SHING ZO LOPON*)

Dawa Tsering effectively served as the head architect, contractor, specialist in woodwork, and project manager at the same time. All the skilled labourers (timber and stone) were directly accountable to him. The master-builder provides the measurements for every single building component, irrespective of the material used. The proportional dimensioning of timber profiles and carvings are fixed by the head carpenter, applying his own anthropometric measurements or making use of British and metric scaling devices. In order to achieve uniformity in terms of proportion and dimension, the master-builder prepares samples of each timber component, which are then reproduced by his fellow carpenters. Wooden stencils are often prepared to enable the *shing zope* to produce identical profiled timber components. The master-builder gives continual guidance to the stone masons (*do zope*) by specifying the exact plinth area and the wall thickness, and by marking the exact positioning of doors, windows, and floor joists. His tool box of hand tools for carpentry and carving excels

12 The following grades for carpenters (*shing zo*) were noted: *zowpon* (first-class master carpenters able to give authoritative guidance to others); *zo gyenthek* (second-class carpenters who are experienced enough to lead a construction site on their own); *zo lagshep* (assistant carpenters or helpers). The title of *zorig lopön* (*zorig* meaning art or artist and *lopön* denoting a leader or teacher) is reserved for exceptional figures who embody and radiate exceptional knowledge of the *zorig chusum* through endorsed leadership.



Fig. 3-14 Begana craftspeople.
Owner and patron Sangay Dorji (fourth from left, with glasses) proudly posing at the construction site of his house in Begana. The processes of making involved — from foundations to rooftop — were measured and mapped by the author on an almost daily basis.
Source: Marc Dujardin (1991).

in sobriety and simplicity, especially considering the incredibly high standard of the timber architecture that is created with it.[13] (Fig. 3-15)

THE ROLE OF THE CARPENTER (*SHING ZOPE*)

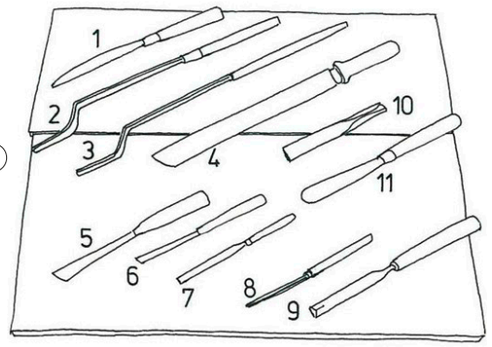
Together with the head carpenter, the *shing zope* are the most important actors in the construction process. They must be well acquainted with all the traditional carpentry profiling skills and techniques essential for nail-less timber jointing. This way of working allows the carpenters to prefabricate all building components at ground level, including even the roof structure, which is very convenient as it allows for preliminarily assemblages to be tested out and double checked prior to installation. The use of elaborate timber jointing also enables the carpenters to disassemble each building component (e.g., window or door frame) into easily transportable parts. This makes it possible to install entire timber structures relatively quickly and in accordance with the building construction rituals, which are fixed in time according to the house owner's astrological calendar. Some of the *shing zope* are also highly experienced wood carvers, having mostly learned their trade by participating in high standard renovation works at *dzong*, *lhakhang*, and royal palaces.

THE ROLE OF THE CARPENTER HELPER (*SHING ZO LAGSHEP*)

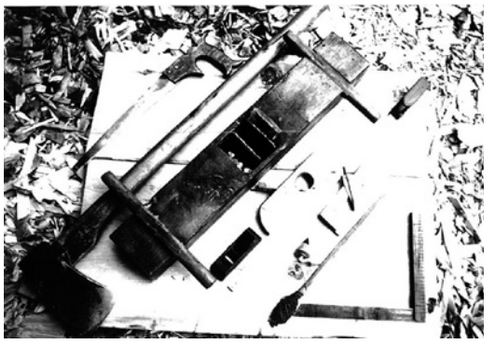
The *lagshep* carry out much of the manual and semi-skilled labour on the site, but are not always trainees in carpentry. One can often see that squaring of timber being taken care of by the house builder or some of his relatives. Under the direct guidance of the head carpenter, the *lagshep* are mainly responsible for processing the raw timber logs into more practical timber sections, usually by means of an axe (*tarey*) or knife (*gi-chung*). The parts of the rough timber section to be chopped away are marked with the help of a thread (*thigkued*). These threads are dipped into red mud paint, stretched from the extreme ends of the beam and then quickly lifted, leaving a straight mark along the entire length. Helpers are furthermore employed to plane the axed timber profiles into the exact sections required to prepare the detailed carpentry jointing works.

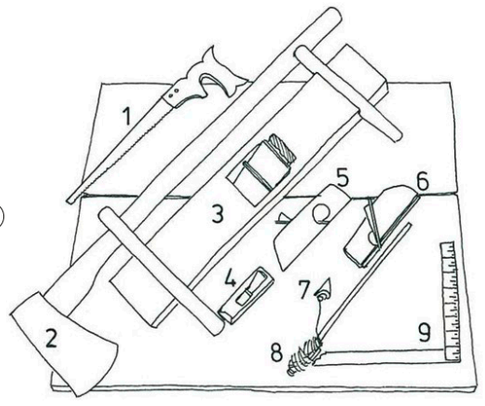
13 For a comprehensive and pictorial overview of the hand tools associated with the 13 traditional crafts, see Chang Dorji's book *Clear Exposition of Bhutanese Architecture* (2004: 51–58). Besides their practical applications, the cultural values and rituals associated with the both crafting and measurement tools are presented here.





A





B

Fig. 3-15 Display of the toolbox owned by the head carpenter at the Begana house.
The basic set of hand tools used for carpentry and wood carving by *shing zope*, *shing zo* and *shing zo lagshep*. The terms were phonetically recorded.
Source: Marc Dujardin (1991).

A
1 Tserim
2 Chorti
3 Chorti
4 Gi-chung
5 Sektchu
6 Sektchu-Chungkhu
7 Zong
8 Mindu
9 Zong
10 Zong
11 Khagum

B
1 Solee
2 Taree
3 Jelee
4 Jelee chungkhu
5 Shubjeel
6 Tsaktap
7 Tshungdho
8 Tsagthig
9 Loebey

ROLE OF THE MASON/ STONE DRESSER (*DO ZOPE*)

Masons in Bhutan are referred to according to the primary building material they use for massive wall constructions. Masons who use rammed earth as their main building material are called *pa zope* (*pa* meaning earth). Because Sangay Dorji's house was constructed with one or two-sided dressed stones, most of the processing work was conducted by stone masons, referred to as *do zope* (*do* meaning stone). It is a common practice to puzzle the massive stone walls into a structural whole, filling the gaps with mud mortar. Sangay Dorji, however, instructed the masons to use cement mortar for pointing and rendering the exposed wall surface.

ROLE OF THE UNSKILLED LABOUR FORCE

Women play an active role in house construction, particularly as labourers. They are often responsible for the collection of the raw building materials such as stones and earth, and many serve as full-time assistants to the *shing zowpon*, *pa zowpon*, *do zowpon*. Their active participation makes it possible for the Bhutanese to construct high standard houses at an affordable price. The role of this informal sector is therefore of primary importance to the survival of traditional architecture and building practice. Although such unskilled labourers lack the social status and respect of their skilled counterparts, in many ways they constitute the spine of Bhutan's informal construction sector, insofar as it is based on self-reliance and the participation of a broad cross-section of the local community.

THE ACTUAL COST OF CONSTRUCTION

It is very difficult to assess the actual monetary cost of a traditionally constructed house. The financial value of the mutually exchanged labour and payments in kind are difficult to estimate. However, based on interviews as well as my own calculations and measurements, the cost of Sangay Dorji's house is estimated at BTN 105,350 (USD 5,760) including the labour costs incurred for the timber partition wall (*eckra*) that was installed in 1990. The construction of the semi-attached kitchen (*tapsang*) and latrine were scheduled for 1991–92. At the time of construction, house tap water was not available at Begana. Water was usually collected from a common tap stand or from a small stream, activating a prayer wheel of a *chhukhor mani* built to protect the local village community.

DESCRIPTION OF THE HOUSE

The house of Sangay Dorji has a rectangular base of 895 cm by 940 cm. The plinth area was fixed at 5 *tho-gang* + 1 *tchu-gang* (5×170 cm + 45 cm) by 5 *tho-gang* + 2 *tchu-gang* (5×170 cm + 2×45 cm). The base plan is thus nearing a square footprint, but is premeditatedly not exactly square. The front of the building and the main entrance door on the ground floor is exposed to the east and overlooks the nearby river, which is very auspicious according to local geomantic considerations, which share much with the principles of Chinese geomancy (Kuo 1992: 23–27). The main entrance door (*go*) provides access to a single room, which is subdivided in three or more rooms. The two tapering wooden posts are topped by nicely carved capitals. They are required to distribute heavy loads of the floor joists over the main beam down to the pillars. Looking at the front facade (Fig. 3-16), the left window frame is an adapted *boego payab* with a horizontally stretched *horzhu* (Fig. 3-17), designed and constructed to include a small grocery shop (*tshongkhang*). Subsequently, Sangay Dorji was surprised when he was warned not to open any kind of shop in his house, which rendered this feature redundant.[14] The arched window pattern (*horzu*) is stretched horizontally while keeping the proportion of the height. To the right of the main and centrally positioned door (*go*), one can see a typical *horgo payab* window frame without *shamig* (side panels). The main living space is located on the first floor but is only accessible via the back of the house.

14 Government employees are not permitted to combine official duties with this kind of business. The floor space was used to store potatoes. A trimmer construction indicates that an internal staircase will be built in the future. When I revisited the house in 2013, the ground floor indeed functioned as shop, run by his eldest daughter who owns the house now.

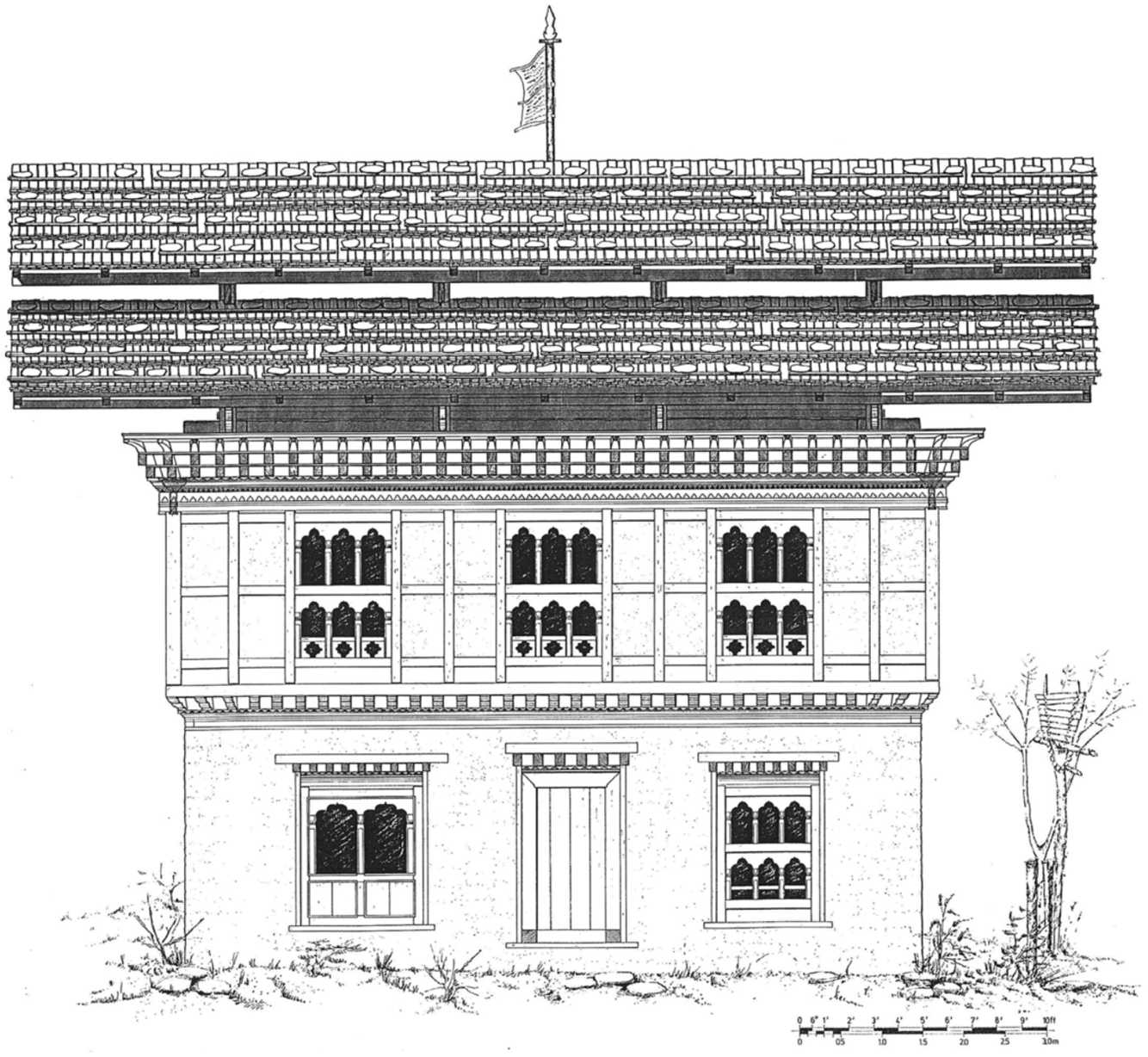


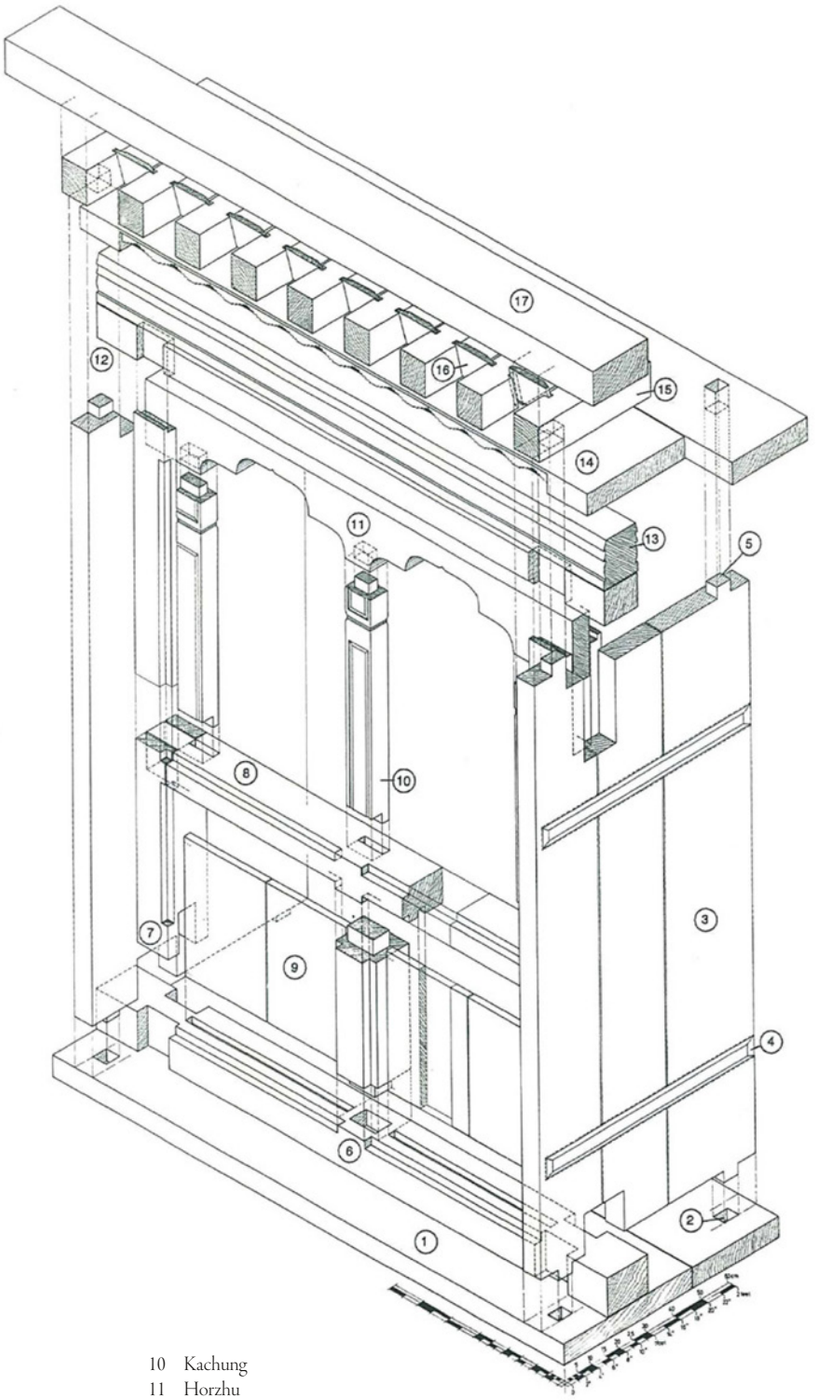
Fig. 3-16 Begana House: Front elevation cast.
Front elevation of the Begana House, depicting the symmetrical, load-bearing *rabsel go-cham* timber frame on the top floor. To mark the planned shop on the ground floor, note the adapted *boego payab* window frame with stretched arches, which differs from the two-layered *horgo payab* without *shamig* (side panels) on the other side of the main entrance door (*go*).
Source: Marc Dujardin (1991), original ink drawing at a scale of 1:20.



Top image: Front view of the window frame, specially designed to visualise the existence of a shop (*tshongkhang*).

Bottom image: With the functional detailing of the shop window, the complete symmetry of the front elevation could no longer be maintained.





1 Chiden
2 Dhon
3 Losyop
4 Gondap-gi-wang
5 Diu
6 Gyenthey-godi
7 Gosing
8 Barthoe
9 Shamig
10 Kachung
11 Horzhu
12 Haam
13 Dung
14 Pem-chutsi
15 Bho
16 Ka
17 Salen

Fig. 3-17 Adapted *boego payab* shop window frame, Begana.
Right (next page): Photographs and an exploded view of the adapted *Byelgo payab* timber window frame. All such timber window and door frames are load-bearing structural components around which rammed earth (pisé) or stone (*do*) walls are mounted.
Source: Marc Dujardin (1991), original ink drawing at a scale of 1:5.

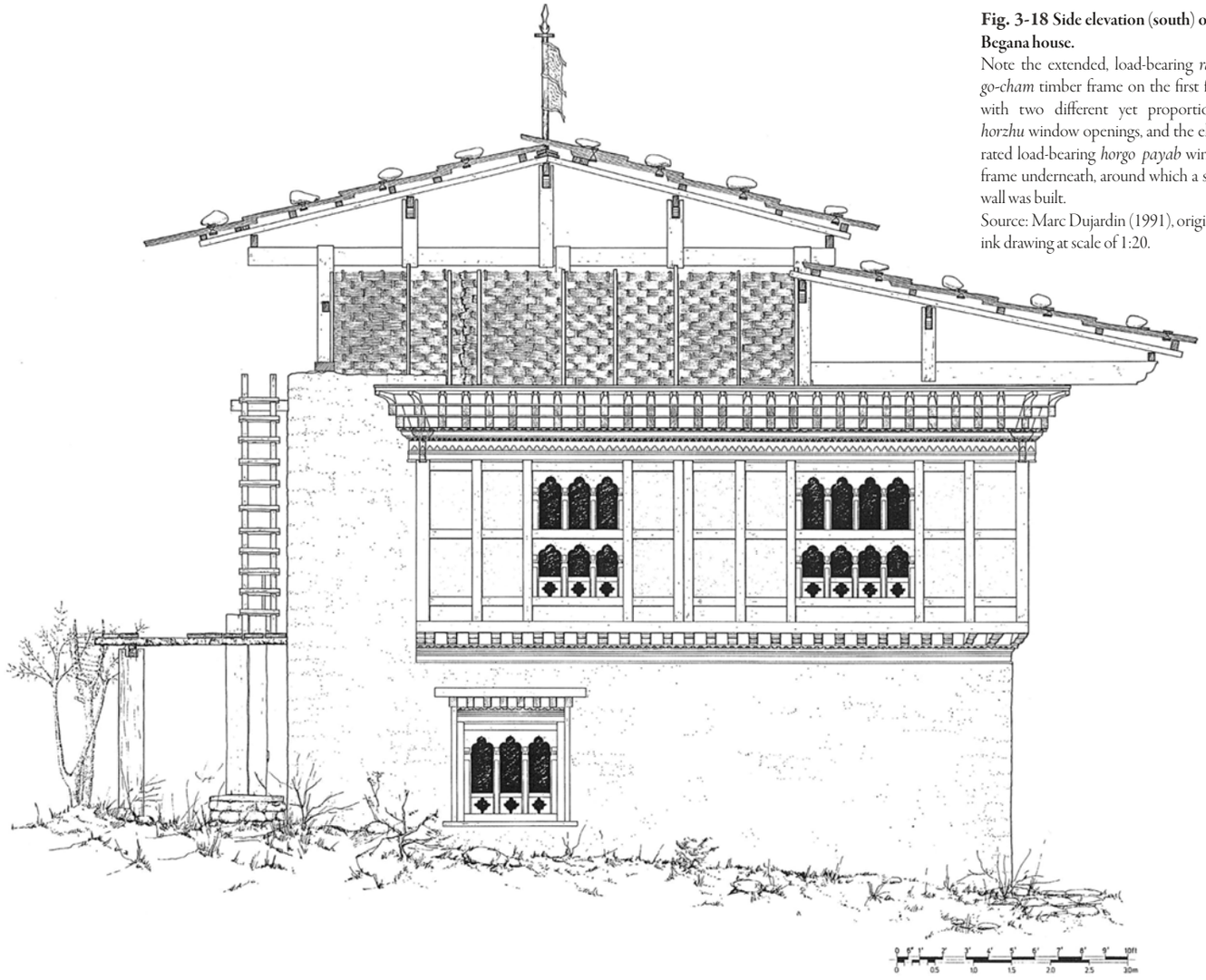


Fig. 3-18 Side elevation (south) of the Begana house.
Note the extended, load-bearing *rabsel go-cham* timber frame on the first floor, with two different yet proportionate *horzhu* window openings, and the elaborated load-bearing *horgo payab* window frame underneath, around which a stone wall was built.
Source: Marc Dujardin (1991), original ink drawing at scale of 1:20.



One part of the *rabsel* timber framework being prefabricated at ground level. Once completed, the timber structure is erected at ground level for testing.

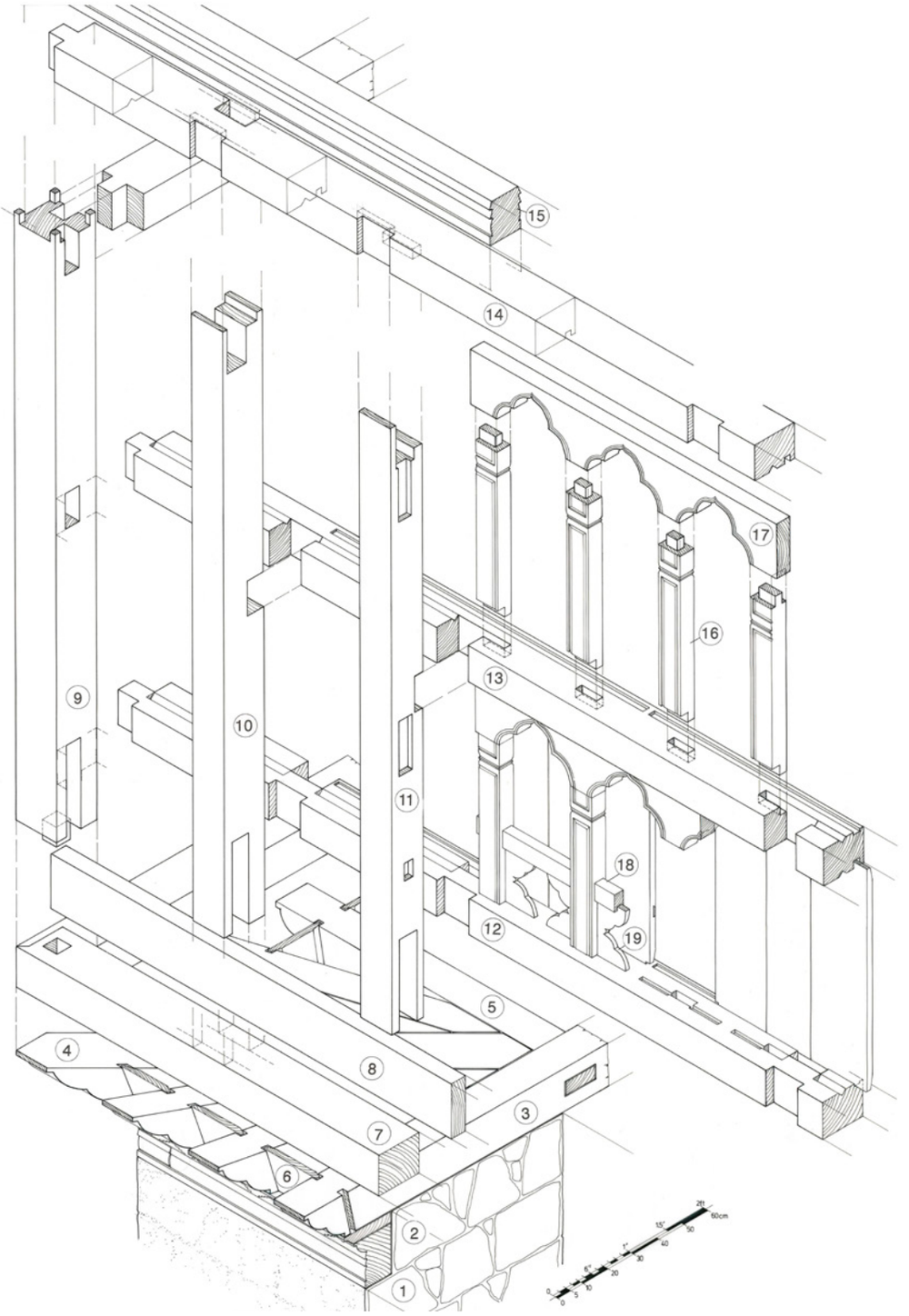


Detail of the joint between the top of the corner post (*zumbhu*) of the *rabsel* with the horizontal frame (*gongu*). The joint will be fixed by the crossed *dung* profile, locked in between the four top ends of the corner post.



View of the *dung* profile holding the timber framework of the *rabsel* in place. Note how the *rabsel* is fixed to the load-bearing wall by inserting the *dung* into the mansonry work.

Fig. 3-19 Exploded view of the *rabsel* timber framework.
This view of the *rabsel go-cham* structure reveals the nailless timber jointing framework, which is prefabricated and tested at ground level before being erected at an auspicious moment, following an astrologer's advice.
Source: Marc Dujardin (1991), original ink drawing at scale of 1:5.



1 Dung-pem
2 Chutsi
3 Langlap
4 Sar-chhen
5 Tshay-chu
6 Ka
7 Buden
8 Thrang-cho
9 Zumbhu
10 Bhu
11 Gosing
12 Dgeon-stod
13 Bar-thu
14 Gongu
15 Dung
16 Kachu
17 Jing
18 Jusing
19 Chhigey

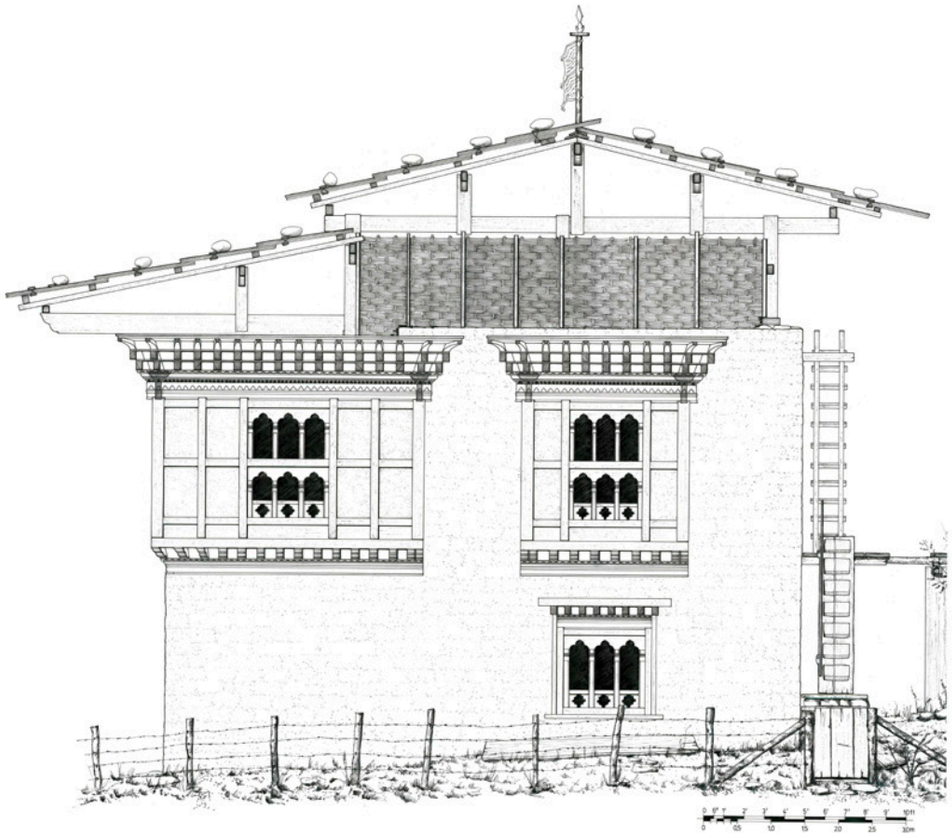


Fig. 3-20 Side elevation (north) of the Begana house, depicting the shorter *rabsel go-cham* timber frame.
The architectural dominance of the *rabsel* facade is achieved by aligning the adjacent projected *horgo payab* with *shamig*. Centrally positioned underneath is an elaborated version of a load-bearing *boego payab* window frame.
Source: Marc Dujardin (1991), original ink drawing at a scale of 1:20.





Left: Front view of the side window on the ground floor, part of the north elevation. Note the loggia type window above.

Right: An identical window frame was incorporated in the south elevation. Note the ceiling joists in the foreground, squared with the help of an axe (*tar*) and planed with a two-man plane (*djilu*).

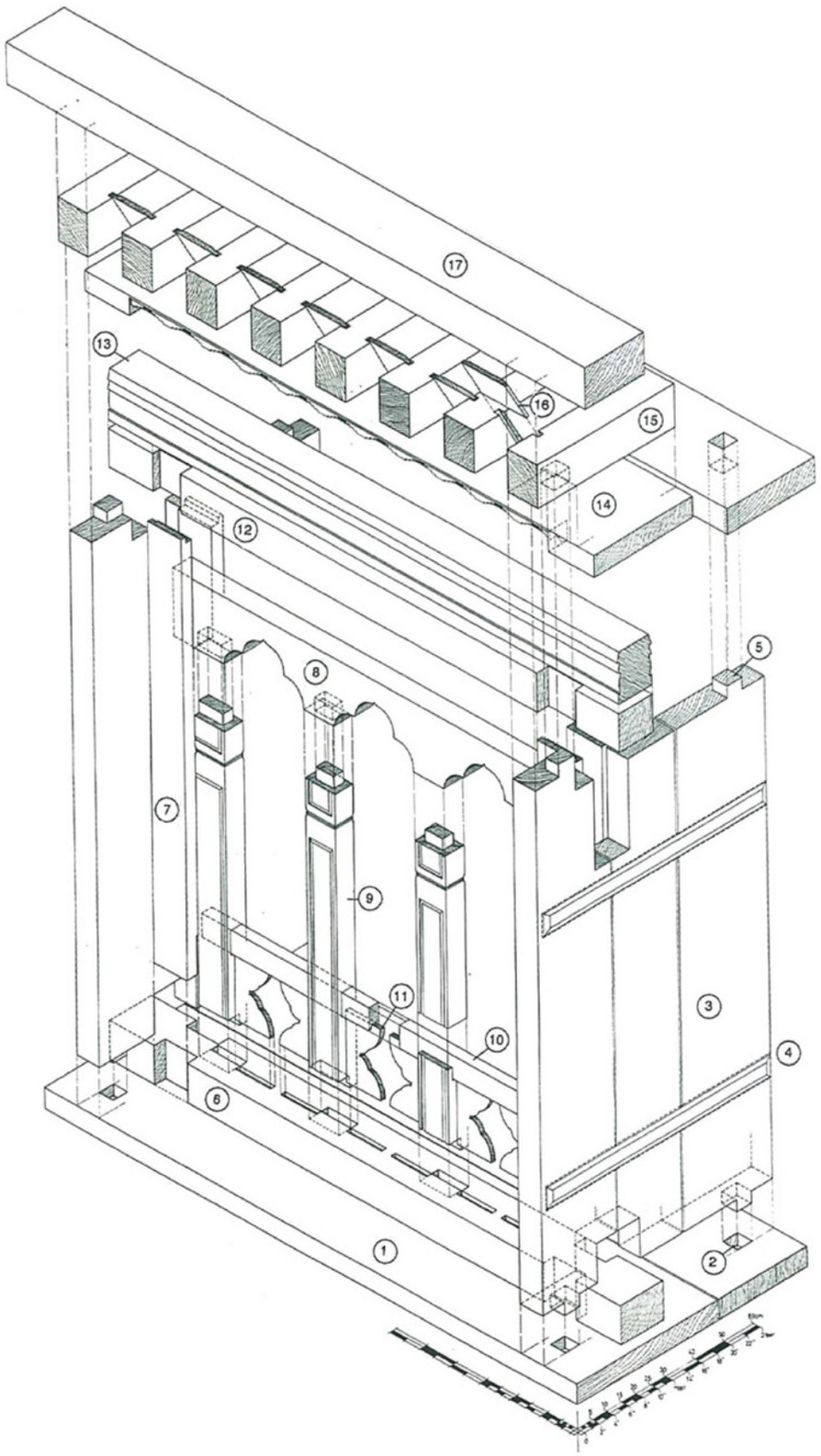
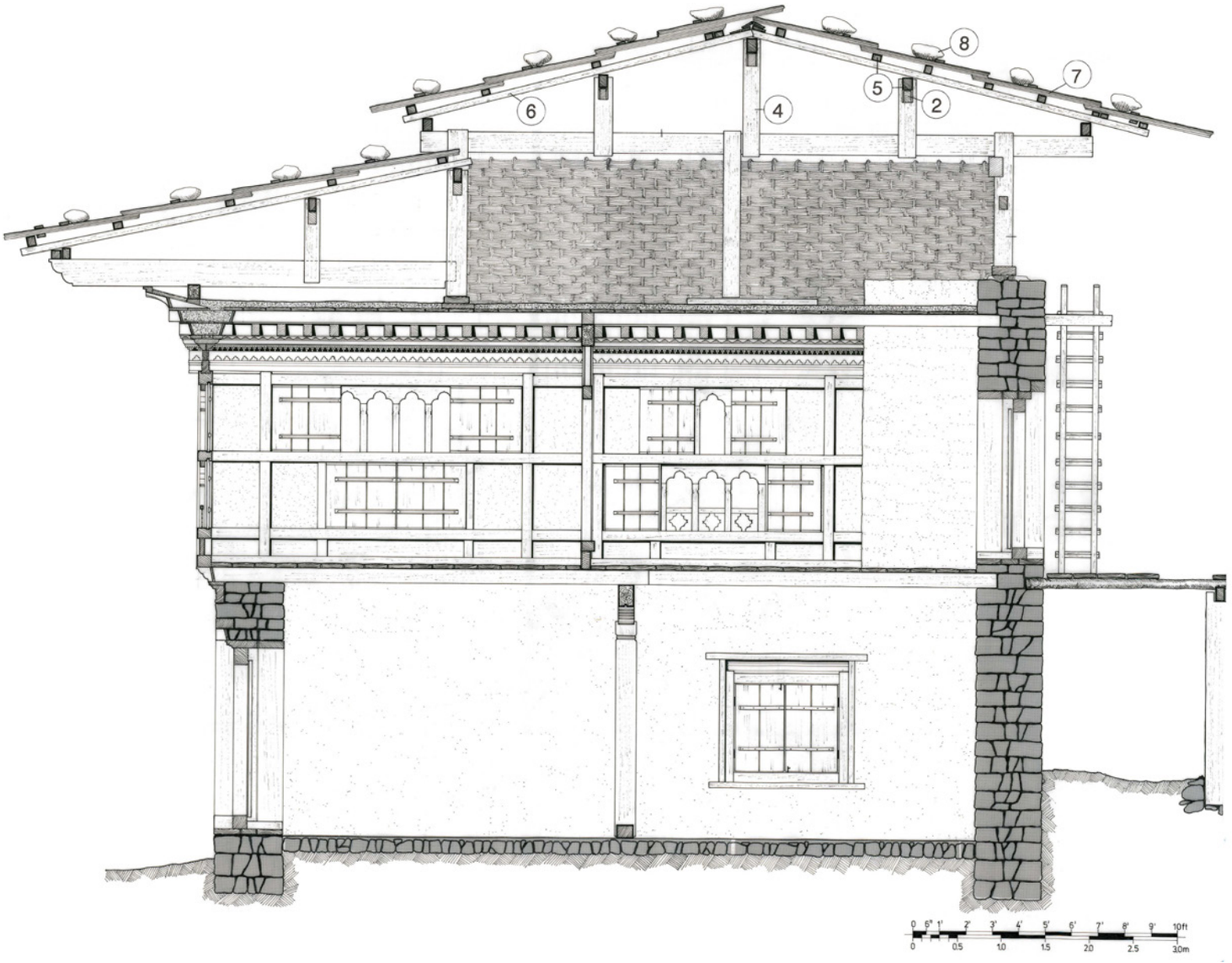


Fig. 3-21 Exploded view of the *boego payab* window frame.
Often situated on the ground floor of farmhouses, this elaborated version with *pem-chutsi* profiling can be seen as an example of cityfication whereby the ground floor no longer serves as a stable for cattle. Source: Marc Dujardin (1991), original ink drawing at a scale of 1:5.

1 Enta
2 Dhon
3 Losyop
4 Gondap-gi-wang
5 Diu
6 Gyenthey-godi
7 Gosing
8 Jing
9 Katchu
10 Jusing
11 Chhigey
12 Haam
13 Dung
14 Pem-chutsi
15 Bho
16 Ka
17 Pyidey



1 Shari
2 Zshyu
3 Dhingri
4 Shyatum
5 Buttom
6 Chim
7 Shing-lep
8 Doh

Fig. 3-22 Begana house cross-section.
Cross-section of the Begana house, showing how the horizontal parts of the *rabsel* structure serve as guides for the sliding window shutters in wood. Window frames, embedded in the superstructure, are usually fitted with hinged wooden panels. The choice of dressed stonework instead of rammed earth was prompted by the local availability of stone boulders, which were (non-traditionally) bound by cement mortar. Note also the "lean-to" roof construction, which is more commonly observed in the region of Wangduephodrang.
Source: Marc Dujardin (1991), original ink drawing at a scale 1:20.

The most striking feature of the architectural configuration is the asymmetrical shape of a typical *rabsel go-cham* (Fig. 3-18), with two tiers of arched *horzhu* window frames. (Fig. 3-19) It almost covers the entire top floor of the south elevation.[15] The north elevation is exposed to the roadside and consists of the shorter side of the *rabsel go-cham* timber framework. (Fig. 3-20) Towards the rear, a magnificent *lobur rabsel* bay window is centrally positioned above the only ground floor *boego payab* window frame. (Fig. 3-21) The side entrance from the roadside also leads to the stable and to the back garden. The *naga* residence (*lukhang*) is built in the shape of a *chörten* and a structure to burn incense (*sangthab*), was constructed after completion of the house. The most attractive feature of all, however, is a tree decorated with phallic replicas and a string of decorative egg shells. Sangay Dorji told me that this was an effective way of distracting passing witches who may harbour intentions to curse the house and its inhabitants. Distracted by the phallic symbols, the hope is that they forget to speak their evil thoughts.

When Sangay's fourth child died during delivery in September 1990, he cut the branches of a young willow tree away and carved the trunk into several phallic symbols. A steep ladder, carved out of a single tree, leads to a temporarily constructed platform made from old pieces of timber. Where this platform stands, the latrine and kitchen will later be constructed over a garage. The door to the left serves as the main entrance door to the living area. The door to the right provides direct access from the living room to the kitchen. The newly-built partition wall subdivides the back space into a bedroom (having a loggia type window to the north) and a living room, which temporarily serves as the kitchen. A cast iron stove was recently installed and the chimney does not extend beyond the roof. This room gives access to the main bedroom of the parents and children. They sleep with their heads exposed to the east or the north, in the direction of the house chapel (*choesham*). The main bedroom gives access to the house chapel or shrine room (*choesham*), which is considered the most important room in the house. The entrance to this room is given special attention through the use of *pema* profiling on the door frame, which symbolises the lotus. The altar is organised in a niche and consists of various religious statues made of brass and painted clay, religious posters, photos of important *lama*, and pictures of the Royal Family. The shrine room is furthermore filled with all kinds of ornaments and musical instruments, which are required for the regular performance of religious ceremonies. Once the house was completed, the house owner invited a carpenter/carver to construct a special altar, typical for Bhutan. The entrance to the attic, which is used as a storage facility and for drying vegetables and meat during the rainy season, is only possible via a ladder accessible from the outside platform. The construction of a lean-to roof (*ghung-chim* or *chenkhap*) under the main gabled roof (*ghungyim*), facilitates access to the roof for repair works as well as for the sun-drying of chillies. The roof consists of three to five layers of loose laying shakes (*shinglep*), held in place by river boulders over pieces of timber. Above the ridge of the house, located at the centre, waves a small prayer flag. (Fig. 3-22)

Although my primary focus here is on two of the most characteristic features of Bhutanese traditional architecture—*rabsel* and *horzhu* window frames—the Begana case study sheds considerable light on the complexity, contingency and variability of traditional house construction more broadly. The construction process made use of a selection of the *zorig chusum* and various kinds of craftsmen, including a handful of skilled experts and a much larger unskilled labour force. One key observation emerging from this is the importance of the house owner's own architectural choices in guiding the construction process. Sangay Dorji chose the type of *rabsel* window frame and the lean-to roof pattern, which originate from the valley of his birth and that of his master carpenter.

It was the elaborate farmhouse design he came across at Lobeysa that led him to urge his master carpenter to include specific detailing of timber profiles in his own house, constructed at the peri-urban edge of the capital. Other such decisions include the insertion of a typical "shop" window frame, indicating that the ground floor would never serve as a stable, and the erection of the superstructure in dressed stone instead of rammed earth (*pa zo*). These highly individual decisions reveal that in terms of contemporary design, construction, materials, and envisaged usage, it is possible for prescription and innovation to go hand in hand without straying too far away from Bhutan's archetypal architecture and without minimising the role of the traditional "toolbox" of crafts.

In September 2013, I revisited the house of Sangay Dorji to present him with my study of his house construction as a token of friendship. (Fig. 3-23 and Fig. 3-24)

15 The asymmetrical application of the *rabsel* is more frequently observed in Wangdiphodrang Dzongkhag, particularly in Nawang Gewog, the place of origin of the owner.





Fig. 3-23 Begana house front.
Revisiting the house of Sangay Dorji in 2013. The left picture shows the "shop-house", transferred and inhabited by his eldest daughter. He and his wife now live in a shack up the hill, overlooking the house.
Source: Marc Dujardin (2013).

Fig. 3-24 Begana house rear facade.
The right picture shows the major architectural changes to the building, such as the reversal of the roof design by placing the lean-to roof at the back instead of the front, accommodating a separate sanitation unit and kitchen above. The traditional roof shingles held down by boulders (Fig. 3-22) have been replaced by corrugated iron sheets, as commonly observed throughout rural and urbanised settlements.
Source: Marc Dujardin (2013).

Most of the intended additions and refinements had been implemented, including the once disapproved of grocery shop. Following his retirement and several rites of passage, namely the wedding of his eldest daughter, the traditional deconstruction and reconstruction of the family house had not taken place in the way I had recorded it in many village settlements during the 1980s. However, Sangay and his wife had moved out of this house and passed it on to their daughter. They now dwelt uphill from the site, intent on spending the rest of their earthly lives in a one-storied wooden hutment, expressing their renouncement of material wealth and comforts by living in sobriety and spiritual devotion.

With these fine-grained insights in mind, we can now zoom out again to the level where I could witness in person the "dynamics" of traditional crafting, trendsetting, and culture transfer through architectural copying and innovation. Here activities are commanded by the highest possible level of authority—the trinity of the King as patron, the Je Khenpo as the ritual master, and the *zorig lopon* as the highest ranked craftsman. The focus here is the *dzong* (monastery-fortress) of Punakha and the way it was architecturally reanimated after a long period of politico-cultural dormancy.

THE "RUIN-CARNATION" OF PUNAKHA DZONG: THE *ZORIG CHUSUM* RE-ACTIVATED

Based on both Tibetan fortress architecture and local building traditions, monumental *dzong* fortress-monasteries were introduced in Bhutan as part of a strategic plan to found a nation in the 17th century. By means of a massive building campaign the founder of Bhutan, Shabdrung Ngawang Namgyel, discovered in architecture a means of giving his new nation a distinct spatial and cultural identity. From a limited palette of architectural conventions, rooted in the *zorig chusum*, the monastery-fortress may well be considered Bhutan's architectural *tour de force*. Accommodating governmental and religious functions, it is the typical form adopted by Bhutan's state-religious architecture.

Until the introduction of modernised space definitions, the internal spatial organisation and configuration of a monastery-fortress (with various courtyards, corridors, arcade-porches, multiple stairs and interlinking groups of in-between spaces) was the only architectural configuration that suggested in some way a genuine sense of urbanism in terms of architectonic complexity and density. Unlike those monastery-fortresses which are built on hillsides, the old capital *dzong* of Punakha is favourably sited at the lower end of a valley, where two rivers converge around the base of a hill. The *dzong* emerges like a ship at the foot of this hill.[16]

In accordance with local patterns of seasonal migration of people and livestock between the valleys of Punakha and Thimpu, the *dzong* of Punakha and that of Thimphu, which was built in 1641, were politically and ritually interlinked and designated as winter and summer capital *dzong* respectively. In the 1950s, the late King Jigme Dorji Wangchuk decided to make Thimphu Dzong, known as Tashichoedzong, the permanent seat of the King and central government. With the funda-

16 Like many historical sites in Bhutan, the choice of location for Punakha Dzong is ascribed to Guru Rinpoche in the 8th century. The complex was built by Shabdrung Ngawang Namgyel, the head abbot of the Ralung monastery, in 1637 in front of a little fortress (*dzongchung*) as the place par excellence for preserving the Rajung Karsapani, Bhutan's most sacred relic, which the latter took with him when he fled from Tibet in 1616. The Ranjung Karsapani is the self-created image of Avalokiteshvara (Chenrezig) formed from the first vertebra of Tsangpa Gyare, the founder of the Drukpa School in Tibet at the time of his cremation. See Pommaret (1990: 176), Dasho Rigzin Dorji in Kuensel of 26.2.1994, and Aris (1994: 27). This bone relic (*rus*) was the issue of multiple Tibetan threats and military attacks on Bhutanese soil.

mental reconstruction of Tashichoedzong taking place in Thimphu in 1964, led by *zorig chichop drepa* Parpa Oezer (Fig. 3-10), and the beginnings of planned urbanisation underway in the new capital valley, the former winter capital of Punakha Dzong lost much of its political justification and cultural status. It had largely become a monument commemorating a glorious past. Unlike the more cyclical processes of architectural rebuilding in Japanese culture, Bhutanese *dzong* are subjected to political transition. Coinciding with a national programme of preservation and promotion of national identity, commonly referred to as the *Tsawa Sum*, or the three foundations, the Dzong of Punakha fell victim to disaster. In 1986, a fire burnt down the south-west corner, destroying the winter quarters of Bhutan's head abbot, Je Khenpo. But no matter how calamitous the fire was for the Bhutanese, it also provided an opportunity for restoring the monument after a period of cultural stagnation. Throughout its history, the Punakha Dzong had always attracted the highest level of patronage. The fire gave the Fourth King of Bhutan, Jigme Singye Wangchuk, a chance to demonstrate his exemplary religious devotion by commanding the total rebuilding of the Machen Lhakhang, one of the most sacred temples within the *dzong* complex, as well as the monk's great assembly hall or *Kunrey*, and shortly after, the little fortress or *dzongchung* following its total destruction in a flash flood in 1994.

The first of these three reconstructions, the new Machen Lhakhang, was built by the best craftsmen recruited from all over the country, having proved their skills in the construction of the new Kurje Lhakhang in Bumthang, which was commissioned by HRH Ashi Kesang, the Fourth King's mother. (Fig. 3-25) The resemblance between the two temples is striking, particularly the composition of the frontal facade with a variety of boldly carved *lobur rabsel*, or bay window frames. The ornamental refinement of the Machen Lhakhang (completed in 1991) is even more impressive however. (Fig. 3-26) Immediately striking features include the use of new building materials such as cement and concrete and the application of new techniques such as the concrete casting methods in the service of a traditional configuration intrinsic to timber architecture. Frescoes and sculptures, traditionally built with timber, were now being cast and sculpted out of concrete, and cast in situ, such as the frame for the red religious belt (*khemar*) and the sculpture of the mythical snow lion (*sengye*). The most interesting aspect of this building experience, however, is the flexibility and ease by which this peculiar interchange of prescription and practice suddenly results in unexpected changes in the timber architecture throughout the construction process. For example, previ-



Fig. 3-25 Kurje Lhakhang.
The frontal facade of the Kurje Lhakhang, completed in the mid 1980s. The traditional toolbox of the *zorig chusum* was extended by introducing concrete casting and sculpting.
Source: Marc Dujardin (1987).

ously installed door and window frames were relocated within the building, resulting in totally unexpected changes in the envisaged look of the facade design.

The second building to be reconstructed was the monks' great "hundred-pillar" assembly hall, known as the Kunre, which is located in the southernmost section of the *dzong*. Pictures taken just before the demolition of the original structure demonstrate the exceptional architectural standards and historical value of this particular monument. Lacking a tradition of documentation, those involved did little to record these features prior to their destruction, even while it appeared obvious to outsiders that a considerable array of valuable objects such as mural paintings and cosmic *mandala* were about to be lost forever. From the ruins of the old Kunre, the new one literally emerged from scratch. There is no doubt that this new version once again exhibits the very best that Bhutanese artisanal craftsmanship can achieve, this time at the dawn of the 21st century. In this sense, quality was replaced by refined quality and tradition by revitalised tradition. Here too, the construction of the new Kunre reveals how the Bhutanese—despite the involvement of foreign 'conservationist'-minded expertise—go their own way when it comes to architectural decisions.[17]

The third major reconstruction work concerned the historically important Dzongchung, or 'little fortress', which was rebuilt to twice its original size, incorporating many architectural features from the monastery-fortresses of Thimphu and Punakha. With the installation of the golden pinnacle (*serto*) on the lantern-type rooftop (*jabzhi*) of the Dzongchung and the Kunre in 1996, as well as the reinstallation of Bhutan's most sacred relics in the same year in the Machen Lhakhang, Punakha Dzong's most radical processes of demolition and reconstruction had reached a spatiocultural climax. (Fig. 3-27 and Fig. 3-28)

From a typical western point of view, the complete demolition and reconstruction of the old Machen Lhakhang, Kunre and Dzongchung appears nothing less than the wiping out of a whole historical chapter. For most Bhutanese, however, their re-erection confirms the impermanent status of architecture on the one hand, while on the other it marks a new, better, "best ever" phase in the country's contemporary quest for national and cultural identity, while retaining a token of preservation. Most important from my own perspective is how Bhutan's tradition of deconstructing and reconstructing its most valued architectural heritage, embodied by *dzong* and *lhakhang*, proves that such dynamic ways of dealing with heritage impact upon the standard, quality, and applicability of this peculiar, upscaled "toolbox" of 13 traditional crafts to address present-day, culture-geared design questions. For instance, we can ask ourselves whether the trial and error testing of copying timber profiling in cast cement concrete, or the artistic carving and sculpting of formerly wooden ornaments in

17 The proposed rear elevation for the new Kunre by Ellen Schmidt-Heusel, an architect contracted by the Ministry of Home Affairs for the design, was overruled at the last-minute by the highest authorities (the trinity of patron-ritual master-master builder) during the process of re-erecting the new assembly hall. The alterations switched between the design types of *lobur rabsel* window frames to *horzhu* window frames for the "lantern" roof top, and upgraded standards from sober to bold for the woodwork crafting and painting (*shing zo, par zo, lha zo* and *gar zo*), see Dujardin (2000 Vol. II: 51f., fig. 4).



Fig. 3-26 Machen Lhakhang.
The facade of the Machen Lhakhang, one of the major reconstructions conducted at Punakha Dzong in the late 1980s. Built by the same craftsmen who built the Kurje Lhakhang, one does not need an experts' eye to see the resemblance between the two edifices. Balanced with the finest dressed stone (*do*), the timber architecture comprises most, if not all, of the traditional window types and patterns.
Source: Marc Dujardin (1989).

half-dried cement, fall under the umbrella of one or more of the 13 traditional crafts, or whether the number of contemporary crafting skills should be increased to include these new practices. Can we now speak of a "*zorig chusum* version 1.4"[18], is it "in the making", or has such a point of departure not yet been reached?

In the next section, I consider how culture transfer takes place from such valourised "propelling monuments" to Bhutan's predominantly rural dwelling culture, approached from the perspective of enlightened village artisans and craftsmen who worked closely with the Fourth King's *zorig lopon*, Dasho Khandro.



Fig. 3-27 Punakha Dzong.
The totally reconstructed Punakha Dzong is a setter of architectural trends for decades to come. Until its reconstruction, a horizontally stretched building complex was dominated by one single structure, namely the *utse*. Nowadays, the *utse*, Machen Lhakhang and *kunre* (assembly hall) seem to sprout from the massive basement and tower over the valley.
Source: Marc Dujardin (2013).



Fig. 3-28 Punakha *dzongchung*.
The *dzongchung*, rebuilt on its original site opposite the main entrance of Punakha Dzong. From an architectural perspective, the reconstructed *dzongchung* is yet another sign of Bhutan's artisanal mastery, continuously striving for cultural uniqueness and national connectedness yet without cutting itself off from deliberate forms of technical innovation.
Source: Marc Dujardin (2013).

18 Let us say "v" stands for "version", "one" stands for "unified nation" and "four" stands for the Fourth King, under whose authority the upgrading of these crafts was activated.

FROM *DZONG* TO FARMHOUSE: DISSEMINATING THE *ZORIG CHUSUM* V1.4 THROUGHOUT BHUTAN

Considering the extreme character of Bhutan's landscape and the broad mosaic of peoples that inhabit it, how can we explain the fact that changes in the architectural configuration of *dzong* and villages have occurred simultaneously throughout the country? If Bhutan displays such a great variety both in its topography and geography and in the multicultural pattern of its society, how is it possible that architectural innovations were and are so rapidly disseminated and adopted everywhere?

One explanation is that the *dzong*, embodying the highest Buddhist ideals and values materialised by virtue of the *zorig chusum*, functions as both a "locus" and a "vehicle" of cultural transfer and change. The architectural uniformity of *dzong* and traditional village settlements has been a constant throughout the country's history (Dujardin 2000: 159–222). Essential in this are the trinity of "patron", "ritual master" and "master-builder" at all stages of building construction. To ensure the continuity of Bhutan's architectural tradition, the structuring of the spatial environment cannot be left to individual architectural creativity. From a political perspective, the master-builder not only acts as the architect and contractor, but also as a highly valued "authority" in material culture and cultural renewal. The master-builder's primary role is thus to combine his profound knowledge of Buddhist iconography (as expressed in the canon of his own anthropometrical measurements) with the practical and spiritual objectives of the patron in the form of an architectural synthesis. Traditionally, the preparation of and reference to drawn building plans is secondary or even irrelevant, as demonstrated by the Begana case study. To insure a truthful materialisation of such iconographic programmes, reference is made to proportional design and construction schemes. Craftsmanship in nailless forms of timber architecture, however, is a kind of ready knowledge that is transferred from mentor to disciple by means of oral instruction and extensive on-the-job-training at multiple construction sites in various regions. In practice, the master-builder provides the artisans with small sticks on which the elementary units of measurement of his own canon are marked as measures of standardisation. In addition to the aspect of scaling, wooden stencils — full-scale samples of the most important, innovative, and complex timber jointing to be reproduced — are prepared by the master-builder, or under his guidance. It is this peculiar practice of scaling that ritually connects all building craftspeople, from Bhutan's most senior master-builder (*zorig lopön*) to the historical Banglinpa (master-builder of the first Shabdrung) and the mythical figure of Vishwakarma (the primordial Hindu architect cited in the Vedas) in one direction, and from the master-builder to the lowest apprentice in the other. These combined ritualised relationships and practical connections may explain why the head-carpenter in every village is treated with such respect.

If we acknowledge the advantage of proportional building, which involves a minimum of scaling for a maximum of applications, the high standard of Bhutan's craft and building technology by itself lays the basis for the smooth transfer of accomplished architectural ideas on the one hand, and for a building industry that facilitates and encourages innovation through the practice of demolition and rebuilding on the other. Without wishing to detract from Bhutan's highly skilled stone dressers and *pisé* builders, it is the high standard of Bhutan's prefabricated timber architecture that plays the key role in giving material form to Bhutan's sense of ever-evolving national and cultural identity.

After the reconstruction of *dzong* or other important historical buildings and monuments, professionally developed and spiritually enlightened village artisans introduce these renewed concepts into the architecture of the villages. As the woodwork of a traditional farmhouse is renewed approximately every 20 years, or at least once per generation, it is easy to understand how new architectural trends set by the *dzong* are adopted by the villagers relatively quickly, even for dwellings in remote places. By studying aspects of cultural transfer from a praxeological perspective, I have identified that in addition to the village craftsman's eagerness to learn from a high-ranked *zorig lopon* and the *dzong's* role as an all-encompassing "vocational" training centre for practicing the *zorig chusum*, two other factors play a part in explaining why architectural innovations and style changes are assimilated without much opposition by the local village communities. Firstly, the provision of labour services by villagers on a voluntary or rotational basis

(*dzongsey woolah*) suggests that ordinary people are well informed about new architectural trends set by the *dzong*. Secondly, reconstructed monuments embody the highest Buddhist ideals and values, functioning not only as the sociopolitical and cultural heart of a district (*dzongkhag*) but also serving to create the most auspicious scenography for staging the annual festivals of *tshechu* and *dromchoe*, thus evoking a strong sense of cultural belonging (Dujardin 2000: 218f.). Virtually everybody gathers at the *dzong* to commemorate the "Great Deeds" of Guru Rinpoche and to honour the main protective deities.[19] It is at such collectively staged rituals that the *dzong* unveils its true role as "cultural centre": both locus and vehicle not only of cultural renewal, but also exchange and change. By copying the innovations onto their reconstructed farmhouse, each individual thus endorses a broader cultural revitalisation, promoted by the authorities and exhibited in the form of the renovated *dzong*.

The regular "pictorial" update of Rukubji village, the subject of perhaps my most all-encompassing architectural study (Dujardin 2000: 250–271), shows rapid and quite radical changes in the visual expression of building form and type, transforming farmhouses to look like celestial palaces. Paradoxically, from the inside, these renovated farmhouses have not much in common with the archetypal plan layout of the three-tiered traditional farmhouse (Fig. 3-29 and Fig. 3-30). This brings us back to the metaphor of "balancing" between culture transfer and culture rupture. There is evidence that traditional village architecture as a seasoned concept for inhabiting the inhospitable Himalayas while expressing in material culture a strong sense of cultural belonging is shifting more concertedly towards modernised "citified" village settlements, diluting Bhutan's archetypal farmhouse as embodiment of the *Lha Tsen Lu Ragsum*.

19 For an introduction to Bhutanese festivals, see Pommaret (1990: 102–3).





Fig. 3-29 Rukubji village in 1987.
Top image: Lateral picture of the village as viewed from the national highway in 1987. To the right, the village temple (*lhakhang*) looks much like a solitary farmhouse. Features showing its religious function (*khemar*) were applied on the rear of the building only. The core of the village cluster comprises two to three-storey farmhouses, with stabling for cattle on the ground floor. The gabled roofs are topped with loose wooden shingles (*shingleps*), held down by sticks and boulders.
Source: Marc Dujardin (1987).

Fig. 3-30 Rukubji village in 2013.
Bottom image: Taken from the same viewpoint, this picture shows the architectural expression of a true temple building. Most of the rebuilt farmhouses now omit ground-floor stables, transforming Rukubji into a strongly citified village in terms of construction techniques, building materials, and usage patterns. The concept of the traditional farmhouse is being put under pressure and building culture in Rukubji is heading towards an irreversible rupture. If the distinct architectural figures of village and city continue to blur at this pace, this trend could herald the end of Bhutan's archetypical expression of its traditional tripartite world view (*Lha Tsen Lu Ragsum*).
Source: Marc Dujardin (2013).

BHUTANISING BHUTANESE ARCHITECTURE: THE QUEST FOR CULTURAL UNIQUENESS INSTITUTIONALISED

The Shabdrung's quest for cultural identity and specificity proved even more effective than warfare in establishing a Bhutanese identity separate from the former homeland of Tibet. In the process, it subordinated all internal, political, religious, and cultural forces that were potentially hostile to the idea of a commonly shared nationhood. We can perhaps assume that similar strategies and forces are presently at work in contemporary Bhutan, addressing a range of problems concerning national identity, sovereignty, and security on the one hand, and haphazard modernisation on the other. To understand some of this from a policy perspective, let us consider the Rural Housing (Demonstration) Project (RHP), for which I served as the project architect between 1986 and 1991.

In the mid-1980s, the Fourth King of Bhutan approved nine basic objectives for the nation's Sixth Development Plan (1987–1992).[20] Then, in 1987, the National Urban Development Corporation (NUDC) received a Royal Command to draw up a programme for implementing Objective five of the Sixth Plan, namely "to improve traditional housing and living conditions in the rural areas" (which comprised 90 % of the housing stock at the time). It was agreed that both health and living conditions would benefit from a series of simple improvements to the traditional farmhouse, while maintaining the best of indigenous architecture. A variety of settlement types from different climatic and geographical zones were reviewed, taking both their structure and social organisation into account, so that the proposed innovations could be carried out in the most locally appropriate and effective manner. Practical and economic considerations were primary, as were the cultural sensitivities of the people who would be affected. I was asked by the Royal Government of Bhutan and the United Nations Centre for Human settlements (UNCHS) to assist with the formulation, design, planning, implementation, and evaluation of the programme.

In order to publicise and demonstrate the innovations, I built a model of an improved Drukpa farmhouse on a scale of 1:20. Most of the proposed technical improvements could be demonstrated by dismantling this model, without detracting from the overall impression of the prototype. A variety of designs and scale models were built for different climatic zones. To compensate for the loss of detail, complementary tools for exhibition and instruction such as improved window frames to fit glass panes and improved timber *payab gosho*, *gedkar payab* and *rabsel* window frames were built full-scale. (Fig. 3-31 to Fig. 3-34) Bhutan's former King Jigme Singye Wangchuk took a personal interest in the project. All of the models were presented by the king during his visits to the different districts (*dzongkhag*). (Fig. 3-35) The campaign was completed with the first experimental house in Thimphu being built, visited, and approved by the entire National Assembly. The total RHP package provided on-the-job-training to 388 selected village craftsmen, mainly *shing zo*, *do zo* and *par zo* practitioners, and resulted in 18 improved traditional prototype houses being built, covering all of the 18 administrative districts of Bhutan (there are now 20).[21] (Fig. 3-37 and Fig. 3-38) A follow-up, known as the Gewog-level Rural Housing Project, was designed to extend the model house concept but was discontinued in the early 1990s for practical, institutional, and political reasons.[22] Notwithstanding the short life-span of the extension project, many of the architectural and technical innovations that the master-carpenters were taught found their way to the villages unexpectedly easy. Post-project field visits showed that, even prior to the distribution of the revised construction handbook (Dujardin 1990), several of these technical innovations were spontaneously incorporated and elaborated without any further formal technical assistance or support. This exemplifies the open-minded and innovative approach that traditional master-builders take towards new designs and technologies.[23]

From the perspective of building craft traditions, I can testify that all the proposed technical improvements, visible and non-visible, were designed, tested, and integrated to meet certain prerequisites. These innovations could only be realised as a kind of upscaling of the commonly practiced building knowledge of the moment, only if they could be realised by local artisans, making use of their existing hand tools, and only if the few imported building hardware materials (such as small glass panes, metal hinges, and cement) could reach even the remotest village via existing modes of transportation.

20 The initial research for this project is outlined in Dujardin (1987: 10). The main articles of the Sixth Development Plan were: (1) The strengthening of the government's administrative machine; (2) the preservation and promotion of national identity; (3) the mobilisation of internal resources; (4) the enhancement of rural incomes; (5) the improvement of rural housing and resettlement; (6) the consolidation and improvement of development services; (7) the development of human resources; (8) the encouragement of popular participation; and (9) the promotion of national self-reliance, see Parmanand (1992: 43).

21 The practical experience was finally translated into large informative posters (A1 size), a construction handbook (A3 size), a documentary film, and the completed projects were extensively covered in Kuensel, Bhutan's National Weekly.

22 The decision to discontinue was prompted by increasing political unrest in the country's southern districts and the resulting suspension of all nationally and internationally sponsored development activities in these politically disturbed regions. This decision to reduce the number of building operations (191 units) and to abandon the top-down approach was actually one of the recommendations in my formal evaluation report and was supported by the United Nations.

23 While it is beyond the scope of this essay to explore the political and cultural intentions of the RHP, see for further details: Dujardin (2005: 169–171).

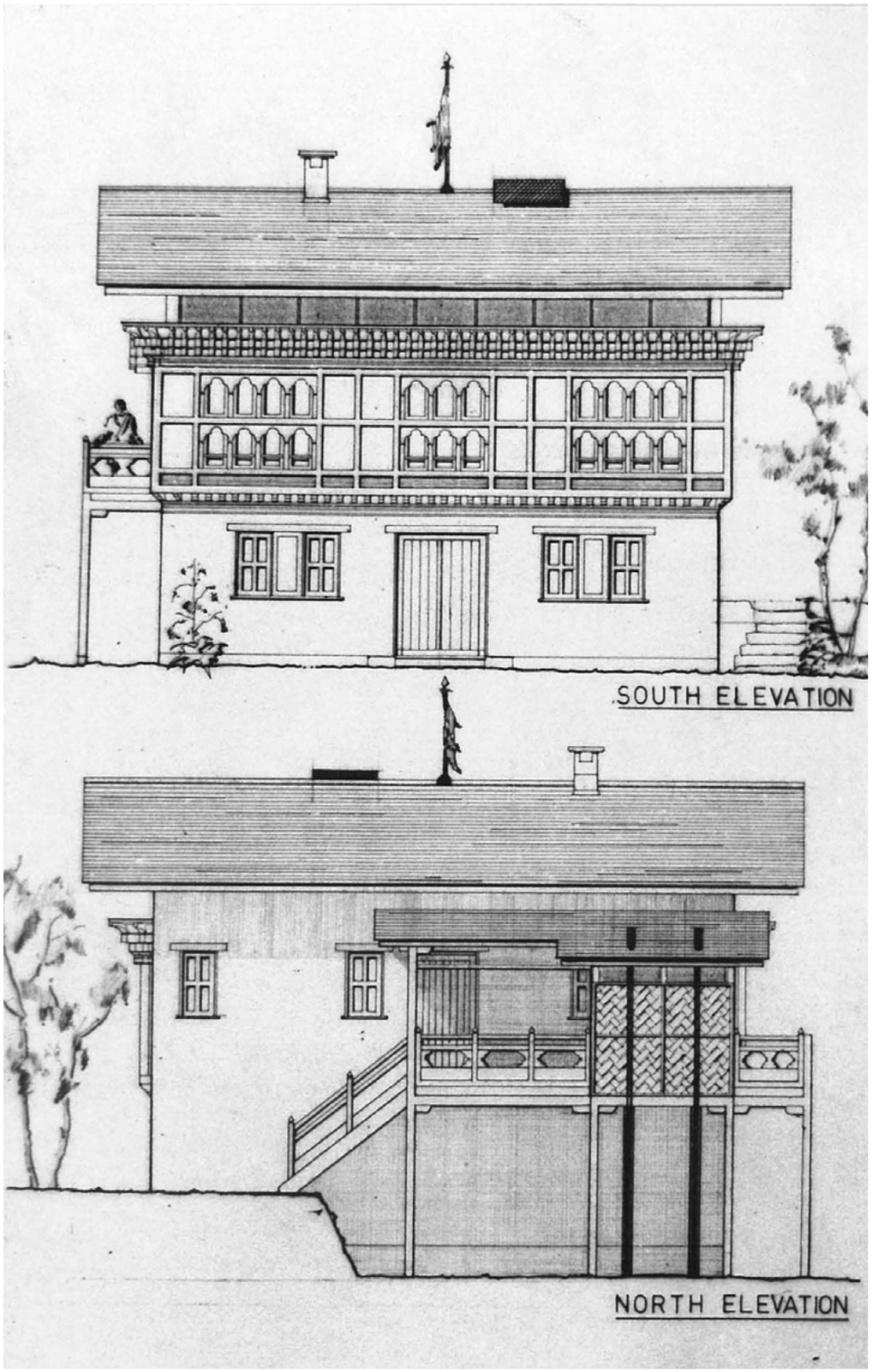


Fig. 3-31 Rural Housing Project, elevations.
Original elevations of the first improved traditional two-storey farmhouse. The proposed innovations originate from various directives aimed at making rural dwellings safer, healthier, and more economical, while keeping the best of Bhutan's unique architecture, building traditions and craftwork.
Source: Marc Dujardin (1987).

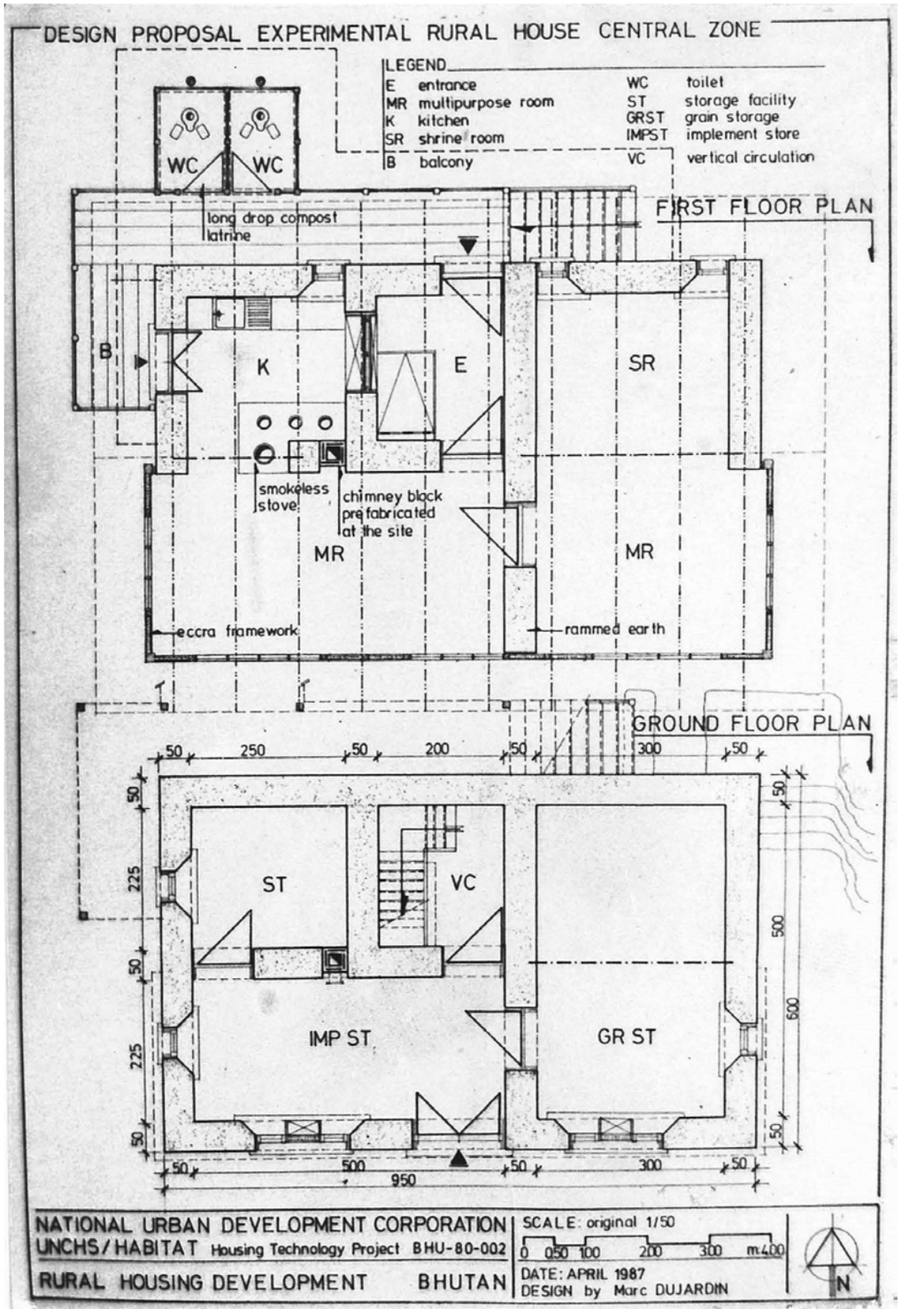


Fig. 3-32 Rural Housing Project, plans.
Floor plans.
Source: Marc Dujardin (1987).



Fig. 3-33 Rural Housing Project, scale models.
This model of the proposed design was built by the author at 1:20 scale. Several technical innovations could be demonstrated by taking this scale model apart.
Source: Marc Dujardin (1987).











Fig. 3-34 Rural Housing Project, demonstration tools.
This collection of demonstration tools were designed and built by the author in close collaboration with his assistant project architect, S.T. Nadik, and the technical staff of the Department of Works and Housing. Whenever technical innovations were not possible to view in the 1:20 scale model, 1:1 models were built to demonstrate improved timber frames and jointing. The concept and building of passive solar heating and food drying devices is credited to Andreas Bahmann, a Swiss expert from Helvetas-Bhutan.
Source: Marc Dujardin (1987).

1 Bhutanese carpenters have no experience in the use of architectural and production drawings. They know all the commonly-used building components and details only as mental maps. Therefore, we prepared our instruction tools for improved traditional house construction in the form of full-scale models.

2 Simple passive solar devices such as solar driers for vegetables and meat, as well as solar water heaters, were successfully introduced by the project. The solar water heater shown here provides the user with 40 litres of hot water at 60 °C to 70 °C, every 3 to 4 hours. The hot water is tapped by refilling the pipe with cold water.

3 The scale model of the first experimental improved traditional house was extensively used as a training tool, often at actual construction sites. In the background, one can observe the walls of the prototype coming up, constructed in rammed earth (pisé).

4 Some of the technical innovations could not be demonstrated in the scale model of the house, built at 1:20. Building components, such as the improved *ekkra* (timber structure and window frame with shutter), were therefore displayed by constructing full-scale models.

5 Based on the isometric drawings and various models, prepared by the training team, trainees were asked to replicate the construction models prior to the construction of an improved traditional house. This was their main on-the-job training exercise.

As such, the RHP reached for a certain level of innovation that honoured and certainly did not "stray" too far from Bhutan's 13 traditional crafts.

Reflecting on the damage to Bhutan's built heritage caused by earthquakes over a long span of time, an article entitled "Decades old model house could be an answer", was published in *The Bhutan Observer* on 17.3.2012.[24] It commended the RHP prototype model house for its balance between preservation and innovation. The author, Gyembo Namgyal wrote that Ugyen, the responsible engineer of Pemagatshel Dzong, argued that the local RHP model house designed decades back has better features than some of the government promoted and designed structures built much later. "It would be a good idea to once again promote the model house. We can have additional bonding and earthquake safety features incorporated in it" he said. More important was the voice of the local residents, some of whom were asking the government to consider this model once more: "It has traditional features complemented by modern floor plans" said Sangay Gyeltshen, another resident of Bartseri village, who has been witness to the rise and resilience of the structure. "We heard of collapsed BHU's, schools and *gewog* offices in recent earthquakes, but the dilapidated model house (dating back to 1989) withstood all those calamities. This speaks a lot about it. […] it could serve as a good model for a modern house built with all traditional features intact."

A strong argument can be made that the process through which technical, material, and stylistic innovations are transferred from *dzong* to farmhouse represents a centuries-old system of cultural renewal. However, the case of Tashichoedzong, examined in the next section, helps us to understand that a critical point in this system has perhaps been reached. This case suggests that the *dzong*'s role as both an embodiment of the *zorig chusum* and as a setter of trends is currently losing authority. This calls into question the *dzong*'s long-standing function as unifier of Bhutanese architectures, expressing Bhutan's sense of spatiocultural belonging and connectedness.

24 Online: https://bhutanobserver.com.bt/bhutan-observer-publications/ (accessed: 1.2.2024).



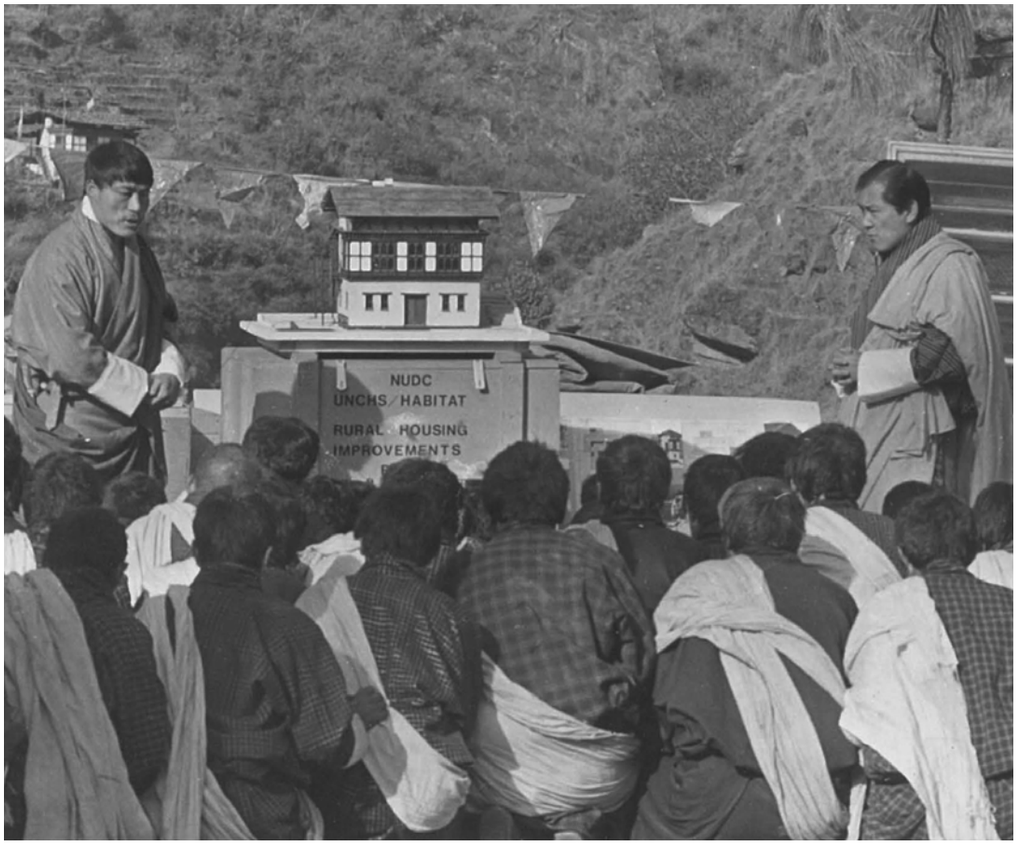


Fig. 3-35 Rural Housing Project, Royal command.
These pictures, dating from 1987, show Druk Gyalpo Jigme Singye Wangchuk, Fourth King of Bhutan and Lyonpo C. Dorji, Chairman of the Planning Commission, RGOB, introducing the Rural Housing Demonstration Project by means of a full truck-load of scale models and plans.
Source: Kuensel (1987), with permission of the Palace.

Fig. 3-36 Idem.
Source: Kuensel (1987), with permission of the Palace.



Fig. 3-37 Rural Housing Project, prototype.
A guided tour of the completed prototype at Wangduephodrang in 1990. After the completion of the first prototype at Lungtenphug (near Thimphu) in 1988, the team was instructed to design and construct a range of larger buildings.
Source: Marc Dujardin (1990).



Fig. 3-38 Revisiting the RHP prototype at Wangduephodrang in 2013.
Regardless of the reconstruction of the attached sanitation unit in rammed earth instead of timber and the replacement of the timber roof shingles with corrugated metal sheets, the prototype seemed to have held up well against time and environmental factors, including seismic events. The prototype is currently rented out as a residential dwelling.
Source: Marc Dujardin (2013).

STRUGGLING BETWEEN IDENTITY AND DIFFERENCE IN CONTEMPORARY BHUTAN: THE 13 TRADITIONAL CRAFTS IN JEOPARDY?

With the preparation of a master plan for the capital Thimphu in 1964, a first attempt was made to produce a blueprint for the development of Bhutan's first urban valley. Before the 1970s, the valley consisted of gently sloping terraced agricultural fields, with very few signs of urban development except for a growing nucleus centred around the newly reconstructed *dzong*. The commercial centre developed along one of the city's main axes, known as Norzim Lam, consisting of uniform, single-storey, government-owned shop-houses in a traditional style. Once privatised, typological uniformity was quickly abandoned and construction modernised in form, building materials, and technology. The initial structure was usually demolished and rebuilt as a multi-storey commercial block, with additional residential apartments. Every single space was turned into a rented room or flat, and a wave of building violations followed. The illegal infill of attic space and the failure to comply with the zone-related building height regulations are just two examples of Bhutan's urban proliferation.[25]

From the 1980s onwards, the newly-formed National Urban Development Corporation (NUDC) worked on policies and strategies to consolidate development areas and streamline urban development, which until then had been relatively unplanned and haphazard. As home ownership was encouraged, previously uniform housing estates were dismantled and sold to the private sector, resulting in a more eclectic settlement fabric with a mixture of traditional and imported dwelling patterns and styles. Thimphu not only attracted those seeking jobs in the civil service. Farmers from various valleys gave up their agricultural activities to start small businesses in the capital. Once the commercial area had been demarcated, several private parties acquired large building plots and invited their village carpenter to construct traditional farmhouses. From the various traditional house constructions, which are in fact elaborated versions of Bhutan's traditional archetype (the farmhouse), one can easily guess at the valley of origin of the house-owner. However, although these private houses were built according to traditional designs and construction practices, comparable to Sangay Dorji's house in Begana, they were employed for a very different function to that of a typical rural farmhouse. Most were quite quickly reorganised as rental units, accommodating up to ten families of different ethnic origins. This massively reduced the living space of the house-owner/builder, reversing the situation found in rural village settlements, where the typological archetypes truly acted as central places or "social habitats" for the entire village, making their interiors appear as "spacious voids" (Dujardin 2000: 257).

With Bhutan's increasing exposure to western concepts of urban planning and architectural form, the rebuilding of Tashichoedzong is one of the first substantial built signs of Bhutan's move towards planned development, modernisation, and urbanisation. On the other hand, not only did the revitalised *dzong* undoubtedly represent the best this dwelling culture could achieve at this particular juncture (1960s), but the reconstructed monument literally stood for national identity and tradition itself. There is therefore every reason to believe that the most effective way to cope with the rapid import of conflicting westernised urban typologies and conventions, was to impose a "facade control" on the city. Although some typical characteristics of Bhutan's traditional architecture, such as the abundant use of timber and rammed earth technology, were increasingly discouraged[26] within the municipal boundaries, the new capital *dzong* of Thimphu somehow retained its trendsetting role.

At first glance, distinct features of the *dzong's* "introverted *rabsel* style" courtyard architecture were turned inside-out, in part to lessen the cultural shock of encountering unfamiliar architectural features of built form and public space. Thus elaborate timber galleries, typical of Bhutan's monumental fortress architecture, were reversed and reconceived as a local version of shopping arcades and commercial centres. This process of copying and reinventing traditional features was not only confined to the institutional sector, associated with accommodating and housing the capital's central seat of government. Without exception, all newly introduced building types — from post office to privately-owned apartment block and from urban villa to petrol station — were subjected to the same bold cosmetic treatment. From the early 1970s onwards, with the force of a tsunami, construction industries emerged making extensive use of new building materials and technologies, while also copying typical features and fragments of the capital *dzong's*

25 Similar experiences of rapid, commercially-driven, and largely unregulated urban development have been documented right across the Himalayas — for example, see McDuie-Ra, Chettri, and Norboo et al., this volume.

26 It is worth noting that the abundant use of timber is discouraged within the township for economic and ecological reasons, but more importantly to minimise fire hazards.

elaborate timber architecture. Through the massive deployment of an imported (skilled and unskilled) labour force to build this "instant city", the traditional culture transfer from *dzong* to village, as well as the role of the traditionally skilled craftsmen and their *zorig chusum* toolbox, was massively under-appreciated. There were two main reasons for this. Firstly, the newly-favoured modes of design, planning, and building construction strongly deviated from Bhutan's predominantly rural traditional craftsmanship. Secondly, once highly valued and respected (but now outnumbered) masters of the *zorig chusum* v1.4. were never actively reskilled to enable them to cope with the large quantities and accelerated construction modes that such a mass building project demanded. Governmental ministries and agencies such as the Central Town Planning Committee, the National Urban Development Corporation, the Public Works Department, the Department of Works and Housing, and the Ministry of Works and Human Settlements emerged, merged and diverged over time, each with their own agendas, approaches, and spheres of influence. These were predominantly staffed with foreign-trained architects and planners who showed limited interest in mapping, understanding or learning from Bhutan's mastery of timber architecture, except in order to comply with the "facade control" guidelines. For example, in the 1980s, Bhutan's Public Works Department was structured along the lines of its Indian counterpart, with the latter providing both know-how and staff in order to lay down the rules and regulations for Bhutan's early urban planning and design activities.

Even a rudimentary acquaintance with the identity and internal dynamics of Bhutan's "uncharted" dwelling culture would make it apparent that during this period the cultural transfer from *dzong* to city was starting to take place at a more superficial and aesthetic level. When the author took office as UNCHS architect and planner in several of these agencies (NUDC-PWB, Dept. of Works & Housing, 1986–1991), no documentation was available on traditional Bhutanese architecture, nor on *zorig chusum* based craftsmanship. To initiate the systematic mapping of traditional architecture a Dutch architect, Jos Maseland, was appointed within our UNCHS-NUDC project in order to compile a basic "catalogue" of traditional building types, but without studying the building practices behind them. The result, *An Introduction to Traditional Architecture of Bhutan*, was firstly circulated as a reference report for architects and planners during the 1980s, before it was published as a book in 1993.

TOWARDS A CONTAGIOUS STYLISTIC DECLINE OF BHUTAN'S ART OF WOODWORK (*SHING ZO*): A CASE IN PRACTICE

In the foreword to the 1993 book on traditional architecture, the former Foreign Minister and chairman of the NUDC, H.E. Lyonpo Dawa Tsering, raised the discussion on Bhutanese traditional architecture in the modern world to a more complex and mediated level:

> Bhutanese architects have traditionally borrowed architectural forms and ideas from outside and made them their own. Their forms have changed over time, as it must in all living cultures. They developed distinctive ideas through a synthesis of old forms and ideas. Traditional buildings have imbibed ideas from Chinese decorative concepts, Indian religious motives and Persian window frames. The achievement has been to combine external motifs and make them distinctively Bhutanese. In endeavours to preserve the spirit of traditional architecture, it must be kept in mind that when a culture's forms become frozen and rigid and unchanging, they lost life and freshness. Traditional architecture in order to retain its power and beauty must adjust to changing needs and conditions. I cannot simply clothe new functions with a veneer of old forms. The main must be to produce structures which blend a mix the best of different ideas and forms and reach a new synthesis. The aim of this book is to document traditional architecture, both religious and secular. I sincerely hope that this exhaustive documentation of an important facet of Bhutanese culture will serve both as record of past achievements and as a guide and encouragement to future creativity. (Maseland 1993: foreword)



Fig. 3-39 Thimphu Central Post Office.
Front and side elevations taken during the completion of the new Thimphu Central Post Office in 1989. Although the design was formally approved by the Royal Government, this public building became the subject of controversy surrounding the *rabsel* and cornice features, which were wrongly and insensitively copied to proportion from Bhutan's traditional timber architecture.
Source: Marc Dujardin (1989).



Fig. 3-40 Thimphu Central Post Office — contested cornice.
Close-up of a totally overhauled design scheme that reduced the functionality, craftwork and aesthetics of Bhutan's traditional timber architecture to the level of mimetic pastiche. From stenciled *horzhu* windows hidden by the reflection of glass and disproportionate cornices and side panels (*shamig*) to non-functional wooden imitations of the projecting supports (*gyetsa*) of a *gomang rabsel* window frame, this building heralded a move towards the rupture of traditional Bhutanese building culture.
Source: Marc Dujardin (1989).

From the viewpoint of Bhutan's hitherto "uncharted" material culture, this book appeared as a major step towards mapping, writing, and referencing Bhutan's architectural tradition. However, this is not what actually happened. On the contrary, this reference book has been widely criticised, not to say reviled, by both international and local experts motivated by a wish to both understand and preserve Bhutan's unique architectural legacy. For example, my own detailed mapping of traditional architecture and studies of the *shing zo* arts of woodwork from a praxeological perspective (Begana, Rukubji and Thimphu), together with detailed fieldwork by eminent scholars of material culture such as Niels Gutschow (Chendebji Eye Chörten) and Pierre Pichard (Simthokha Dzong), unveiled numerous unreliable measurements and erroneous interpretations of the building types discussed. Nevertheless, the book came to be a widely used reference tool in the design of new institutional and public service buildings, such as the new Thimphu Central Post Office that was built in the second half of the 1980s (Fig. 3-39 and Fig. 3-40). The controversy surrounding the "traditional" cornices, which were pasted onto the building to meet the "facade control" guidelines, exemplifies how a lack of profound knowledge of the *shing zo* woodcarving practices can combine with other erroneous assumptions to place the "DNA" of Bhutanese traditional timber architecture at risk of being severely diluted and even "contaminated".

On 24.7.1999, Dasho Shingkhar Lam Kunzang Wangchuk, one of my mentors or *lopon*, made the following statement in Bhutan's National Weekly, Kuensel, entitled "Book on Bhutanese architecture misleading":

> The Bhutanese traditional houses, which resemble celestial palaces, are built in perfect conformity with our culture and tradition. By chance I got a got copy of page 197 from a book on Bhutanese traditional architecture entitled: "An introduction to Traditional Architecture of Bhutan". I was shocked to see a drawing that mentioned that a one-storey house should have one layer of *boh*, a two-storey house two layers of *boh*. Under no circumstances can three layers of *boh* be made, regardless of any standard. In our tradition, two layers of *boh* along with "*ngangked* or *phana*" are put even if the house is one storeyed. As a matter of fact even if a three-storey house which puts up only one layer of *boh* and *ngangked*, it is accepted and not considered a defect. Usually one cannot afford to put *bagam* to general houses except in the case of *dzong*, palaces and *lhakhang*. Quite surprisingly, a *bagam* has been put below the *langlhap*. This too is a misinformation. As per our tradition, a *bagam* should be put below the *boh* but not below the *langlhap*. If you put the *bagam* below the *langlhap* it will look as if horns have been placed on the head of a horse. There should be no excuse for complacency, if we have to write a book to pass on our traditions to the future generation, it should be well researched, otherwise there is a danger of losing the authenticity of tradition. I am concerned and would like to suggest that proper attention be taken before publishing such books.[27]

This critical article publicly restated views that my occasional *zorig lopon* had shared privately with me, his *shing zo lopon*, in training.[28] It further revealed the status of the *zorig chusum* in general and *shing zo* in particular at that time. A fully recognised authority in this field but usually a reserved character, Kunzang Wangchuk evidently felt strongly enough about this issue to send out a clear wake-up call to all those involved in contemporary design, planning, and construction.

Without any doubt, this book was a case of plagiarism for convenience that displayed a serious lack of ethics, professionalism, and respect for the "shaping" power and the praxeology of "making". It completely overlooked what Bhutanese architecture, approached as a cultural practice, did throughout its recorded history, namely combining a strong formal, technical, and stylistic core with an openness towards qualitative innovation and transformation (Fig. 3-41 and Fig. 3-42). Without any proper referencing, the author of this by now-maligned architecture book indiscriminately copied a technical drawing prepared by the former Central Town Planning Committee and represented it as a definitive catalogue of traditional cornices, of which the most elaborate had never been observed in Bhutan. The (partly invented) construction detail section[29] shows three "traditional" cornice types that increase in degree of ornamentation as the number of built floors increases. In so doing, the drawing wrongly suggests an "infinite" and linear progression if applied to constructions with even more floors. How could it be that this confusing and corrupted construction detail found its way not only into published "design guidelines" but also into newly designed public service buildings, such as the prestigious Central Post Office building in Thimphu? One of the results of this debacle was the construction of Western-type buildings onto which Bhutan's signature wooden cornice components were either modelled in

27 Note: *ngangked* and *phana* refer to the same member, but *ngangked* (crane's neck) sounds more pleasing than *phana* (pig's nose).

28 One of his teaching tools was setting me to build a one-to-one scale model of a small wooden house shrine, showing all the details of Bhutanese timber cornices. This shrine today is the pinnacle of the "Bhutan corner" in my home in Lokeren, Belgium.

29 The original technical drawing was completed on 20.5.1983, by J.M. Sharma, Assistant Architect, Central Town Planning Committee. Source: author's personal collection.

cement concrete, or pasted onto walls as non-structural timber parts, then simply painted over to make these important buildings look more like a celestial palace or a modernised *dzong*.

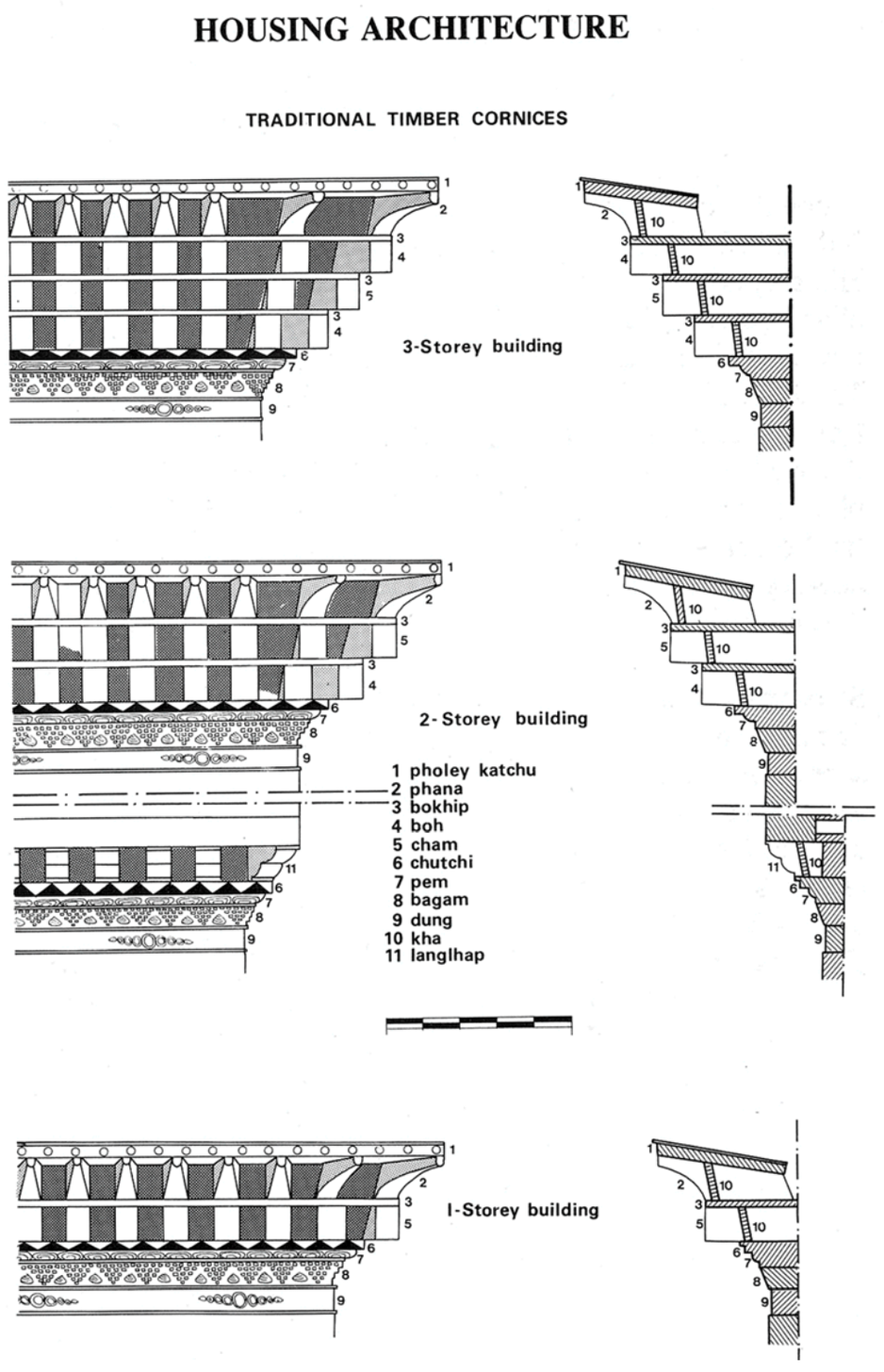


Fig. 3-41 Maseland copy/paste.
Traditional timber cornices as documented and drawn in the late 1980s by Jos Maseland as part of the NUDC-UNCHS documentation project of Bhutanese Architecture, later published as a book in 1993.
Source: Maseland (1993: 197).

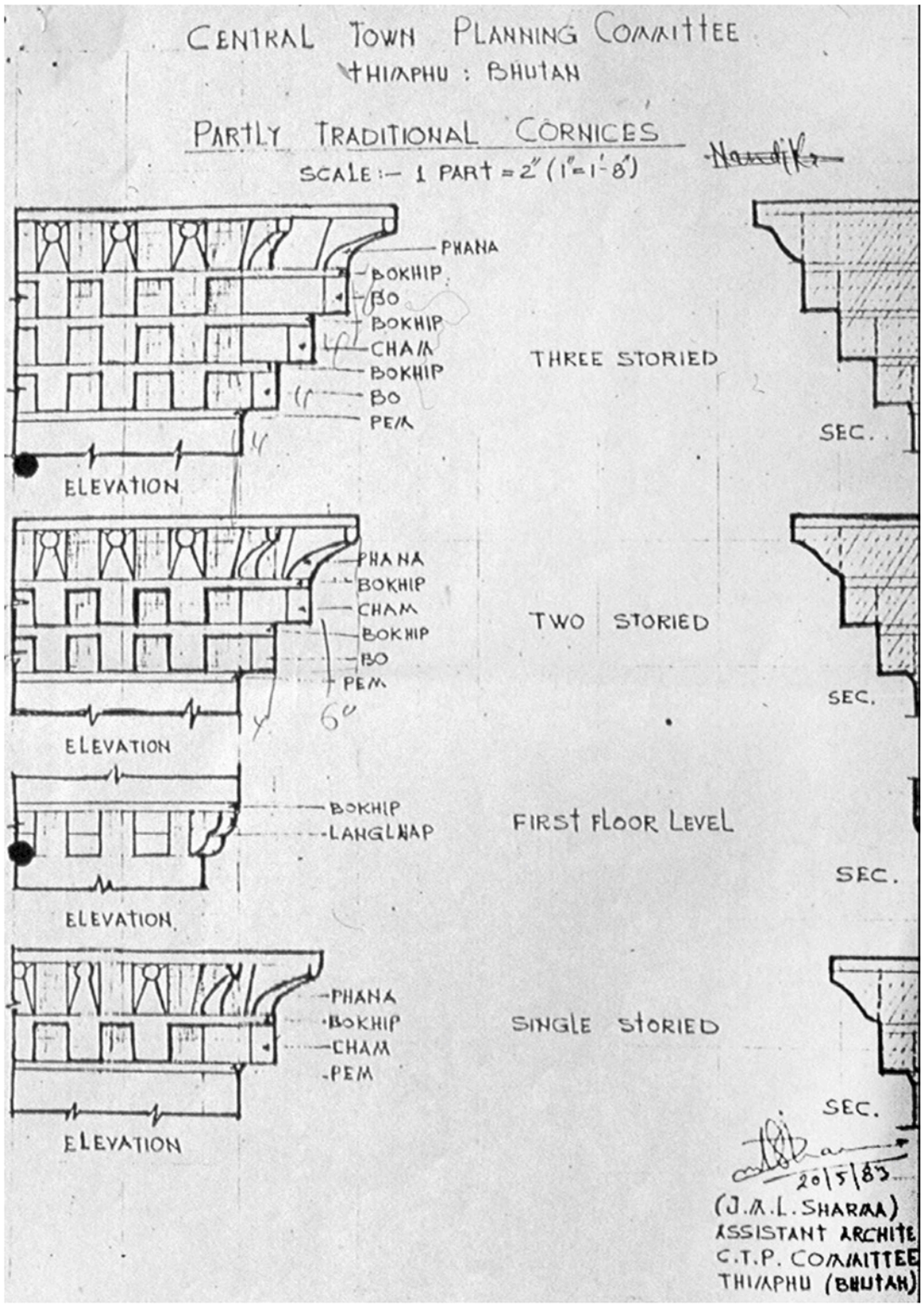


Fig. 3-42 Central Town Planning drawing — cornices for cement concrete.
The beginning of disproportionate detailing of traditional timber cornices, designed to be cast in cement concrete. This drawing was uncritically copied by Jos Maseland and published as if it were "traditional". The top pattern was simply reinvented by the CTP technical assistant without any sense of rigour.
Source: Public Works Department, ROGOB (1983).

THE TRADITIONAL ARCHITECTURE GUIDELINES: THE *ZORIG CHUSUM* AS INSTITUTIONALISED "COSMETIC" DESCRIPTION AND PRESCRIPTION

From the 1990s onwards, the first Bhutanese architects, male and female alike, who had received basic training in India, Australia, Europe, and the USA, began returning to join in the shaping of their own country's architectural present and future. These relatively inexperienced practitioners took on a great responsibility when striving to balance Bhutan's centuries old (and still very much living) tradition of architectural craftsmanship with precarious and culture-threatening modes of modernised industrial design, planning, and construction technology. Gradually, whether as private architects or as civil servants, these youngsters began taking over crucial executive positions in the governmental bodies and agencies set up to address Bhutan's complex urban urgencies, as well as looking after important conservation sites and monuments. Others developed their own private design offices and took a more freewheeling approach, often resulting in highly questionable productions that relegated Bhutan's architectural heritage and know-how to the level of gadgets and gimmicks. However, some have managed to find a better balance in their design attitude, working more synergically to connect Bhutan's living architectural tradition to contemporary innovations. It is appropriate here to highlight Aum Dorji Yangki[30], who graduated in 1996 to become Bhutan's first female architect, as well as the first president of the Bhutan Institute of Architects. From her hands and those of several of her contemporaries, much more reliable documents were drawn up, giving much more value to Bhutan's mastery of craftsmanship while also seeking to redirect the unprecedented and complex urban sprawl developments that were resulting from an unhinged construction industry, bulging with extreme forms of eclecticism and bold formalism. (Fig. 3-43)

Building on this hope, a new booklet entitled *Traditional Architecture Guidelines* was

30 For an introduction of Bhutan's first female architect, refer to online: https://en.wikipedia.org/wiki/Dorji_Yangki (accessed: 1.2.2024).



Fig. 3-43 Private company building, Thimphu, between Yandren Lam and Tarayana bus stop.
This picture is representative of the contemporary architecture of the city — derailed architecture from design to materialisation. Compared to the design of the controversial Thimphu General Post Office, this building is painful to behold for anyone who experienced Bhutanese architecture prior to the 1990s.
Source: André Loeckx (2013).

released (MoWHS 2014), paving the way towards a more plausible, comprehensive, and culture-geared approach. Here, Bhutan's updated toolbox of building craft knowledge and skill begins to regain its place, step by step, although some would say not quickly or convincingly enough. Indeed, the (then) Deputy Minister Dasho Leki Dorji noted in his introduction to the booklet that although efforts have been made to incorporate traditional architecture with modern construction methods and materials, the results have not been encouraging, primarily due to the absence of formal guidelines. He argues that in societies like Bhutan, where ancient traditions are not incompatible with modern life, the dilutive effects of modernisation are "most visible in our houses". He further argues that the import of materials and labour, the dependence on modern technology, growing ignorance of traditional Bhutanese architecture, and a "dwindling number of artisans", have all contributed to a marked decline in traditional building styles and practices. Asking whether traditional Bhutanese architecture can survive in the face of the irreversible process of urbanisation requires us to bear in mind that every enforced innovation entails a process of acculturation that may put the proposed model also at risk (Dujardin 2005: 177f.). The following medical metaphor might be of usage here. If the "prescription" does not go hand in hand with a detailed "description" of the diagnosis, nor with the "why" and the "how" of the remedy to be followed, it may well be that in cases of incorrect treatment, the authority of the prescriber and everything this entails is overruled, and the remedy not only fails to cure the disease but actually worsens it.

In *Bhutan's National Weekly* of 13.4.2002, a senior planner suggested that all existing traditional buildings within Thimphu's municipal boundary and surrounding regions should be preserved and that all new buildings should include elements of traditional architecture. For instance, traditional window frames such as the *payab gochu* and *rabsel go-cham* series were industrialised (MoWHS 2014: 186–218). Very basic, non-detailed design guidelines were presented for buildings other than residences, such as industrial units, automobile workshops, slaughterhouses, and bus stops, which excluded the need for elaborate craft traditions and skills, reserving them only for "exceptional" public building projects. This process of simplification, standardisation, and mass production to meet the demand of rapidly developing townships and citified village settlements might be seen as a "slap in the face" to all practitioners of the 13 crafts, who now see their skills being copied and reproduced on an industrial scale, with severely limited respect for their vanishing industry.

This brings us back to the central question of whether we are dealing here with a case of culture transfer or culture rupture. Against the backdrop of Bhutan's unhinged design and construction industry, reaching far beyond its urban perimeters, the once upsetting critique by one of the nation's most respected masters of the *zorig chusum*, Dasho Shingkhar Lam Kunzang Wangchuk, concerning the "architectonic" misfit of Thimphu Central Post Office caused by Maseland's sloppy guidelines (1993) which preceded the more reliable *Traditional Architecture Guidelines* (2014), appears now to have been a storm in a teacup.

DZONG RECONSTRUCTION AS HYBRID "MAKERS LAB": BHUTAN'S 13 TRADITIONAL CRAFTS UPSCALED

Current approaches to *dzong* architecture as either an isolated matter of national heritage or as the kinds of "frozen monuments" reflected in UNESCO policies strays very far from what Bhutan's living architecture stood for only a couple of decades ago. This literally makes *dzong* reconstruction the most important agent of change and locus for uniting the divergent currents at play in Bhutanese architecture. Perhaps more important, however, is the realisation that by exercising influence over the settlement tissue, exemplary edifices like the *dzong* have themselves been subject to unprecedented innovations drawn, in return, from Bhutan's process of modernisation and urbanisation. In this regard, one should not underestimate or deny the future role of the city as the new vehicle of cultural transfer and trend-setting for all of Bhutan's dwelling culture. Partly through the intermediary of the "modernised" *dzong* and partly through the citification that is occurring in the villages as a result of the ties that urban dwellers still hold with them, Bhutan has reached a critical stage of development. The emergent intersection of traditional factors and modernised agents of change look likely to lead to even more ambiguous definitions of space and even more complex hybrid built forms, culture-generating and culture-rupturing alike.



Fig. 3-44 Wangdi ruins — entrance.
Picture of the main entrance to the fire-ravaged Wangdue Phodrang Dzong.
Source: Marc Dujardin (2013).



Fig. 3-45 Wangdi ruins — internal view.
The Wangdue Phodrang Dzong ruins viewed from within. Considering the innovative construction technology and building materials that were applied during reconstruction (2014–2022), this may well be the last time that the remains of Bhutanese monumental architecture consists merely of stone, rammed earth and wood ashes.
Source: Marc Dujardin (2013).

This is true not just for the capital *dzong* in Thimphu, but for all the monumental and historically important religious buildings of Bhutan. What the reconstruction of Thimphu Dzong meant for "making" the first version of its "instant capital city" in the late 1960s and 1970s can be illustrated by the subsequent design of public and administrative buildings and the institutionalised enforcement of a facade control. What the later Punakha Dzong reconstruction set in motion is exemplified by the wave of architectural fine-tuning that affected Bhutan's entire stock of religious and state-religious buildings between the late 1980s and 1990s. In terms of Bhutan's rural dwelling culture, almost every farmhouse has been rebuilt with the bold ornamentation and features associated with Punakha Dzong, transforming the so-called "Three-tiered archetype" into a kind of celestial palace, but one incorporating numerous urban-inspired layout considerations.

Taking us from the present into the future, the totally reconstructed Wangdue Phodrang Dzong, which was razed to the ground by accidental fire on 24.7.2012, may well become Bhutan's "architectural tour de force *par excellence*" for many decades to come. (Fig. 3-44 and Fig. 3-45)

This hugely complex reconstruction process started in 2014 with finance from India. At the time of writing, 87 % of the project has been

completed (Kuensel 2.9.2021). The project draws on the experiences of cooperation across various fields of expertise that was gained during the design and construction of the "*dzong*-like" SAARC building in Thimphu in the late 1980s. However, the new Wangdue Phodrang Dzong reaches for even higher standards of achievement in terms of design, architecture, build quality and, not least, national pride. It will certainly be the most advanced "hybrid" example of what *dzong* can represent in terms of an architectural body of knowledge that both celebrates and enhances the traditional craftsmanship of the *zorig chusum*. It will also represent the most sophisticated combination of imported construction technology and traditional know-how, making Bhutan's architectural legacy even more sustainable than ever before. It has been designed to meet the challenges of today and tomorrow, notably the climate change and ecological sustainability issues that the 'circular'[31] building construction modes currently on the rise worldwide seek to address.

A press release date 24.6.2012, cited H.E. Lyonchoen Jigmi Y. Thinley, the (then) Prime Minister of Bhutan:

> All Bhutanese are joined in grief as we try to reconcile with the images of the great Wangdue Phodrang Dzong consumed by flames and billowing smoke. Of all the fires that have reminded us of the impermanence of life and its manifestations, this has pierced our hearts no less painfully than the terrible sense of loss we endured when, Paro Taktsang, the holiest of our shrines was also destroyed by fire. But Taktsang has been fully restored and is no less sacred or significant. In fact, more cherished and revered today because the fire awakened all of us to the fragility and vulnerability of this most precious heritage. It gave to many of us the opportunity to contribute to its full and embellished restoration. In so doing, our nation and its people were blessed with great merit (*sonam*). Wangdue Phodrang Dzong did not succumb for the first time to the reality and inevitability of destruction. It was destroyed before and it will be destroyed again by forces beyond our control. What we must remember is that it was rebuilt and it always stood as the Dzong that Zhabdrung Ngawang Namgyel built until the day before. We the people of Bhutan have not lost but gained another opportunity to renew and further enrich our proud heritage. The people of Shar Dhar Gye will have their Dzong again. So, like the indomitable will of the Bhutanese people and the fame of Palden Drukpa, Wangdue Phodrang will rise again with greater glory and magnificence [...] We must seize the opportunity to build a "stronger, more durable" and glorious Dzong in the name of Zhabdrung Ngawang Namyel and the will of His Majesty the King.

One decade later, the former Prime Minister's vision appears to be coming true. The newly reconstructed Wangdue Phodrang Dzong will undeniably become the nation's most "advanced" showpiece of its entire architectural legacy. Wangdue Phodrang Dzong will look much like its magnificent predecessors from the outside in terms of architectural greatness and will thus display the very best of Bhutan's timber architecture and *shing zo* building craft traditions. At the same time, it will be embedded with numerous material

31 For an introduction to the increasingly prominent "circular economy" approach to sustainable building construction, see Nourozi et al. (2021).



Fig. 3-46 Master carpenter Dorji.
Perhaps Bhutan's most skilled master builder, *shing zowpon* Dorji, pictured at the construction site of Wangdue Phodrang Dzong in 2021.
Source: Chayku and Jigme Wangchuk — Bhutan Broadcasting Service (2021).

innovations and hi-tech devices such as reinforced concrete raft slabs, earthquake-resilient features installed in the central tower (*utse*), and an array of inbuilt fire safety measures.

Having seen Bhutanese architecture presented from the perspective of the *zorig chusum* as a site of struggle between identity and difference, expediency and continuity, readers may well end up with the question: what lies ahead for this all-encompassing toolbox that balances on the cutting edge of cultural transfer and culture rupture? I have chosen to shed some light on this important, precarious, and open-ended question in the form of an epilogue, giving voice to two key Bhutanese actors in the ongoing reconstruction of Wangdue Phodrang Dzong, namely 50-year-old project director Kinley Wangchuk (Division for Conservation of Heritage Sites — Department of Culture) and the 71-year-old *shing zo lopon* Dorji from Bjena Gewog, Bhutan's most qualified present-day head carpenter, widely referred to as the "Wood Whisperer of Wangdue".[32] (Fig. 3-46)

32 Bhutan Broadcasting Service (27.11.2021), "The Wood Whisperer of Wangdue" by Changa Dorji. Online: http://www.bbs.bt/news/?p=161703 (accessed: 1.2.2024).

EPILOGUE

The introduction to this chapter pictures Bhutan's predominantly rural architectural traditionality not as a fossilised body of centuries old habits, conventions, and untainted practices, but rather as one that permitted and even stimulated change. This picture held true until the late 1960s, when the momentum in Bhutan's built history was directed towards thinking, planning, and building Thimphu as an "instant city", or in other words, the first attempt to conceive and materialise a "Bhutanised" version of urban space definition. From a praxeological viewpoint, this entailed a "process of making" that had almost nothing in common with the long standing mastery of the arts of woodwork architecture and technology contained in the comprehensive toolbox of the *zorig chusum*. Rooted in Tibetan Buddhist thought and related definitions of space, and seeing buildings as analogies of a higher conceptualised order, the founding of Bhutan as a sovereign state in the 17th century could never have been materialised without the "Bhutanisation" of the craft traditions that were in vogue at the time the nation's founder, Shabdrung Ngawang Namgyel, fled from Tibet in 1616.

The built history of Bhutan's monastery-fortresses has been studied over a long period and from several viewpoints, from the 1783 paintings of Samuel Davis to the first photographs taken by John Claude White in 1907, followed by the visits of numerous other interested foreigners prior to my arrival in Bhutan in 1986. These contributions combined with my own observations, photographs, and sketches made between the late 1980s and 1999, enabling me to understand Bhutan's architectural legacy as both "living" and "propelling" (Dujardin 2000: 186–219), driven by a never-ending quest for national identity and cultural uniqueness within harsh Himalayan landscapes. Reconceiving the term "Bhutanisation" from the perspective of material culture has enabled me to understand the empowering effects of frequent *dzong* reconstruction processes, which both enhanced existing styles and set new trends in motion. This process thus urged the entire architectural legacy — from religious and state-religious to secular definitions of built form (the morpho-typological palette) — to comply with the new "model" embodied by the remade *dzong* monument. In this sense, "making" always entailed simultaneous processes of revisiting, enhancing and upscaling the toolbox of the 13 traditional crafts, at least to some extent.

From the major reconstruction project of Punakha Dzong in the second half of the 20th century onwards, however, it does not take an expert's eye to see that the *zorig chusum*, and the woodworking arts in particular, started coming under greater pressure than ever before. Experimental sculpting and casting of formerly timber components such as joists and cornice parts, or ornaments such as snow lions, in concrete are but examples of the many ways that the *zorig chusum* were being challenged in terms of materials, tools, skills, expertise, and indeed the entire "process of making". Several of these technical innovations found their origin and practice within the struggle to Bhutanise the accelerating influx of citified and western-inspired design and construction industries, of which the controversy surrounding the cornice of Thimphu's Central Post Office represents but one convincing example.

Bhutanising the urban fabric in this way meant disconnecting from almost everything that Bhutan's craft traditions were (and are)

all about: from the concept, structural logics and environmental considerations, to the "hands" that actually do the making, from master builder to layperson and from young to elderly. In former times, by the time a girl or a boy started building her/his own farmhouse, assisted by the entire community, she/he would likely have already taken part in at least 15 house constructions and/or provided semi-skilled (e.g., squaring trees into timber sections) or unskilled labour to several important religious and state-religious reconstructions projects. What we might conceive of as a "traditional building industry" emerged from, and worked most effectively in, rural Bhutan. The author's study of one village settlement, Rukubji, revealed how traditionally conceived and built three-tiered farmhouses, Bhutan's archetype, gradually became modernised from the inside-out, often initiated by family members who chose to move to the city and there developed new norms and expectations, such as subdivided rooms, new privacy norms, and the clear separation of humans and animals. When I revisited Rukubji in 2013, almost every farmhouse had been dismantled and rebuilt in the style of a "citified" village temple house, with the cattle expelled and many former design sensibilities along with them.

I inspected the ruins of Wandue Phodrang Dzong in September 2013 and have subsequently followed this giant "makers lab" for practising the *zorig chusum* in general and *shing zo* in particular at regular intervals, through formal sources and social media. I can't think of a more apt way to close this chapter than by giving voice to two of Bhutan's highest ranked architectural experts. Two recent articles[33] present *shing zo lopon* Dorji as the country's most qualified head carpenter and Kinley Wangchuk as its most qualified project director, who leads a hand-picked team of architects and engineers as they seek to master advanced modernised modes of planning, design, and construction while retaining a strong sense of all that came before. Reading these articles, I felt the weight of many of my concerns about the future of Bhutan's magnificent timber architecture being lifted from my shoulders.

Shing zo lopon Dorji began carpentry work from the age of 18, and as Changa Dorji's article states:

> He barely knows the alphabet and to even hold a pencil, his hands would disapprove, but from what he does with wood, it is as though he talks to them and they automatically form their shape. According to Dorji, if an educated person devotes enough time, learning the trade is a piece of cake, but for people like him it is difficult. He said that having to look after farm works especially makes learning carpentry more challenging.

The article further recounts that over his nearly four-decade career, Dorji's most prominent works include the total reconstruction of the Punakha Dzong Chung Lhakhang,[34] the Bemri Lhakhang in Paro, the Kideykhar Shedra in Mongar, and the Surey Lhakhang in Gelephu.[35] Spearheading eight years of carpentry works at the Wangdue Phodrang *dzong* reconstruction, he trained about 40 carpenters on-the-job. According to Dorji, the lack of skilled carpenters and experienced experts was, and remains, the main challenge to practicing the *zorig chusum* to the highest level: "We asked the gups (village leaders) to send their best carpenters, but when people turned up, they couldn't take the responsibility we gave them. They weren't skilled enough and this delay caused that about 50 % of the procured timber from Khotokha, Nahin and Bumthang turned up damaged". Exceptional wood carvers too were difficult to select. In this regard, it is worth mentioning a story recounted by Phurpa Lhama in the Kuensel article: "In 2014, Karma Tshering sat with over 80 individuals, all experts in carving and design patterns (*remo*) or stencils in handmade paper (*dezo*), competing for work with the project. Carving out two intricate dragons made him win the competition to build altars and thrones (*thris*) inside the *lhakang* in the *dzong*". Karma Tshering argued that the lack of skilled carvers was the major problem he faced, echoing Dorji's complaints regarding the absence of *shing zo* experts. With pay differences of at least BTN 500 per day between the project work and private contracting work, it is perhaps no surprise that many craftsmen chose to leave the project in search of higher incomes, showing the underlying economic dimensions of a typical problematised heritage issue at hand.

Reconstructing an entire *dzong* from its desolated plinth represented an unprecedented challenge to take on, alongside the need for various technical improvements to counter problems arising from the repetitive demolitions that Bhutanese monuments were subjected to over their entire built history. The project sheet of this particular reconstruction project[36] shows the profiles of all the stakeholders and staff of the implementing agency, namely the Division for Conservation of Heritage Sites of the Department of Culture, Min-

34 This *lhakhang* was washed away in 1994 by a flash flood caused by a glacial lake outburst, see Dujardin (2000 Vol. 2.: 53f., Fig. 4).

35 Dorji's professional experience is listed in the formal Wangue Phodrang Dzong Reconstruction Project Summary Document as follows: Wangdue Dzong Renovation: 1 year (1984); Renovation of Tango Dzong: 6 years; Renovation of Punakha Dzong: 1 year; Construction of Khota Rinchenling Sedra: 8 years; Construction of Dolung Goempa: 1 year; Construction of Wachey Lhakhang: 1 year; and Wangdue Phodrang Dzong Reconstruction Project: 8 years by 2022.

33 The articles referred to are "Hands that are raising the Wangdue Dzong" by Phurpa Lhama and Jigme Wangchuk (Kuensel 2.9.2021) and "The Wood Whisperer of Wangdue" by Changa Dorji (BBS 27.11.2021).

36 For a full overview of the Wangdue Phodrang Dzong Reconstruction Project, refer to online: http://www.departmentofculture.gov.bt/en/wp-content/uploads/2017/02/WDRP-Profile.pdf (accessed: 1.2.2024).

istry of Home and Cultural Affairs. As project director, Kinley Wangchuk relies on a project management team comprising 11 formally skilled experts, including the project engineer, senior forest ranger and two female staff members—the project architect and structural engineer. This document also provides an overview of all the "skilled workers" involved (327 in total) as per their skill, grade, and number. According to Kinley Wangchuk, the reconstruction took time because of the technical innovations mentioned earlier and the "service tunnels" running underneath the Dzong. This vast project thus involves over three hundred skilled and unskilled project staff, both formally educated and trained-on-the job, men and women alike, and is spearheaded by illustrious personalities and experts in both "conservation" (*shing zo lopon* Dorji) and "innovation" (project director Kinley Wangchuk). It can be seen to constitute an unparalleled "makers lab" where leading experts and their trainees experiment with a new plane of convergence between the finest in traditional Bhutanese skills and modern materials and techniques, and will arguably provide hugely valuable data and insights that enable both Bhutan and the world to learn from truly "exceptional" practice.

My own journey through this landscape has involved incessant weighing-up of how resilient Bhutan's toolbox of traditional crafts might be in the future, questioning how the "makers" of tomorrow will manage to cope with the country's pace of modernisation while staying in tune with its past. Now more than ever, craftspeople must constantly reinvent themselves, their knowledge, and practices to keep up with the radical changes underway. Emerging problems such as climate change and ecological sustainability add new urgencies to these already powerful transformative forces, but rather than seeing this as a desperate situation, I prefer to focus on its positive and productive aspects. The Wangdue Phodrang reconstruction project illustrates this potential perfectly. By aligning their vastly different backgrounds of formal and informal education, on-the-job training and longstanding expertise, those involved are forced to deal with Bhutan's living architectural tradition by collectively facing the accelerated and often disruptive processes of modernisation, which requires in turn a completely different approach to the culture converging, all-encompassing traditional toolbox. The heterogeneous members of this team are literally "joining hands" in order to "make" the Wangdue Phodrang Dzong an example of "best practice" in the Bhutanese architecture of the 21st century. The *shing zo lopon* and project director stand as much more than mere figureheads, as they actively lead the way in revisiting, rewriting, and upscaling an advanced version of the 13 traditional crafts, empowering them with the knowledge and wisdom to transform potentially culture-threatening change into culture-generating energy, opening up to the world with more than only self-confidence as "makers of" the latest version of Bhutan's 13 traditional crafts.



Fig. 3-47 Reconstructed Wangdue Phodrang Dzong in 2022.
Source: Elien Van Dille (2022).

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IV

Contemporary Homes in Eastern Tibet

Anna Wozniak

Name: Anna Wozniak
Designation: Freelance architect and independent researcher.

Biography

Anna Wozniak

is an architect specializing in natural building materials, climate adaptation, and rammed earth technologies. Her research explores the contemporary development of traditional building techniques, while her practical work integrates traditional techniques with modern technologies. She has worked on numerous architectural and conservation projects in Nepal, Bhutan, Ladakh, and Tibet, and served as construction manager and researcher at the Tibet Heritage Fund. From 2012 to 2017, she was a senior researcher at Technische Universität Berlin's Habitat Unit, focusing on Himalayan and Tibetan farmhouse architecture, and in 2022 her doctoral dissertation "Change and Continuity in Eastern Tibetan Housing Culture" was approved by Technische Universität Berlin.

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INTRODUCTION

Enormous changes have been taking place in building craft traditions across Tibetan and Himalayan regions since the beginning of the current century. These changes are due to numerous factors such as road construction, expansion of electricity and cellular networks, new media and tourism, as well as the rapidly growing availability of new building materials. Whereas in many places traditional building techniques and crafts have been deteriorating or are at risk of disappearing altogether, as several contributions to this volume illustrate, parts of eastern Tibet are undergoing a contrasting set of developments whereby such crafts are being continuously applied and refined. One such area is Drango (Chin.: Luhou), situated in Ganzi Tibetan Autonomous Prefecture of Sichuan Province, Peoples' Republic of China.

In Drango, contemporary houses continue to be built with traditional building materials such as stone, earth, and timber. Even though modern building materials and construction techniques have become widely available over recent decades, the local population continues to construct houses with building methods and techniques passed on for generations. Although there is high building activity in the region's major towns and much of it uses concrete, the rural population does not seek to deploy it as the main material in house construction. Unlike in other parts of the Himalayan region, such as Himachal Pradesh, Sikkim and Ladakh,[1] where concrete has rapidly replaced natural building materials and is regarded as a symbol of modernity and progress, in Drango the rural population's cultural identity is intensely linked to construction with timber and people are eager to uphold this tradition.

Due to increasing household income levels in Drango and neighbouring counties in Ganzi Prefecture, the local population has significantly increased its domestic building activity since the 2010s. The majority of households have chosen to utilise their available money for the construction of new family homes. Thus, the local population's welfare improvements have allowed for a new generation of house designs to emerge. These new houses are generally larger than their predecessors, with more glazing and mostly sloping roofs. The contemporary architecture of the region is thus characterised by both the continuation of vernacular building traditions and modern transformations. Furthermore, the new generation of houses is characterised by an extensive use of timber, leading to a range of structural and decorative changes to the buildings. This, in turn, has enabled the advancement of timber building technologies and allowed carpentry crafts to flourish.

Painting is another traditional craft that has been resurgent in Drango since the beginning of the century. The majority of contemporary houses have been decorated with extensive interior painting work, rich in motifs and colours. As the interior design of homes has significantly gained in importance since the 2010s, traditional painting techniques have been revitalised. The value attached to such painting work is underlined by the large amounts of money people are prepared to spend on it.

This chapter focuses on the crafts and people involved in the process of house construction in the aforementioned part of eastern Tibet. It argues that building craft traditions have adapted to the changing context and are expanding rather than contracting, becoming an important economic activity as well as a means for expressing local cultural identity.[2] In contrast to most places in the Himalayas, where traditional building crafts are vanishing and craftspeople are losing their livelihoods, the popularity of timber construction has made carpentry a profitable and respectable occupation in Drango. This has allowed for the transfer of knowledge to the younger generation and the advancement of timber building technology. My research portrays the vibrant building tradition in Drango and considers the future of traditional building practices from this unique perspective.

1 For examples in this volume, see Thakkar and Shah, McDuie-Ra and Chettri, and Norboo et al.

2 The presented findings are based on data collected between 2016 and 2018 for the author's doctoral thesis at Technische Universität Berlin. It consists of the documentation of construction sites; detailed surveys of selected buildings; and interviews with local craftspeople and residents. The investigated rural areas in Luhou County include the surroundings of Xindu and the townships of Niba, Kaniang, Luoqiu, and Renda.

STUDY SITE

Luhou County (Tib.: Drango) lies in the northeast of Ganzi Tibetan Autonomous Prefecture, in the northwest of Sichuan. It is one of the easternmost regions on the Tibetan plateau, before the landscape transforms into the Hengduan Mountains and then the lowlands of the Sichuan Basin. The county's altitude ranges between 3,000–5,000 m and the population density is 10.12 inhabitants per km^2. In 2010 the county's population was 46,558 with the rural population accounting for 82 % (Gzz.Gov. 2010). The region has a long tradition of settlements and agriculture. The majority of villages are situated along the river valleys at altitudes below 3,500 m. The traditional lifestyle of the local population is highly adapted to the high-altitude climate and based on exchange between farmers and nomadic pastoralists. Some villagers also practice agro-pastoralism, growing barley and other crops close to their settlements and herding cattle on the high altitude meadows.

The landscape of Drango is mountainous and characterised by deep river gorges of the Nyechu (Chin.: Niqu), Dzachu (Chin.: Zaqu) and Seechu (Chin.: Xiangshui) rivers that cut through the plateau. The deep gorges allow wind to transport humid air masses from the Sichuan Basin far onto the plateau and thus significantly influence the alpine climate of Drango. The high humidity supports the growth of alpine coniferous forests in this mountainous region. Annual precipitation in Drango is 690 mm with most of it coming down as rain in the summer months between June and August. While humidity in the summer is above 70 %, the winter is cold and dry with humidity below 40 %. Daily temperatures range from 20–30 °C in summer and from 0–10 °C in winter (Weather and Climate 2021). Moreover, the alpine climate is characterised by large differences between daytime and nighttime temperatures, which can amount to 20 °C. Thus, an appropriate building technology is required that is suited to these extreme climatic conditions.

Historically Drango was part of the Hor States, which consisted of Khangsar, Mazur, Drango, Beri, and Trehor and was attributed to Kham (Ronis 2010). Today, these historical areas are assigned to the administrative counties of Kandze (Chin.: Ganzi), Drango (Chin.: Luhou) and Tawu (Chin.: Daofu). In the Hor States, rulers were responsible for individual families rather than geographical areas, so their spheres of influence overlapped to some extent (Samuel 1993: 67). Due to the strategically favourable location of Shindo at the junction of three valleys, it played an important role in the past and served as a stopover for traders and travellers on the historical "Tea Horse" trade route between Sichuan and Tibet.

FOREST RESOURCES IN EASTERN TIBET

Timber resources are rare on the Tibetan Plateau, with forested areas covering less than five percent of the high altitude region (Fig. 4-1). They grow only in areas with high humidity, like the southern and eastern fringes of the plateau. In eastern Tibet, alpine conifer forests, consisting mostly of spruce and fir, grow mainly on south-facing slopes at elevations between 2,700 m and 4,000 m (Ryavec and Winkler 2006: 42).

The ready availability of timber in Drango has resulted in a centuries-long tradition of carpentry, with the material being used extensively in the construction of local houses and monumental buildings such as temples and monasteries. Timber was also used traditionally for making furniture and other everyday objects such as spoons and bowls, although these have largely been replaced by industrially-made products over recent decades. The forests further serve as an energy source for the villagers, as they collect dry branches from the shrub layer to burn alongside the traditionally used animal manure. In addition, the forest is a rich source of herbs and mushrooms, which are collected by the local population for subsistence and trade purposes.

Because rural livelihoods depend heavily on the forest across eastern Tibet, the conservation of natural recourses has become intertwined with religious beliefs (Woodhouse et al. 2015: 300). The communities' relationship with the environment is based on their belief that local gods and spirits reside in the landscape. Consequently, people tend to have a respectful approach towards the environment,

trying not to disturb or anger these spiritual beings. This attitude is also influenced by the concept of karma, the universal law of cause and effect, which prohibits the indiscriminate killing of animals. Thus, the local population regards the forests as far more than simply a source of timber.

Nevertheless, Drango has been in the midst of conflicts centred on its rich forest resources since the 1950s. During the 1980s and 1990s, large scale deforestation took place all over China and a vast amount of timber was extracted from Ganzi and other parts of eastern Tibet to support China's push for rapid industrial development. Ryavec and Winkler (2006: 42) estimate that out of a total standing volume of 340 million cubic meters, 200 million cubic meters of timber have been cleared in Ganzi Prefecture since the 1950s. The consequences of this deforestation include fragmented forest cover, soil erosion, landslides, desertification, and the endangerment of endemic species. To halt this negative development path, the National Forest Conservation Program (NFCP) was introduced in 1998, which banned logging in primary forests and supported the replanting of trees. The first phase lasted from 1998 to 2010 and was then extended into a second phase from 2010 to 2020. In eastern Tibet, the program helped to avoid catastrophic resource depletion, but did little to improve forest condition or achieve effective reforestation.

As part of the NFCP, the government took initial steps to prohibit the construction of wooden houses in parts of Ganzi and promoted the use of concrete for local house building

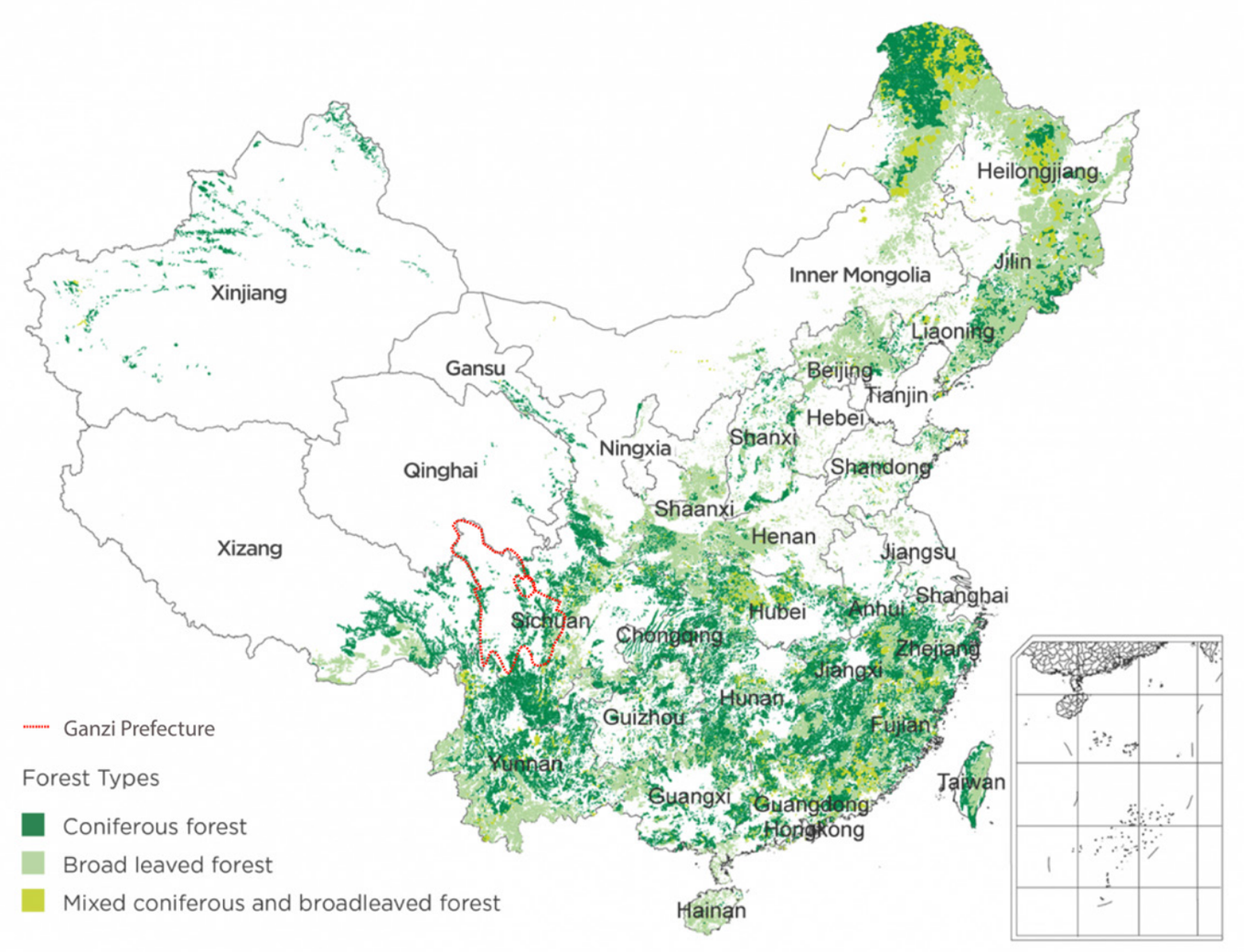


Fig. 4-1 China's Forest Cover.
Source: Shi et al. (2011).

(Yang 2001). Another consequence was the policy objective of promoting hydropower, mining, and tourism in Ganzi, which has been successfully executed on a large scale in the prefecture ever since. This placed further restrictions upon the local population regarding the use of timber. In Drango, each household was officially allowed to use only a limited amount of timber every 30 years, or more in cases of marriage.

At the beginning of the 2010s, I observed increasing consumption of timber by the local population in Drango, suggesting that the material was becoming widely accessible once again. The extensive amount of timber applied in house construction suggested a loosening of restrictions during this period. However, interviews with the local population confirmed that the acquisition of timber remained a highly contested issue. Government policies are conflicting with the needs of the local population and there continues to be an imbalance between forest product utilisation and forest conservation in Drango and across eastern Tibet.

My interviews show that the local population has a clear preference for timber construction and deliberately chooses it as the main building material. In contrast to Ladakh (see Norboo et al., this volume) and Sikkim (see McDuie-Ra and Chettri, this volume) for example, the local population does not regard natural building materials as inferior, but rather perceives their qualities as desirable. The interviews also demonstrate that the local population does not strive to build as cheaply as possible, but desires high-quality dwellings that meet their culturally specific needs while also expressing their regional and local identity. Elements such as wooden flooring, panelled walls and ceilings provide comfort and convenience to the inhabitants. The local population also values the relative ease with which buildings made from these materials can be maintained. The sturdy timber framing and log rooms further provide good earthquake resistance, which is important in this seismically active mountainous region. Besides providing shelter and comfort in contemporary houses, timber is also used extensively for specific decorative elements that also express regional identity.

In response to the high building activity in Drango, the local government introduced new restrictions and regulations in 2019, prohibiting the use of timber as a building material and encouraging the construction of concrete houses. If such restrictions are strictly implemented, they will have a constraining effect on the continuation of local building craft traditions and therefore the cultural identity of the local population. Current developments in Drango thus reveal the tensions that can emerge between sustainable resource use, local housing material preferences, and government regulations. In contrast to the widespread shift towards concrete as the primary building material across the Himalayan region and Asia more broadly, local identity in Drango is so strongly linked to timber-based construction that it continues to be upheld into the current century, although not without challenges and tensions.

RECENT DEVELOPMENTS

Despite its historical importance, the county's capital of Shindo was a small town until the beginning of the 21st century, with a total population of only 8,259 people in 2010. At this time, most villages in Drango were difficult to access due to high mountain passes and bad road conditions that made transport both difficult and slow. Electricity supplies were also insufficient, leaving most villages away from the main roads without any access at all. Unlike in Central Tibet, development was not forced by the state in this part of eastern Tibet until end of the 2000s, when infrastructure, urbanisation, and tourism started to be heavily subsidised.

One of several significant changes taking place in Ganzi Prefecture in the 2010s was the vast expansion of the electricity network. While in the beginning of the 2000s, power supply was primarily provided to major towns by local micro-hydropower plants, roughly 70 % of the prefecture did not receive sufficient power supply before 2011 (China Electric Power Institute 2019). Consequently, large investment funds were released and the power network was significantly extended. According to the State Grid Sichuan Electric Power Company, the total transmission capacity of the prefecture was vastly increased from 2 million kW to 14.2 million kW between 2011 and

2019 (Xinhua Net 2019). This was accompanied by the expansion of the cellular telephone network, as there was a lack of mobile connectivity in Ganzi before the 2010s. When smartphones became widely available around 2012, the local population went from almost no means of communication to the extensive use of personal mobile phones and internet connections within a short space of time. Access to new media has exposed the rural communities not only to new products and services, but above all to different lifestyles and values.

Another major change to affect Ganzi Prefecture in the 2010s was the upgrading of provincial roads to national highways, with the aim of linking this part of the plateau more directly to the lowlands of Sichuan. The construction of highways and two new airports has led to substantial changes in the entire region. Drango was mostly affected by the construction of the G317 national highway that passes directly through Shindo and the construction of the Ganzi Gesar Airport. As transport became easier, the local market supply increased and many new goods became available. Since then the markets offer a larger variety of food products, electronics, clothes, household equipment, and furniture. Moreover, new building materials became readily obtainable, such as plastic, metal, and large glass panes, as well as synthetic varnishes and lacquers. The highways also enabled large construction machinery and vehicles to be brought onto the plateau, such as excavators and mobile cranes. Chinese building companies mostly carried out the road construction and there was no deliberate inclusion of the local population. Nevertheless, the extensive construction work in the entire region offered some income opportunities for local Tibetans. They were mostly engaged in the transport of materials, such as gravel, sand, and other raw materials, if they could afford to invest in their own vehicles.

Simultaneously, urbanisation was prioritised across the entire prefecture and as a consequence countless building projects were carried out in Shindo. Due to its relatively low elevation of 3,100 m, the town is popular among migrant workers and businesspeople from lowland Sichuan. This has resulted in an enormous population influx within the last decade. Large-scale modern housing developments were introduced in Shindo and countless high-rise apartment buildings were constructed. Large poultry farms and commercial greenhouses were built just outside of town, to provide Drango and neighbouring counties with poultry and vegetables, ensuring availability of the food products common in the Sichuan Basin.

Another factor that has brought tremendous changes to Drango is the rapid growth of tourism since 2012. Whereas 2.7 million domestic tourists visited Ganzi Prefecture in 2009, this number had increased to 10.69 million in 2015 (Yang and Zhao 2016: 352) and by 2019 had reached a staggering 33 million (China Poverty Reduction Online 2020). Tourism development is supported by the government and was further accelerated by the "Ganzi Tourism Fund" introduced by the Chinese Communist Party in 2016. It released substantial sums of money with the aim of further increasing the annual number of visitors. Yeshe Dawa, the governor of Ganzi Prefecture, stated that the total funds that were to be released in the course of the program accounted for nearly USD 30 billion (NBC News 2016). This influx of money has fuelled the construction sector and significantly increased the number of investors, resulting in a building boom in the prefecture. The fund also accelerated the development of natural sites such as mountains and lakes for tourism purposes.

Tourism, infrastructure development, and urbanisation have thus become the main tools of rural development in Ganzi Prefecture, although they have brought little benefit to the local population (Holz 2018: 44). The development of tourism has had a large impact on the built environment in the region as numerous high-rise hotels and service structures were constructed. New buildings are mainly constructed with concrete and often mimic local features such as window decorations and other traditional elements, but built using different materials and separated from their original symbolic and functional context.[3] As a consequence, the built environment of Drango — and indeed the entire prefecture — has changed enormously over the last decade. Furthermore, countless construction projects have had vast environmental impacts in this fragile, high-altitude ecosystem.

Despite these developments, there has been little effort on behalf of the state to improve the livelihoods of the rural population. For example, there have been no attempts to improve traditional agricultural methods, so fields continue to be manually cultivated with the help of animals. Moreover, there has been no improvement of education or vocational training for the local population. In order to adopt new professions and occupations, specialised knowledge and skills are required, which are

3 For discussion of similar practices taking place in Bhutan, see Dujardin (this volume).

usually acquired in job-related training. Across the Tibetan cultural region, however, there is a lack of educational institutions or programs that would enable the local population to acquire new specialised skills and thus adopt new occupations (Wagner 2007: 55). Most students in Drango leave school lacking the skills or qualifications needed to pursue further professional training or to embark on an attractive occupational path. Nevertheless, some local people have found ways to profit from the subsidised development of the region and a large number of households in Drango have abandoned agriculture and rely solely on non-farm income since the 2010s. Despite their poor education and the lack of expertise, the local population has found ways to make additional income, mostly in the transport and service sectors. However, the majority of households in Drango rely on the caterpillar fungus (*Cordyceps sinensis*) harvest in order to increase their cash income.[4] Caterpillar fungus has become incredibly valuable in regional and global markets and is a major source of income for populations across the Tibetan plateau and the Himalayas (Winkler 2008; Woodhouse et al. 2015; Tan 2018; Sulek 2019). According to recent interviews, one *jin* (500 g) of caterpillar fungus could cost between CNY 20,000–40,000 (EUR 2,800–5,600) in the study region in 2018.[5] A good quality harvest can provide a household with up to CNY 300,000 (EUR 42,000) in cash annually (Winkler 2008: 291), making it by far the most profitable economic activity in the region.

As a result of increased cash flows, the showcase and demonstration of wealth within the rural communities has grown continuously. Apart from the assimilation of material goods, this development has induced the aforementioned building boom in the rural regions of Drango since the early 2010s. This trend was further encouraged by the "easy" loans actively advertised by the Agricultural Bank of China. Thus, the local population has increased their building activity enormously in the 2010s and most local houses in Drango have been replaced by new structures. At the time of my survey, between 2016 and 2018, the local population was free to build as they wanted as there were no regulations or restrictions regarding the structure, material or design of the building. Therefore, contemporary architecture can be seen as the result of the needs and requirements of the homeowners and house builders alone.

4 The caterpillar fungus (*Cordyceps sinensis*) is a substance used in Chinese traditional medicine and a range of associated commercial products marketed primarily as aphrodisiacs. It is obtained from a fungus that grows parasitically on the caterpillars of a particular moth species. It is collected on the high meadows in early spring.

5 The exchange rate was provided by Oanda Corporation 2020 as CNY 1 = EUR 0.14 on 29.11.2021.

HOUSEHOLDS IN THE RURAL COMMUNITIES OF DRANGO

A house in rural Drango is usually inhabited by three generations. Typically, two couples from two generations share it, while the other inhabitants are unmarried siblings of the grandparents, or parents and children. My interview data suggests that between 2016 and 2018, the average number of people per household was five. Most households continue to form a single economic unit in which each member has a designated role, despite the growing economic independence of individuals. Consistent with local tradition, the oldest male typically takes the role of the household's head and is responsible for the economic sufficiency of the household. When a young couple is to be married, it is customary that older family members negotiate their place of residence according to the labour requirements of the concerned households. Usually parents prefer their oldest son to remain living with them and the child that stays with the parents inherits the house and the associated land (Lhundrom 2011: 330). In eastern Tibet, land was assigned to households in form of long-term leases at the end of collectivisation in the 1980s. This distribution is unalterable and there are almost no means for the rural population to acquire additional land. Therefore, families try to avoid partition of arable land between siblings and marriages are arranged accordingly. As a result, when a family wants to construct a new house, it is customary to dismantle the old house and build the new one on the same site.

My interviews lead me to conclude that a new house is most often built around the time that the role of the household's head is transferred to the eldest son. Furthermore, one of the most important reasons for constructing a new house in the 2010s was to uphold the social status of the family for the younger generation. New houses were seldom built because the family required more space or wanted to improve technical aspects, such as heating or insulation. Surveys of houses from the previous building generation (1990s) and the current one (2010s) has revealed that these aspects were rarely altered. Although the out-

er appearance and structural framing of buildings has changed significantly, technical improvements have been relatively limited.

Building tradition in eastern Tibet is a dynamic process. Each generation slightly alters house design according to the availability of resources and building techniques, as well as the current fashion. The construction of a new house allows for the integration of contemporary design elements popular at that moment in time. A house that includes such elements is considered "modern" and represents a prosperous, successful family. Old dwellings, on the other hand, do not have much value for the rural communities and are seen as symbols of poor or dysfunctional households. It thus seems reasonable to propose that the continuous reconstruction of the family home is an intrinsic aspect of eastern Tibetan building culture, which resonates with the findings of Marc Dujardin in Bhutan (Dujardin 2003, this volume).

While the alteration of house design was formerly quite a gradual and nuanced process, since the beginning of the current century changes have become more radical. The availability of transport vehicles and building machinery such as mobile cranes has enabled the increased use of both new materials and larger timber trunks. Furthermore, houses have emerged as elements of strong competition within the rural communities of Drango, so that representation and status now outweigh shelter and comfort as criteria informing construction decisions. Though in many cases old houses provided enough space and comfort, most families now aspire to construct new houses that meet or exceed their community's expectations. The householders interviewed in Drango unanimously reported that neighbours were now competing with each other to have the "best" house.

RURAL INCOME AND COSTS OF BUILDING A NEW HOUSE IN THE 2010s

This section examines the cost of new house construction in relation to rural household income in Drango in the second half of the 2010s. In 2018, the average per capita annual income of rural households in Sichuan was approx. CNY 19,000 (EUR 2,500). Anything below CNY 7,000 (EUR 900) was considered low income, whereas anything above CNY 45,000 (EUR 5,770) was considered high income (Sichuan Statistical Yearbook 2019). Although a detailed breakdown of rural household income is not available for the study site, the following data allows for an approximate calculation.

Household structures in the study region are complex and members may take on a range of different responsibilities. Since the beginning of the 21st century, it has become much more common for individuals to take up work outside their villages. While at first this was mostly true for middle-aged men, nowadays even young women carry out paid occupations outside the village, for example as teachers or office workers. Professionals such as teachers and government employees in Drango earn about CNY 3,000 (EUR 360) a month, corresponding to CNY 36,000 (EUR 4,320) a year. Additional income from casual labour varies by household and the number of its members. In 2018, the daily rate for unskilled construction work was CNY 150 (EUR 18). Thus, if two people from one household work in such roles for a total of 90 days, they can earn about CNY 27,000 (EUR 3,240) per year. One surveyed household reported to have sold a surplus of 5.5 tons of barley for CNY 20,000 (EUR 2,400) in 2017. In 2018 the daily rate for a carpenter's work in Drango was CNY 300 (EUR 36). Thus, if working 320 days per year, a carpenter's annual salary accounts for nearly CNY 100,000 (EUR 12,000). However, by far the largest amounts were generated through the collection and sale of caterpillar fungus, ranging from CNY 200,000–500,000 (EUR 24,000–60,000) per year in the 2010s.

My research indicates that the construction of an average-sized new house in Drango in the second half of the 2010s cost about CNY 1 million (EUR 120,000). The timber and carpenters' salaries accounted for more than 60 % of the total construction costs, with timber alone representing 30–40 %. According to local carpenters, timber cost about CNY 600–800 per cubic meter in 2018. Besides the timber, the major factor influencing the total cost of house construction was the standard of interior finishing, with the largest expenditures going towards interior painting. The

highest documented sum for the implementation of high-quality painting works was CNY 200,000 (EUR 24,000). According to the survey, only a few households decided to forego the application of interior painting in order to save money, which suggests both that such decorative elements are highly valued and that most households are financially secure enough to include them. Overall, constructing a new house compliant with the latest design trends represented a huge expenditure for rural households, but one that many were now able to afford due to the growing possibilities for livelihood diversification and income generation.

CONSTRUCTION PRINCIPLES AND SIGNIFICANT CHANGES TO CONTEMPORARY HOUSE DESIGN

This section points out the most significant changes to new houses when compared to their predecessors, which were mostly constructed in the 1990s. New houses built in Drango since the 2010s differ significantly from their predecessors. Above all, contemporary homes are characterised by an increased use of timber that is displayed as an element of wealth. Increased cash incomes have enabled the majority of people to construct prestigious homes that represent both cultural continuity and economic prosperity. House construction was not regulated at that time, leaving local builders free to build as they desired. Consequently, new dwellings correspond to the wishes and needs of the owners and builders only. Architectural traditions were kept alive at the same time as new requirements were integrated into house design, demonstrating that traditional building techniques are adaptable to the changing needs associated with modern lifestyles. As a result, many prestigious structures have been constructed that made use of plentiful local resources while also incorporating new building materials and techniques. Furthermore, in contrast to their relatively simple predecessors, contemporary homes tend to be well furnished and extensively decorated.

Older dwellings in Drango are mainly two-storey buildings, with the ground floor made from rammed earth or stone masonry and the upper floor built in timber, topped with a flat mud roof. The new generation of houses usually also have two stories, but are built mainly from timber and have sloped roofs (Fig. 4-2). The ground floor of a typical house is mostly used as a stable for livestock and a storage area, while the upper floor holds the family's living rooms and the shrine. A common change seen on ground floors is their conversion into garages for personal vehicles. (Fig. 4-3) This alters the appearance of the building's front facade, as large, double-winged metal doors are often installed to accommodate wide entrances. This shift reflects the decline of agricultural activities and the growing importance of cars as status symbols. The study of old and new floor plans has revealed that there have been no significant changes regarding the usage and layout of rooms (Fig. 4-4 and Fig. 4-5). The most important rooms in a local home in Drango and adjacent regions are the kitchen, the shrine room, and the reception room (Herrle and Wozniak 2017: 120).

The kitchen (*gyakhang*) holds the stove and plays a central role in the family's life, as it is the only heated room in the house and is thus frequently used by all family members. In the winter months, it is often also be used for sleeping. The shrine room (*chükhang*) is commonly oriented towards the front and it is typically the most prestigious room in the house. This is where the family keeps its sacred objects, makes daily offerings, and conducts occasional rituals. In Drango, the finishing of shrine rooms received enormous attention in the 2010s, as they started to be elaborately painted and decorated. The reception room (*ponkhang rabse*), which is commonly adjacent to the shrine, is often used on special occasions only. Families typically store their best carpets, textiles, and blankets in this room and only use it during religious festivals, family events, and for welcoming visitors. These rooms continue to play a significant role in family life, but it is notable that their features and decor have become increasingly lavish over recent decades.

Prior to the 21st century, houses were built using a minimum of resources. Timber in particular was used in accordance to structural necessity and the dimensions of the buildings elements were chosen accordingly.



Fig. 4-2 House built in 1998 in Shkupi (Chin.: Gubi) Village, Drango (Chin.: Luhuo Xian), Ganzi Tibetan Autonomous Prefecture, Sichuan.
Source: Anna Wozniak (2018).



Fig. 4-3 House built in 2014 near Shkupi Village, Drango, Ganzi Tibetan Autonomous Prefecture, Sichuan.
Source: Anna Wozniak (2018).

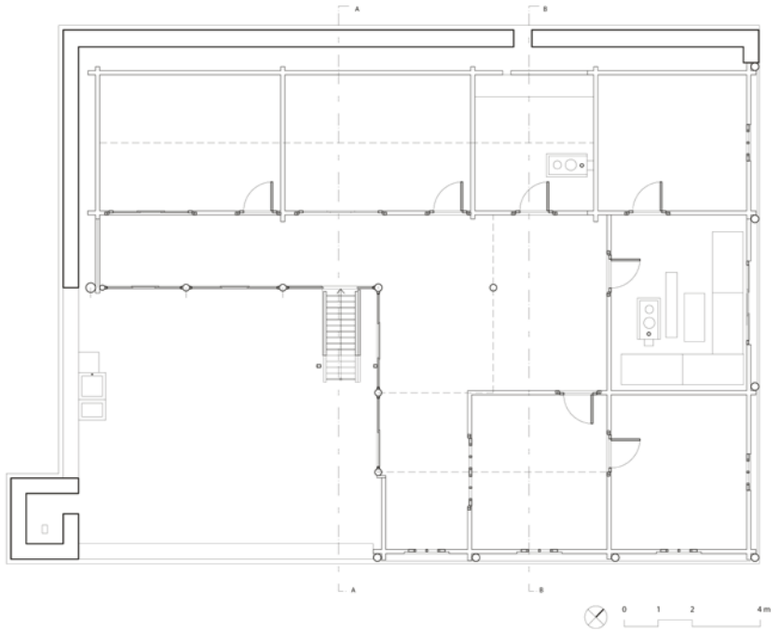


Fig. 4-4 Upper floor plan of a house built in 1998 in Shkupi Village, Drango.
Source: Anna Wozniak (2019).

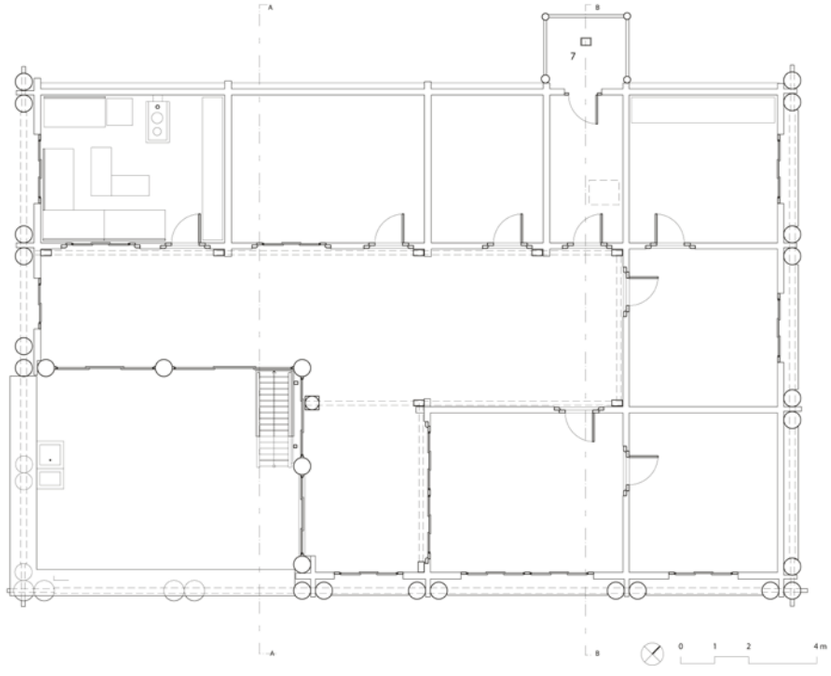


Fig. 4-5 Upper floor plan of a house built in 2014 in Shkupi Village, Drango.
Source: Anna Wozniak (2019).



Fig. 4-6 Completed timber structure of residential dwelling north of Shkupi Village, Drango.
Source: Anna Wozniak (2016).

Only a few structural elements, such as central posts and beams, were built with large dimensions, while secondary elements were designed to be as thin as possible, thus conserving resources and minimising expense. The height of the building and the interior rooms was kept low to ensure sufficient heating and window openings were kept small to minimise heat loss. Newer houses tend to have larger and higher rooms with more openings, as people now desire brighter interiors. Local people repeatedly mentioned their wish to have more light within the house, so new houses tend to include many large openings for windows and doors. Traditional timber-framed grid windows have largely been replaced by prefabricated plastic profiles, without grids but with larger glazed areas.

Prior to the 2010s, the ground floor walls and the entire northern wall were built as massive load bearing walls, either in rammed earth or stone masonry. Rammed earth walls were typically constructed with a thickness of 60–90 cm and their thermal mass regulated the heat within the home, which is of great importance in the prevalent alpine climate, especially considering the difference between day and night temperatures. Other typical features of older houses include large open terraces on the top floor, used for drying and processing agricultural products, and open, portico-like elevations along the terrace, which today tend to be entirely glazed.

By the 2010s, house construction in Drango was shifting increasingly towards timber as the primary building material (Fig. 4-6) and a large amount of resources were also being used for decorative rather than structural purposes. Contemporary houses are typically built solely with timber (Fig. 4-7) and the construction of rammed earth or stonewalls has been largely abandoned in most parts of Drango. Large amounts of timber are now applied for the structure of the building and the dimensions of building elements have been significantly increased, primarily for aesthetical and not structural purposes. One reason for the increased use of this material is simpler transport and handling due to the availability of mobile cranes (Fig. 4-8 and Fig. 4-9). In former times, houses would be constructed largely without plans or diagrams, but as timber structures have become more complex, master carpenters now usually prepare rough plans that capture at least the position of the main posts and the dimensions of the beams (Fig. 4-10). Although log rooms have been built in Drango and surrounding counties like Kandze, Dege, and Nyarong for a long time, the dimensions of the logs used in the 2010s have increased enormously compared to the previous generation of houses.

Most old houses were built into the slope, as a lot of the local terrain is rough and hilly and could not be flattened manually. Since excavators became available to rent by the hour for the first time during the 2010s, most builders now prefer to level the building site before starting construction. These machines are sometimes also used to fill ceilings and roofs with loam, as this is otherwise a time-consuming and labour-intensive construction phase. Some of the carpenters interviewed argued that flat building sites require a different structural layout, which explains why newer houses have a larger number of posts. Another rea-



Fig. 4-7 Carpenter preparing timber beams for the assembly of a house in Nyechu Valley (Chin.: Niqu Qu) southeast of Khanyang (Chin.: Kaniang Xiang), Drango.
Source: Anna Wozniak (2016).

Fig. 4-8 Mobile crane unloading timber logs for house construction north of Shindo Town (Chin.: Xindu Zhen), Drango.
Source: Anna Wozniak (2016).





Fig. 4-9 Band saw assembled for the time of construction on a building site in Nyechu Valley (Chin.: Niqu Qu) southeast of Khanyang (Chin.: Kaniang Xiang), Drango.
Source: Anna Wozniak (2016).

Fig. 4-10 Assembly plan (structural design) of a house on a building site in Nyechu Valley (Chin.: Niqu Qu) southeast of Khanyang (Chin.: Kaniang Xiang), Drango.
Source: Anna Wozniak (2016).

son mentioned for setting two or three posts instead of one was earthquake resilience, which has become an increasingly important consideration over recent decades.

Another significant change in residential buildings in the study region during this period is the adaptation of roof construction. Many new residential buildings built in the 2010s have a hipped roof in the Chinese architectural style, topped with corrugated iron sheets. The flat adobe roofs commonly found on older houses often leaked during heavy rains and required regular maintenance, even more so due to the increasing precipitation experienced in Drango over recent years. Residents cited the rainproof and maintenance-free nature of the hipped roof as the main motivation behind this adaptation. The crossed, hipped roof design finished with metal sheeting is an element adapted from the lowlands of Sichuan. At first Chinese workers were hired to erect these structures, but local carpenters quickly learned how to build such roofs and they now add them to almost every house they construct. Some inhabitants mentioned local cultural identify as a reason for keeping the flat adobe roof, but the trend towards hipped, sloped Chinese-style roofs remains dominant.

As mentioned above, the increasing importance attached to interior finishing is another significant change affecting house design in Drango. The majority of homes built in the 2010s display intricate interior painting, whose recent popularity has sparked the revitalisation of traditional painting crafts across the entire region (Fig. 4-11, Fig. 4-12 and Fig. 4-13), including the revival of certain painting techniques that had almost died out. Local painters had large numbers of orders when interviewed in 2018, suggesting that many families were willing to spend a lot of money for their services. The painting work tends to be of high quality and to involve elaborate designs, which are not only desirable as decoration but are also believed to have protective effects for the household. The applied patterns, colours and images are assimilated with Tibetan Buddhism and the local population believes they have protective and purifying energies.

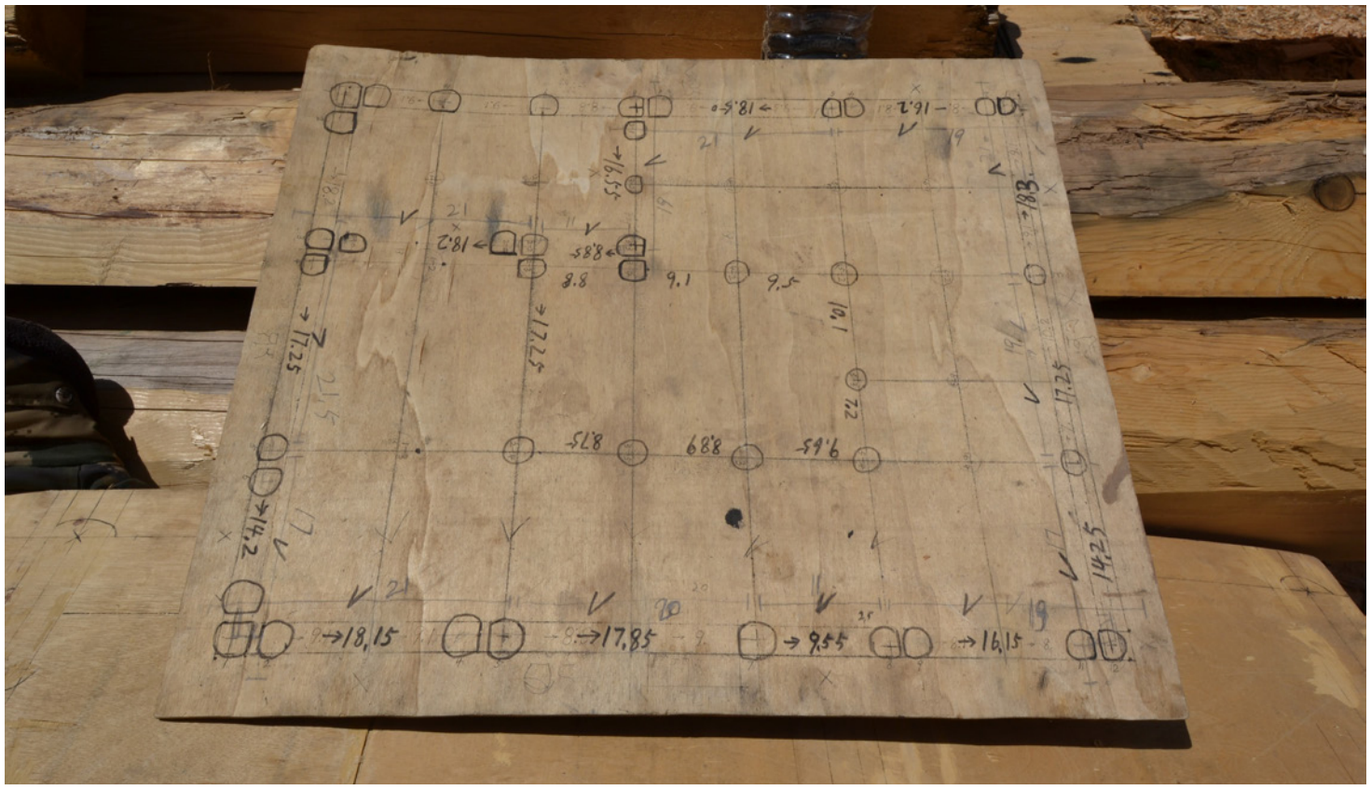




Fig. 4-11 Elaborately painted details on timber structure of a house interior in Skupi Village, Drango.
Source: Anna Wozniak (2016).

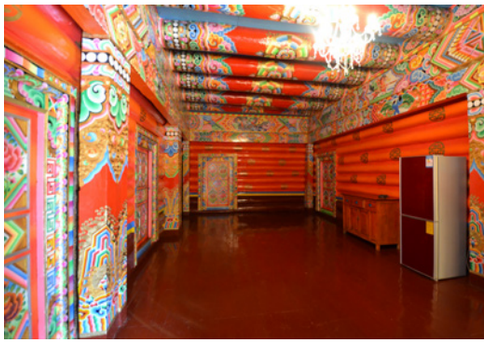


Fig. 4-12 Idem.
Source: Anna Wozniak (2016).



Fig. 4-13 Details of Buddhist symbols and motifs painted on timber elements of a house interior in Skupi Village, Drango.
Source: Anna Wozniak (2016).

House interiors are further decorated with curtains and lamps, which were rarely seen in eastern Tibetan interiors before. Households also contain an increasing amount of western-style furniture such as sofas, armchairs, and glass tables, although I observed most families reserving these for guests or special occasions, preferring traditional furniture such as the bed-sofas and low tea tables common across the entire Tibetan cultural region for their own daily use. Since the 2010s, households also contain an increasing amount of large electrical appliances such as freezers, refrigerators, and in some cases even washing machines, which are installed in prominent locations in part to serve as status symbols.

Beyond the material, structural, and technological changes already discussed, contemporary houses in Drango retain many traditional features and are still built primarily by local craftspeople using traditional skills and techniques. For example, despite the rapidly changing built environment in the region the population consciously chooses to build their homes from timber and clay. It is particularly notable that concrete is not widely used as the main building material and is not seen as a symbol of modernity as it is elsewhere in Asia.[6] Villagers mostly consider the new-style, concrete apartment buildings as too cold, lacking the agreeable thermal properties of earth and wood. They further underline the importance of having a stove inside the house, with many saying they cannot imagine life without a stove as the central focus of family life.

There has been almost no change in the new buildings regarding sanitary facilities. Since the villages are not supplied with water and sewage pipes, no plumbing is installed inside the houses. Some households have a drainage basin near the kitchen or on the terrace, where dirty water can be disposed of. One household I visited had a permanently installed water pipe and a basin made of cement on the terrace. However, water is usually supplied from a communal pipe in the village, a well in front of the house, or by redirecting a nearby mountain stream. Many households have to carry water into the house on a daily basis. Only those few households with installed water piping can use washing machines and their use depends on the skill of the household's head, as he usually installs it himself. Traditional dry toilets continue to be used in all the surveyed houses and the inhabitants expressed no desire for change, as the dry toilet remains in line with their habits and needs. There have also been limited changes regarding insulation or heating of the house. Walls continue to be built single layered, with no additional thermal insulation. However, the larger dimension of logs used in wall construction, the use of new, well-glazed plastic windows as well as the closing of the building envelope have all resulted in thermal gains, largely offsetting the heat now being lost through larger and more numerous doorways and window apertures.

6 For example, see McDuie-Ra and Chettri, Thakkar and Shah, and Norboo et al. (this volume).

PROCESS OF HOUSE CONSTRUCTION AND ROLE OF CRAFTSPEOPLE

This section investigates the process of house building and examines the role of craftspeople in this process. It asks who is involved in the process of home construction in eastern Tibet, what their various roles are, and how this is changing under current conditions.

Apart from agriculture, there are very few traditional professions in the eastern part of the Tibetan cultural area. In rural communities, skills and vocations are commonly divided by gender and knowledge is passed on from generation to generation. In general, women's competencies are focused on unpaid work around the house, whereas men usually carry out trades and paid vocations outside the home. Besides food processing and preparation, women acquire skills of basketry and woollen work such as spinning and weaving, so are responsible for making carpets, blankets, and other textiles and accessories. These handicrafts are mostly produced for the household's own use and are rarely made for sale. Other crafts such as pottery, jewellery, leatherwork, and tailoring are performed by both genders. Traditional, paid craft occupations such as carpentry, masonry, painting, sculpting, carving, forging, and smithing are acquired and performed by men only. Thus, it is men who carry out skilled building craft work while women are limited to unskilled labour, such as preparing and carrying loam. Women usually do not partake in the planning process of a house either. When a family decides to build a new house, first the household

head identifies a master carpenter to carry out the desired building project and the two men initiate talks regarding the location, scope, and dimensions of the building. The master carpenter then calculates the required amount of timber and gives a rough estimate regarding the cost of the material and salaries. These two factors constitute roughly 60 % of the total project costs and are commonly paid in cash. The design of the building is mostly discussed verbally between the two men, with simple sketches sometimes also made on paper or on the ground to ensure mutual understanding. Technical drawings or models are not part of the planning process, although master carpenters often prepare rough plans for their own use, capturing the position of the main posts and the dimensions of beams. (Fig. 4-10)

Simultaneously, the household consults a monk versed in Tibetan geomancy in order to establish the most auspicious date to begin the construction work. The application of geomantic principles and the performance of related rituals is common practice in most Tibetan and Himalayan regions when constructing buildings (Maurer 2009). Auspicious dates are calculated according to horoscope of the household's head. Before the first dig, a monk is asked to perform a ceremony on site, to compensate for disturbing non-human beings (*sadag*) during the construction process. Most inhabitants of Drango are followers of Tibetan Buddhism, whose values and symbolism are incorporated into the design of the architecture as well as the meaning of the house. The Buddhist view is non-anthropocentric and includes the belief that the space used by humans is also inhabited by other beings (Studley 2020: 5).

Those beings are mostly referred to as *zhibdag*, *sadag*, *lu* and *lhapa* in the eastern Tibetan cultural region. Rituals can be performed in simple or more extensive versions according to the budget of the builders, and only once they have been carried out can the construction work begin. My interviews indicate that monks are also called upon in cases where an old house is being dismantled, and when a family's stove is being moved to a new location. This reflects the belief that a fire deity resides inside the stove and has to be appeased prior to being relocated. Other rituals are performed once a house's foundations rise above ground and when the first posts are erected, as these also intrude into spaces occupied by non-human entities. Although the involvement of monks is crucial during these specific phases, it is the master carpenter who plays the most important role throughout the house construction process in Drango. This begins with verbal negotiations over the house design between the master carpenter and the household head. Elements are designed according to the knowledge passed on for generations and altered according to contemporary trends, personal preferences, and available resources. These on-site negotiations continue through each of the construction phases. Due to the large amount of verbal communication involved in the building process, it is important that the two men involved have similar origins and speak the same dialect of the Tibetan language. Generally, builders attempt to hire craftspeople from their home region to ensure fruitful communication and the fulfilment of expectations on all sides. I observed that when a family moved to another region with a differing building style, they brought in carpenters from their native place to ensure a house design compliant with their expectations and thus increase the chances of a successful building project.

There is no prefabrication during the construction process and all elements are prepared in succession. Most of the timber is delivered in the form of whole trunks and is then processed manually on-site by the carpenters. Nowadays most carpenters, especially the younger ones, tend to use electric tools such as saws and planes for cutting the trunks into useable sections and for rough processing of the surfaces, as these are very time consuming processes when carried out manually. Finer work such as carving and joinery continues to be conducted with traditional hand tools. Only small amounts of timber are cut into boards or beams at nearby sawmills. I have also seen small sawmills being set up directly on some building sites, but only in cases where larger than average amounts of wood are required. (Fig. 4-9) When rammed earth walls are built or ceilings and roofs need to be filled with clay, this work is carried out by unskilled labourers. In former times, these time consuming and labour-intensive activities were carried out with the help of the local community, as villagers often helped each other during harvest and house construction.

However, my observations at building sites and interviews with building families in the region revealed that by the 2010s, such community support systems had broken down and additional day labourers had to be hired for this work. The loss of mutual aid in rural communities results from socioeconomic change and the ascendance of the cash econ-

omy, which mean many community members now work outside their villages and do not have time to take part in mutual community activities.

CRAFTSPEOPLE IN CONTEMPORARY DRANGO

In many Tibetan and Himalayan regions, natural building materials such as timber, earth, and stone have increasingly been replaced by concrete, fired bricks, and metal over recent decades. As several contributions to this volume clearly show, traditional building crafts are in decline in many areas. Craft knowledge and skills are no longer being transmitted to the younger generation and craftspeople are losing their livelihoods and social status. In sharp contrast, the local population of Drango continues to build houses primarily from timber, largely rejecting industrially-produced construction materials and modernised house designs. Due to the high level of building activity among rural communities over recent years, traditional building skills are in high demand and the carpenters and painters of Drango continue to enjoy a good economic and social status. The people's preference for natural materials and local craftspeople has allowed for both continuity and evolution of the craft traditions themselves. Against the trend of declining status and income for building trades in the wider region, I argue that Drango's carpenters and painters are in a period of both growth and advancement.

This increase in building activity in Drango has resulted in economic and social benefits for the local population. Among other things, it has had a positive effect on rural household income and on the vocational training of apprentices. Carpenters' salaries have continuously increased over the last two decades due to the high demand for their services. In eastern Tibet, salaries are agreed upon in proportion to training and experience. The head carpenter negotiates wages for the entire team and divides it according to the skill and time commitments of each worker. According to my findings, a master carpenter received CNY 100–150 (EUR 13–20) per day in 2012, while by 2018 this had increased to CNY 250–300 (EUR 34–40), suggesting that their income doubled in the space of just six years. Consequently, the annual salary of a carpenter in 2018 could amount to CNY 100,000 (EUR 13,500), which is many times higher than the average per capita rural household income of CNY 19,000 (EUR 2,600) in Sichuan. In comparison, local teachers, who have the highest regularly available salary in the region, earn about CNY 36,000 per year. Thus, a skilled carpenter's work provides his household with a competitive income that allows for a comfortable lifestyle and a good economic status.

Furthermore, increased building activity has positively contributed to the transfer of the knowledge and skills of carpentry and painting to the younger generation. As master carpenters obtained a growing number of orders in the 2010s, they needed to hire more assistants in order to fulfil them. Simultaneously, young men were eager to take up these trades, as they were highly valued in their communities, even though there are no institutions dedicated to the training of crafts or building skills in the eastern Tibetan region. The transfer of building craft knowledge and skill still takes place through traditional channels, based on verbal instruction, imitation, and repetition under the watchful eye of a master. Once the master carpenter agrees to accept an apprentice, the younger man accompanies him for a long period of time, learning directly on the building sites by assisting his mentor, and gradually progressing towards independent work as his skills develop. The close relationships of apprenticeship enables young men to acquire both technical and social skills, and thus to establish intimate relationships with the materials, construction processes, and aesthetic possibilities. This empowers the young men's creative thinking, which in turn facilitates both continuity and innovation in construction (Marchand 2006: 66; Dujardin, this volume). The verbal negotiations over house design that take place between homeowners and master carpenters are essential parts of eastern Tibetan building culture, and observing these decision making processes forms a crucial part of the education of junior craftspeople. With the necessary skills and experience, combined with livelihood security, craftspeople can both carry tradition and push at its boundaries. Knowledge transfer thus plays an essential role in the preservation of building culture, as well as in its sustainable development into the future.

CONCLUDING REMARKS

My research leads to several conclusions. These concern the relationship between wealth, resource use, government policies, and preferred house design, the vibrant and dynamic trajectory of building craft traditions in Drango, the relationship between vernacular and modern architecture, and the potential for adaptation of local building crafts looking towards the future.

The increased cash flow in Drango and neighbouring counties during the 2010s has allowed for the majority of rural households to reconstruct their family homes in accordance with both local traditions and contemporary design trends. Most households have chosen to spend their available money on the construction of new custom-made homes, as financial investment remains uncommon in the rural communities of eastern Tibet. The newfound economic prosperity of the local population has thus allowed for the advancement of local house architecture. With enough money and no official building rules to restrict their choices, local builders have enjoyed the opportunity of fulfilling their wishes and have explored new creative possibilities regarding house design. The shift towards a customised design process has generated new solutions to existing problems as well as new structural and decorative elements, allowing local vernacular architecture to progress. This renegotiation of "tradition" by the craftspeople has created an architectural mode that responds to the changing needs and aspirations of its inhabitants, while remaining an important expression of eastern Tibetan cultural identity.

Unlike building traditions in which the majority of raw materials are obtained directly from the local environment, these days most construction components in Drango have to be bought in cash from the market. Despite high timber prices, the local population has significantly increased its consumption of this material as homeowners deliberately choose to spend more money on timber in order to display their status and wealth. Recent building activity in Drango has thus not been driven by concerns over cost effectiveness or resource conservation, but rather by an increasing wish to express local identity and socioeconomic status. As a result, the majority of new buildings have more opulent designs and oversized structures in order to pursue the objective of standing out within the community. During the 2010s, the dimensions of building components were thus chosen according to aesthetic and performative concerns rather than those of cost or structural necessity.

My research suggests that building practice in Drango in the 2010s was not characterised by concerns over the preservation of resources. Whereas earlier building practices maximised the potential of available resources, current trends point towards ostentatious and extravagant building practice with lavish decoration. Although traditional Buddhist ethics advocate a limit on the pursuit of profit, the generation of wealth and its outward presentation are currently on the rise in eastern Tibet. Wealth is increasingly defined financially and materially, rather than being seen through the lenses of health or spiritual accomplishment. As material accumulation becomes increasingly important to the local population, houses have emerged as the quintessential symbol of wealth and status, as well as indexing cultural affinity.

The developments taking place in Drango reveal new tensions between resource use and preferred house design. Whereas formerly, village communities made joint decisions over the distribution, use, and conservation of resources such as arable and pasture land, forestry and irrigation water, these decisions have been made exclusively by the state since the 1990s. The state's regulation of forestry, in particular, had major impacts on the local housing culture of eastern Tibet during this period, when access to timber was highly restricted. After the first phase of the NFCP program ended in 2010, however, restrictions were loosened and farmers were able to buy timber in sizeable quantities again, although this also gave rise to an increase in conflict over access to timber. Wood is without question the key building material in the region and is crucial to both craft tradition and construction practice. In addition to wood's central place in characteristic regional house designs, the local population appreciates its physical properties. Interviewed residents make conscious decisions in favour of wood as a building material, citing reasons such as strength, earthquake resistance, durability, ease of maintenance, and reusability. Wooden floors, ceilings, and walls are also considered the most comfortable by the residents, which also plays a key role in their continued choice of wood as the main construction material. Current developments in Drango thus exemplify tensions between state forestry policies, local building crafts, and the preferences of homeowners. They also

demonstrate how the trajectories of building crafts and vernacular architecture are shaped through the interaction of multiple factors.

The continuation of traditional building crafts in Drango has had a positive impact on the local economy. Carpentry and painting crafts are among the few traditional trades in the region, so their growth has provided much welcome employment and apprenticeship opportunities for local people. Contrary to the trend of declining status and income for building craft practitioners in Tibetan and Himalayan regions at large, my research shows that the carpenters and painters of Drango are in a phase of growth and ascendancy. The local craftspeople have benefitted from the high level of building activity and the preference of the local population to build with timber. The vibrancy of building craft traditions in Drango has made them an attractive choice of work for many young men, in contrast to the situation across much of this region. Due to the longstanding existence of these traditions, the local population maintains a fundamental sense of trust in their master builders, who play a significant part in design decisions. Homeowners align their requirements with both the existing repertoire and the new possibilities and fashions, encouraging the carpenters to incorporate variations into the designs by drawing on their many years of practical experience. In doing so, the craftspeople both draw on knowledge passed down through generations and add new nuances with each building generation.

China in general lacks broad-based and systematic training possibilities for building craftspeople, meaning that many unskilled workers are employed in the construction industry. Consequently, many simplified, standardised, and industrially-produced components are being used, often oversised to compensate for construction deficiencies. The standardised design of settlements, living spaces, and housing rarely involves innovative and optimised spatial concepts or materials, and does not take culture-specific aspects into account. Farmers in eastern Tibet increasingly have access to modern building technologies, such as steel and concrete. However, my research clearly indicates that despite this access, builders in Drango are consciously choosing to use clay and wood as their main building materials. In the execution of concrete buildings, only minimal quality standards tend to be achieved and the detailing tends to be highly generic. Especially in residential construction, there is a lack of spatial concepts designed for specific needs and little account taken of cultural characteristics and regional specificities. The population of Drango remain highly sceptical of concrete construction, perceiving it as too cold for the prevailing climatic conditions. Elderly people in particular reported joint pain after living in concrete buildings, and ceramic floors were also reported to be uncomfortable and poorly adapted to the local climate.

Let us now reflect upon what the Drango case can tell us about the relationship between vernacular and modern architecture, and about the potential for the adaptation of local building crafts when looking to the future. There is a widespread assumption across academic, policy, and applied fields that vernacular building culture is not compatible with "modern" architecture and contemporary housing needs (see Asquith and Vellinga 2006; Oliver 2006; Rael 2009). In many places, this assumption drives standardisation in the form of housing, which does not take into account culture-specific aspects and results in design and functional monotony. Standardised mass construction is also usually carried out with industrially prefabricated building components such as cement, steel, and synthetic materials, which use a lot of energy to produce and transport, and are not ecologically sustainable. In contrast, natural and building materials can be highly suitable for housing as they optimise comfort conditions indoors. In addition, their production requires limited energy, they provide good indoor air quality, are pollution free and non-toxic, and can also often be re-used.

Despite these benefits, a proper, up-to-date and equitable resource management system is an important prerequisite to ensuring the continued use of natural raw materials in local housing. Forest resources in particular require correct and sustainable utilisation, as old-growth stands are rare in the Himalayan region and the extent of forest cover has already been severely reduced by factors such as population growth, urbanisation, and deforestation. In many Himalayan regions the use of timber has already become unsustainable due to the declining availability of these resources (see Thakkar and Shah, this volume). Although Drango still has a good amount of standing forest, without effective reforestation and proper management the continuous use of high amounts of timber by the state and the local population will likely lead to negative consequences in the future.

Another widespread natural building material in Himalayan and Tibetan regions is loam.

In Drango, loam suitable for rammed earth construction can be found directly on site in most areas, requiring limited transport and processing. If constructed in accordance with high standards, rammed earth walls are load bearing, durable, fire proof, easy to maintain, environmentally friendly, and highly reusable. Above all, the thermal mass of such walls regulates the heat, absorbing it during the day and releasing it at night. These qualities are particularly beneficial in the study region due to the large differences between day and night temperatures. Another important aspect of natural building materials is that they can be reused and therefore little is wasted when houses are demolished and reconstructed, as is frequently practiced in this region. Even though rammed earth construction is highly suitable for the harsh conditions and fragile ecology of the Tibetan plateau, its continued use in the current century is controversial, mainly due to safety concerns (see Thakkar and Shah, Dujardin, and Norboo et al., this volume). In the context of Drango, the introduction of norms and standards for loam construction might prove indispensable in order to uphold and modernise this building technique in the future. When placed in the context of China's current stated aims to reduce emissions and encourage sustainability, rammed earth emerges as a construction technique with high development potential. The developments taking place in Drango demonstrate how living environments that meet modern demands can still be created with vernacular building traditions and natural building materials.

It is hoped that the information presented here can encourage policymakers, planners, and local government actors to better realise the potential inherent in vernacular architecture and natural construction materials. At the same time, my research has revealed the need for local building craftspeople to gain external expert advice on the integration of modern facilities and appliances into their modified traditional house designs, so as to meet the demands of the next generation in an appropriate manner. Self-directed building processes and traditional building practices in eastern Tibet do not currently allow for the installation of modern technological systems and devices, but will need to develop these abilities if they are to continue their popularity over the decades to come. One reason for this is the lack of training opportunities in plumbing, heating, and air conditioning technology, as well as the dearth of opportunity in architecture and planning professions in eastern Tibet. These kinds of adaptations to timber and earth building traditions can, however, be seen as prerequisites for their successful continuity in the longer term. Should the People's Republic of China genuinely begin striving to reduce its carbon footprint while also providing much-needed housing solutions, there is enormous potential in upgrading and supporting traditional construction methods instead of prohibiting or undermining them (Asquith and Vellinga 2006; Oliver 2006; Rael 2009; Wallis 2012). The pressing need to develop hybrid modes of construction that combine natural raw materials, local building craft traditions, and modern technologies and appliances in an appropriate manner is particularly clear when one considers the specific challenges of the alpine climate and the particular cultural orientations and aspirations of the people of Drango county.

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V

Back to Earth: Negotiating Tradition and Change in Ladakh's Building Tradition

Gawa Norboo, Martina Oeter, Alexandra Skedzuhn-Safir

Name: Gawa Norboo
Designation: Journalist
Affiliation (Institute): Freelance
E-mail address for correspondence: gawa.norboo@gmail.com

Name: Martina Oeter
Designation: Conservation expert
Affiliation (Institute): Freelance
E-mail address for correspondence: martina.oeter@gmail.com

Name: Alexandra Skedzuhn-Safir
Designation: Researcher and senior lecturer
Affiliation (Institute): Brandenburg University of Technology Cottbus-Senftenberg (BTU)
E-mail address for correspondence: alexandra.skedzuhn@b-tu.de a.skedzuhn@gmx.de

Biography

Gawa Norboo

is a freelance journalist and author based in Leh, Ladakh. He is a graduate of Shri Ram College of Commerce, Delhi University, and has also obtained a post graduate diploma in journalism from the School of Communication, New Delhi. He has worked for newspapers like the New York Times and Sunday Times UK, and for organisations like the Centre for Science and Environment, Humans Rights Watch and UNICEF. His research interests include traditional Himalayan architecture and issues related to sustainability and global warming in his native region of Ladakh in the Western Himalayas.

Martina Oeter

works as conservator of architectural surfaces and since 2011 has been lecturing at Regensburg Technical University in the Faculty of Architecture. She has studied art conservation at the University of Applied Sciences in Cologne, Germany, obtained her MA in Conservation Studies at the Institute of Advanced Architectural Studies, University of York, UK, and received her PhD at Bamberg University on the dichotomy of heritage conservation in the Global North and Global South. Her research interests reflect her international work experience and commitment to an integral approach which combines scientific, technical and social aspects of heritage conservation. Recent publications include, *Against Forgetting: Investigating and Preserving Historic Buildings in a Himalayan Village* (BTU, 2021).

Alexandra Skedzuhn-Safir

is a research assistant at the Chair of Architectural Conservation at BTU Cottbus-Senftenberg. She studied restoration in Florence, obtained her BA in the conservation of architectural surfaces at HAWK University of Applied Sciences and Arts Hildesheim, and her MA in World Heritage Studies at BTU Cottbus-Senftenberg. Her doctoral thesis in conservation focused on the cultural significance of historic brothels in Florence. Her research interests include marginalisation and conflicting values in the heritage discourse. In her postdoctoral project, she researches odours and their relevance for architectural heritage. Recent publications include, *Hidden in Plain Sight: The Topography of Prostitution in Florence between 1860 and 1888* (BTU, 2019).

INTRODUCTION

Just two generations ago, earthen construction was the most common, if not the only, form of construction in Ladakh, an area of the north-western Indian Himalayas bordering both Pakistan and the Tibetan Autonomous Region of China. Ladakh is rich in diverse deposits of clay, earth, and sand, but lacks forested areas or other sources of timber. The particular combination of available resources and an arid, high mountain climate made earthen buildings the only viable architectural basis for this region.

After opening to tourism and external influences in the mid-1970s following a period of relative isolation,[1] Ladakh became in some ways a laboratory for the negotiation between tradition and modernity, which affected also the building culture. Rapid socioeconomic and infrastructural changes posed great challenges, especially for the younger generations, who struggled to embrace the future without losing connections with their local traditions. Earth continued to be the most important building material, but its relevance for the future was increasingly questioned. It was now considered an outdated and poor material that could not offer stability against earthquakes or the longer and heavier rains associated with climate change. Building technology and social organisation also changed. Whereas previously most buildings were vernacular constructions made by the communities themselves, now non-local construction workers from India and Nepal were increasingly employed, and more and more buildings made partly or entirely from concrete. These new internal changes and external influences had significant effects on local building craft traditions. Recent decades have seen a huge influx of non-traditional construction materials and a growing trend for living in new houses with modern design features, drastically changing the appearance of buildings in the regional capital of Leh but also affecting construction activities in the villages.

More recently, earth has started to become a popular construction material again in many parts of the world (Jaquin 2012: 2650), including India and notably Ladakh. This chapter examines this "new tradition" that returns to earth as an appreciated building material. What is particularly interesting here is the connection between the search for identity and a sense of tradition on the one hand, and worldwide trends towards ecological building, sustainability, earthquake safety and comfortable, scientifically-proven building materials on the other. Specifically, the following questions are explored: How is the revival of earthen building in Ladakh manifesting itself? To what extent does the recent increase in the use of rammed earth and adobe represent the revival of historical traditions, or to what extent does it constitute a new and distinct set of techniques and practices? How is this new trend towards building with earth related to scientifically or ecologically informed discourses and practices?

After an introduction to the current situation in Ladakh, where earthen building is again being propagated and applied on different levels, the focus shifts to the close intertwining of earthen building traditions with the local climate, living conditions, and social structures in former times. This enables some reflection upon the relationship between tradition, nostalgia, and contemporary building culture. The main part of the paper then deals with the recent "back to earth" trend in Ladakh. This discussion is informed by the authors' own experiences in the conservation of earthen heritage and the evaluation of the relevant literature, especially on the technical aspects of the new earthen building trend. This also positions Ladakh's case in the broader context of India and the Himalayas. This material is complemented by two sets of interviews with master builders, architects, builders, and residents, who contributed their thoughts on historical building culture, tradition, and change. A final summary and evaluation attempts to answer the main questions posed above under the heading: New earthen building in Ladakh — a continuation of the building tradition?

1 Although it experienced a period of relative isolation between Indian independence in 1947 and the 1970s, Ladakh has by no means always been a territory cut off from the outside world. On the contrary, for a long time it was located on one of the important routes of the Silk Road and was thus a much-visited trading centre and melting pot of different cultures, see Bray (2005: 3); Sharma (2010: 44); and Rizvi (1999).

LADAKH AND THE NEW INTEREST IN EARTHEN CONSTRUCTION

Even with the rapid opening up to new external influences that started from the late 1970s, it was difficult to imagine Ladakh without clay, earth, and sand as primary building materials, if only for economic and resource-related reasons. However, the appearance and construction of buildings in the urban area around Leh town and along the main roads actually changed very quickly.[2] Once ubiquitous earth bricks were now mostly used only as infill masonry within reinforced concrete structures, and corrugated iron roofing rapidly replaced traditional earth and brushwood roofs. Although the villages continued to adhere to traditional construction methods for a longer time, corrugated iron, worked natural stone, steel, and cement gradually diffused across the region and are now common even in the remotest areas.

Today, in addition to the traditional earthen building techniques of adobe and rammed earth, concrete bricks and earthen building techniques modified with cement[3] are widely available and are being used in different ways. The choice of building materials depends largely on their cost and intended use. In terms of material cost, locally-produced adobe bricks are still the cheapest, followed by concrete bricks, then stabilised adobe and finally stabilised rammed earth, which is the most expensive. Therefore, we observe that adobe is still mainly used in villages, while the use of concrete bricks, stabilised adobe, and stabilised rammed earth are largely urban phenomena. They are the choice of material for people who have higher incomes, as well as for institutions and commercial projects with larger budgets.

Over recent years, people who can afford the more expensive building materials are choosing earthen materials stabilised with cement, largely because the aesthetics of earth are in fashion again. Especially in the area around Ladakh's capital Leh, a new earthen building culture has emerged which seeks a connection to historical earthen building less for economic reasons than for ecological reasons and as a commitment to local identity. The mixture of the two building materials seems to combine the advantages of both: earth promises the traditional vernacular appearance and has a good ecological standing, while the admixed cement satisfies desires for stability and low maintenance.

Let us return to the research question posed at the beginning: To what extent does the recent increase in the use of rammed earth and adobe represent the revival of historical traditions, or to what extent does it constitute a new and distinct set of techniques and practices? To understand the changes that have taken place, we address this question from different perspectives. Before we take a closer look at the technical as well as the social, ecological, and aesthetic aspects, let us see what can be understood as the essence of historical earth building in Ladakh.

EARTH BUILDING TRADITION IN LADAKH

Ladakh's architecture has remained relatively stable over recent centuries and is characterised by extensive use of stone and earth, and the severely limited availability of wood.[4] However, construction material usage varied considerably, subject to spatial and cultural influences (Bray 2005: 3).[5] Above all, differences arose from the local variability of available materials (Bläuer 2021: 71–78) and the knowledge passed on from generation to generation concerning the particular properties of the materials, their occurrence, and the local craft traditions that developed from these circumstances.[6]

An elaborate system of ritual acts and tests marked the beginning of every house building process, showing the close intertwining of spiritual matters and practical necessities needed to bring house construction to a good end.[7] The search for the building site and the collection of materials could take a long time, while the right place and moment to build was subject to astrological calculations and special religious rituals to appease the gods and spirits.[8] The condition and properties of the building site were also tested, especially if it was not built on rock but on earthy ground. The builders had knowledge of the quality of the local earths and their deposits (Ferrari 2021: 116–

2 Contrary to the Ladakh 2025 Vision Document, Online: https://cdn.s3waas.gov.in/s3291597a100aadd814d197af4f4bab3a7/uploads/2018/06/2018061732.pdf (accessed: 30.8.2022) published by the Ladakh Autonomous Hill Development Council in Leh, which unilaterally attributes the major changes to the opening of Ladakh to tourism in the 1970s, the massive military presence of the Indian army in this border region had significantly influenced Ladakh's culture and economy for decades prior to this and still has a huge influence today, see Bray (2005: 24).

3 Compressed Stabilised Earth Bricks (CSEB) and Compressed Stabilised Rammed Earth (CSRE), see also footnote 36.

4 Wood was always precious and in simple farmhouses was mainly used for constructively necessary elements, like ceiling beams and lintels for windows and doors. Until glass was introduced by the Indian army in the 1950s, window openings were small and could only be closed from the weather by wooden shutters (Rieger-Jandl 2009: 201). Elaborate carvings on early temples and palaces demonstrate, however, that the use of wood was not limited to purely constructive necessities. Devers (2016) believes that wood in construction began to be employed on a larger scale at the beginning of the 10th century, with the emergence of a Ladakhi dynasty and the second diffusion of Buddhism (11th to 12th centuries). An example is the Wanla fort: a large quantity of wood was employed here, but this was an exceptional case (Devers 2016: 50f.). Both constructively and stylistically, the use of wood was probably influenced from the neighbouring wood-rich areas of the north Indian foothill landscapes (see Thakkar and Shah, this volume; Ferrari 2021: 49).

5 Ferrari (2021: 37) summarises: "Ladakh has gathered, within its small cultural area, a remarkable collection of different art styles, though it is a very complicated matter when it comes to ascertain their origins".

119, 134). The use of adobe and rammed earth in construction might point not only to various external influences and building dates, but also to local knowledge concerning which soil types are suitable for which construction method.

According to Khosla (1979), the building techniques of the Western Himalayas were determined primarily by the local availability of building materials. Rammed earth was more commonly employed in Spiti and Zanskar, whilst Ladakh (Fig. 5-1) relied heavily on adobe (Khosla 1979: 117f.).[9] Both materials were used over many centuries for construction across the entire region. In the first half of the 10th century, the use of adobe and rammed earth became widespread, but it is difficult to determine what materials were used prior to this period. The new mode of construction with earth instead of stone is likely to have been inspired by examples from Tibet and Kashmir, as well as other regions in the Himalayas (Devers 2016: 51f.) to which Ladakh maintained connections (Rizvi 1999).

Of the 250 forts researched in Ladakh, it was found that rammed earth was employed in 24 of them, with a heterogeneous distribution (Devers 2016). Compared to Neil Howard (1989, cited in Devers 2016: 51), who places the use of rammed earth into the second half of the 16th century, recent research has demonstrated that its usage may have started considerably earlier (Devers 2016: 51). Rammed earth was already employed in the first dynasty, suggesting its use to be datable to between the eighth and twelfth centuries.

Different types of rammed earth constructions can be observed in Ladakh (Fig. 5-2 and Fig. 5-3). In addition to the construction method that supports the formwork with timbers running through the wall, there are also constructions whose formwork was supported on the outside. It is conceivable that both types of construction were used at the same time, likely due to different building schools and the preferences of the builders (Jaquin 2012: 2657f.). However, apart from considerations that attribute the preference for rammed earth in certain periods or regions to material-technical considerations, this building technique was used primarily for massive wall constructions and fortifications, and thus also reflects troubled times in Ladakh's history. Early fortified towers built on steep slopes served as short-term defences against marauding bands, while the later fortifications of the 15th and 16th centuries, which included access to fresh water, had a longer-lasting defensive capability and were reactions to the larger-scale conflicts with Kashmir and the Tarim Basin (Devers 2016: 62f.).

Some old rammed earth buildings still exist in Ladakh, which are mostly the remains of castles and defensive structures. The most well-known is the fort at Basgo, known as Rabtan Lhartsekhar Castle. Jaquin (2012) assumes that the construction of the castle occurred prior to 1357, when Basgo was still the capital of Ladakh. Another famous rammed earth fort is the Namgyal Tsemo in Leh, which was built in the mid-1550s (Jaquin 2012: 2651f.). The technique of stud walls with earth-filled wattle and daub, mostly for light partition walls in private houses or for cattle fences, was also widely used. Earthen walls with interlocking horizontal tie beams and especially the common construction of tapering walls indicate early attempts to give buildings stability in the event of earthquakes (Ferrari 2021: 145).[10]

The most common and widespread building technique of the last centuries was, however, adobe brick construction. Concerning the brick sizes of several historic fortifications that have been the subject of research, Ferrari (2021: 138) warns us not to disregard historical systems of measurement, which were not standardised according to established units but were based on the human body and thus variable from person to person. This demonstrates that local knowledge was not only passed from generation to generation, as mentioned above, but was also grounded in localised, variable, and non-standardised traditional practices.

6 Ferrari (2021: 74) describes this local tradition thus: "In the past houses were built by a team of local masons and the family also took part in the construction. Masons and carpenters came almost exclusively from the same village. When there was no money people traded their work for materials or mutually helped each other".

7 The sources employed in this chapter refer mostly to Buddhist architecture and cultural practices. However, it should be noted that the sizable Muslim population in Ladakh would have surely followed specific rituals as well.

8 Dujardin writes in this volume: "From monastery-fortress to farmhouse, from spirit house to shrine, and from prayer flag to carved rock, each and every building, culturalised object or natural phenomenon, seems to partake in an endgame, played out on the surface of a topsy-turvy chessboard — the landscape of the Himalayan range", see also Dujardin (1994: 4f.).

9 Jaquin (2012: 2651) explains "Rammed earth requires a mixture of sandy, silt and clay soil. This type of soil is found in various locations, but generally in relatively hilly areas, where it is possible for eroded sands, and alluvial clays and silts to be found together. As a result, rammed earth can be found at the edges of large river valleys, in mountainous regions where glacial till is found, and occasionally on river valleys at loess plains".

10 The construction of tapering walls is also found in other parts of the world, so Jaquin's (2012: 2658) assertion that tapering walls are a peculiarly East Asian development must be contradicted.

17 See for an overview in the Getty Library Catalog for the keyword earthen construction:
Online: https://primo.getty.edu/primo-explore/search?query=any,contains,Earth%20building&tab=all_gri&search_scope=COMBINED&vid=GRI&offset=0 (accessed: 14.8.2021).

18 Kulshrestha et al. (2020: 8) mention The Indian Institute of Science in Bangalore, see Online: https://cst.iisc.ac.in/bvvr/ (accessed: 23.8.2021), but also Auroville Earth Institute, Online: http://www.earth-auroville.com/about_us_en.php (accessed: 23.8.2021).

19 Kulshrestha et al. (2020: 2) note that until 1971, earth was the most common building material in rural India and until then 57% of buildings were made of it, whereas in 2011 it was down to 28.2%.



Fig. 5-1 Top: Ancient cluster of houses with a stone foundation and upper storeys made of adobe in Kanji, Ladakh.
Source: Alexandra Skedzuhn-Safir (2011).



Fig. 5-2 Bottom right: An example of rammed earth employed in Wanla in the former fort (approx. 13th century).
Source: Alexandra Skedzuhn-Safir (2014).

Fig. 5-3 Bottom left: The monastery of Namgyal Tsemo in Leh district (16th century) was constructed in rammed earth.
Source: Gawa Norboo (2021).



SOME CONSIDERATIONS ON TRADITION, NOSTALGIA, AND HERITAGE CONSTRUCTION

Many discussions of traditional building techniques revolve around their juxtaposition with modern methods. As in the larger context within which such discussions are set, the traditional and the modern are often conceived as being mutually exclusive, with static tradition representing the past while dynamic modernity concerns the present and the future (Quli 2009: 5f.; Watt 1996: 1).[11] This polarised, dichotomous view sees tradition as fundamentally fragile and endangered, and is often accompanied by a sense of nostalgia that suppresses the necessary process of constant analysis of traditions, discussion of their current social value and potential for the future, or adjustment to contemporary needs.[12] Historical building forms and materials are not analysed, questioned, and evaluated in terms of present-day use, and are thus in danger of being used as only as "historical images" and idealised set pieces.[13] Their function is reduced to that of a symbol of the past and an embodiment of a collective memory, solely for the assertion of identity.[14] Therefore, the process of negotiating tradition and change is arduous, often painful and must be adapted not only to the present and possible future, but also to the image we have of our past.[15]

One route out of such dilemmas is to analyse the concepts, materials, skills, activities, social organisation, and forms that constitute a building tradition, to gain an understanding of their cultural significance, and to try to establish their social, cultural, and economic roles, as well as their ecological sustainability.[16] The question emerges whether such analyses are taking place in the "back to earth" building trend in Ladakh, and thus whether the buildings being constructed today consciously perpetuate building traditions, or, on the contrary, ignore and dismantle them through a superficial "traditional style of the day" that actually follows the global fashion for (purported) ecological sustainability combined with modern aesthetics.

LADAKH: BACK TO EARTH

THE "BACK TO EARTH" TREND IN LADAKH IN RELATION TO THE WORLDWIDE REVIVAL OF EARTH BUILDING

Interest in earth building techniques is increasing worldwide and there are various reasons for this.[17] On the one hand are ecological concerns to achieve a healthier indoor climate and to reduce the resource footprint of house building, which is fuelling the climate crisis. The search for affordable solutions to combat growing housing shortages and a desire not to let local building traditions be completely forgotten have also strengthened this trend in recent years (Walker et al. 2020). Although earth as a building material is always in the foreground of these efforts, a country like India shows that modern earth buildings and "back to the earth" building traditions actually head in very different directions. It even seems, ironically, that the preservation of building traditions may actually be threatened by the international and national trend towards earth building. Indian academic institutions have been researching earthen building techniques since the mid-1970s.[18] For some years, the return to earth as a favoured building material has also been viewed positively by the Government of India. As recently as 2016, the government identified a need for 29.5 million houses for low-income people in rural areas that should be addressed by the year 2022. This target is far from being met, but a return to traditional building materials such as earth[19] appears to offer a solution to the problem. Earth is available almost everywhere, is easy to work with and is relatively inexpensive (Kulshrestha et al. 2020: 2).

On the other hand, especially in rural areas where the tradition of earthen buildings can still be continued and the knowledge of vernacular techniques has not yet been lost, building with earth is no longer viewed in a positive light. Studies in India and other countries show that traditional earthen construction is associated with notions of poor stability, the need for constant maintenance, and labels of

11 Watt (1996: 2) notes that "the distancing and bounding of the two concepts can be traced back to the origins of modernity in the 18th century, when the word "modern" acquired favourable connotations of improvement, progress and desirable change".

12 Dujardin (1994: 147) argues that "Tradition is not a 'canon' that lasts for centuries, and it should not necessarily strive for cultural immobility. Tradition holds the potential to absorb the changes that are vital to the survival of mankind. Moreover, it acts as a source of inspiration by which the challenges of modernity can be met with more confidence and cultural self-respect".

13 Dujardin (this volume) quotes Pierre Pichard with the expression "traditional decoration" to describe the trial to stop "stylistic decline in present day Bhutan [...] through the enforcement of a traditional design building codes deriving from the country's centuries-old architectural tradition". Similar efforts are also underway in Ladakh, such as a new tourism incentive policy that "aims to promote a concept of small and beautiful tangible assets in Ladakh based on local tradition and architecture" (Gupta 2020).

14 One of the first important sources of inspiration on the subject of traditions is *The Invention of Tradition* by Eric Hobsbawn and Terence Ranger, published in 1983.

15 Quli (2009: 6) cites AlSayyad, stating that "the end of tradition does not entail the death of tradition itself, only an end to our conception of it — and the emergence of a need to re-evaluate its utility as a repository of authentic (and hence valuable) ideas to be handed down or preserved".

16 Dujardin quotes Pieper and refers to him as one of the pioneers of architectural anthropology: "Architectural anthropology starts with the idea that every human society builds their habitat in a way which on the one hand reflects the ecosystem, technology, mode of production and ideas about life and after-life of that particular society, while on the other hand it articulates in its particular forms what is a universal phenomenon inherent in any human society" (Pieper 1980, in Dujardin 1994: 146).

social backwardness, and is in fact seen as an indicator of poverty among the inhabitants (Kulshrestha et al. 2020: 9). It is not only in low-income rural areas that earthen construction is seen as a choice born of necessity, even if the living climate is still quite appreciated. Official bodies and the building industry have little confidence in traditional earthen construction, mainly because it is not based on standardised building norms.[20] It relies rather on experience passed down over generations as to the choice of building materials and their adequate working techniques.

A way out of this vernacular practice, which enjoys little prestige or support, seems to be the scientific examination of earth as a building material and of the possibilities for modifying or stabilising it with other inorganic building materials such as cement and lime.[21] The scientific investigation of these building materials provides analysis of the ingredients, targeted possibilities for modification, and thus also for standardisation. Earth can thus continue to be used as an abundant and low-cost local resource but with the addition of other materials, can provide a supposedly stronger, safer, and more predictable building material. On the one hand, it promises ecological advantages and seems to tie in with local traditions, and on the other hand, it better meets modern demands for strength, stability, and standardisation.

A survey study in different regions in India conducted 40 informal and semi-structured interviews to explore the reasons why earth is employed or rejected for the construction of houses.[22] It yielded results that appear to reflect the situation worldwide and are also relevant for Ladakh. It was found that the image of the building material and economic reasons are the most important factors influencing the use of earth in construction. The low-income segment of society continues to use earth for traditional style buildings due to its ready availability and usability without the need to involve experts, even though their preference would be to live in supposedly more modern houses with less maintenance work. In contrast, it is mainly the upper-income segments that consciously choose modern earth building materials, both for ecological reasons and due to the particular aesthetics of earthen architecture (Kulshrestha et al. 2020: 7). The study showed very intriguing results, but also demonstrated that the simple comparison of, on the one hand, earth building — be it traditional vernacular processing or modern constructions with modified earth — and, on the other hand, modern conventional building, is highly problematic.

Modern earthen constructions using modified building materials are widely celebrated as a revival of earth building traditions. Extensive scientific debate and practical experiences both in India and worldwide over the past decades on the subject of earth modification has shown, however, that it has little in common with traditional earthen construction and that the modification techniques must also be viewed critically in a number of respects. To actually achieve a more permanent stabilisation of earth, either standardised (and thus imported) earth must be used, or the local earthen material must be tested for its composition in order to determine the optimal mixing ratio between earth and stabilising aggregate. The construction of modern earthen houses is labour-intensive, requires expert inputs, and quickly becomes an expensive endeavour. It thus stands in stark contrast to vernacular earthen building and local knowledge of the best building materials available in the region. As such, it does not currently seem suitable for generating large amounts of housing for rural and/or low-income people. For some time to come, it will primarily satisfy the needs of wealthier and middle-income groups for obtaining supposedly more ecological and fashionable houses, and young architects as an experimental field inspired, at best, by established building craft traditions.

Overall then, modern earthen building appears as an attempt to combine the desirable properties of earthen building with modern technology. While this makes the "back to earth" project popular, it does not do justice to the traditions of earth building or the desire for more ecological building practices. At the same time, various scientists have addressed the problems inherent to the use of stabilised earth. Van Damme and Houben (2016) have shown that the addition of the industrial stabilisers most commonly used today do not appear to make sense, because the relative compressive strength of the product is hardly better than when pure earth is used. Furthermore, the stabilisers have a high carbon footprint, which detracts from the ecological arguments in its favour (Van Damme and Houben 2016). An analysis by Bruno et al. (2020) shows that modified earth severely limits both hygrothermal regulatory capacity and full recyclability. Even stabilised with 8 % cement, earth which initially shows a small increase in strength compared to unstabilised earth is no more stable than pure earth when

20 Kulshreshtha et al. (2020: 8) point out that there is a building code on earthen construction in India (IS 1725), but it is apparently not widely known or used.

21 Compressed stabilised earth blocks (CSEB) and stabilised rammed earth (SRE), or modern rammed earth, using cement as a stabilizer are the most common technologies today, see also online: http://www.earth-auroville.com/earth_technologies_introduction_en.php (accessed: 30.8.2022).

Other tested materials are industrial waste products such as fly ash or blast furnace slag (Van Damme and Houben 2016: 180).

22 The interviewed people are described as follows: "The interviewee group consisted of people involved directly in earth construction. This included earth house dwellers with different socioeconomic backgrounds, earth construction experts, architects, engineers, masons, contractors, consultants, educators and volunteers". (Kulshreshtha et al. 2020: 3)

recycled, because once broken through the recycling process, the cement bonds which bring the stability are irretrievably lost (Bruno et al. 2020).

These issues are taking on greater significance in Ladakh as earthen construction receives increasing attention. A pioneering work in the reintroduction of rammed earth construction in Ladakh was the SECMOL (Students' Educational and Cultural Movement of Ladakh) school building in Phey, which is located roughly 18 km from Leh. It was a joint project by Sonam Wangchuk and Ramon Magsaysay carried out between 1994 and 1998, and received a TERRA Award in 2016.[23] In a second interesting development, Ladakh has established a tourism incentive policy providing financial support to warrant sustainable development. The aim is to promote tourism in remote areas, to ensure that smaller guest houses benefit from these subsidies, and to "promote a concept of small and beautiful fixed assets in Ladakh based on local tradition and architecture" (Jahnavi Gupta 2020). In addition, the policy has established the "Ladakh Tangible Cultural Heritage Conservation Fund" with which the historic buildings located throughout the districts of Leh and Kargil would be preserved, after an evaluation of these sites and establishment of the necessity of conservation work.

Over recent years, more and more buildings are being constructed in Ladakh that refer to earth as a primary building material. Therefore, pertinent questions arise as to how this "back to earth" trend might be evaluated: Are building traditions being considered, are they being actively modified, or does this trend ignore or even counteract them? Is this trend actually grounded on ecological friendliness and concerns for local resource use, or is it based more on scientifically informed advances in construction materials? These questions were investigated through an in situ study of local attitudes and practices relating to contemporary earth-based construction.

LOCAL ATTITUDES AND PRACTICES

In addition to approaching Ladakh's earthen building activities through our own observations and literature research, two sets of interviews were conducted. The first was carried out in 2013 with interview participants living in a small village, aiming to gain an understanding of the motivations behind the preservation of historic buildings and the revival of local building traditions. The second set took place in different locations in and around Leh in the Spring of 2021, involving owners, architects, and builders of new buildings who have consciously chosen earth as a building material.

21 interview participants were selected to determine whether people have noticed major changes in local traditions and lifestyles, and what changes they have observed in buildings in particular. Furthermore, they were asked to evaluate these changes as positive or negative. Another aim was to explore what the interviewees believed to be the reason why some historical buildings have been preserved. Six of the interview participants were female and 15 were male, and most of them came originally from the village of Wanla.[24] The ages of the interviewees ranged from 16 to 80. Some of the interview participants were consciously chosen based on their involvement and acquaintance with the NGO Achi Association, which had been working on the conservation of a historic temple in the village. The interviews were taken in summer 2013 in Wanla during one of the conservation campaigns carried out by the Achi Association. Several of the interviewees were also involved in a three-year youth training programme for the preservation of built cultural heritage (13, 15, 18–21), and this participation may be one reason for their awareness of the significance of local cultural heritage.[25]

23 For more information see online: https://worldarchitecture.org/article-links/epefn/terraawarded_secmol_school_in_leh_is_epitome_of_rammed_earth_passive_solar_architecture.html (accessed: 30.8.2022).

24 One exception was a 31-year old monk from Skurbuchan.

25 This project is further described in Skedzuhn-Safir, Oeter, Vets, and Pfund (2021), and Oeter and Skedzuhn (2014).

ANALYSIS AND EVALUATION OF 2013 INTERVIEWS

Table 5-1: Details about interview participants 2013

Interviewee	Gender (M/F)	Profession	Age
1	m	student	23
2	m	monk	80
3	m	farmer	80
4	f	nun	74
5	f	farmer	55
6	m	shopkeeper	46
7	m	student	17
8	m	driver	30
9	f	farmer	53
10	m	former army member	80
11	f	farmer	42
12	m	farmer	68
13	m	student	17
14	m	carpenter	53
15	m	student	16
16	f	student	25
17	m	engineer	28
18	f	student	18
19	m	monk	24
20	m	monk	23
21	m	monk	31



Fig. 5-4 Cluster of ancient houses in Alchi Village, Ladakh.
Source: Alexandra Skedzuhn-Safir (2011).

The main changes that the interview participants had experienced themselves, or were otherwise aware of, concerned: a) improved mobility due to motorable roads, access to transport and car ownership; b) access to a wider variety of foodstuffs; c) access to industrially manufactured clothing; d) greater financial independence; and e) changes in house building and domestic life. These factors together were seen to have greatly altered long-held traditions over just a few decades. Several interviewees mentioned that the layout of buildings has undergone significant changes over time, because in former times people and their livestock used to live in one building, with people on the upper floor and their animals below (1, 2, 14). Nowadays, farmers mostly separate humans from livestock when constructing new houses, as living conditions and standards have changed, notably through a wider range of possibilities in terms of heating and the growing demand for hygienic environs.

Many historic building details bear witness to the scarcity of resources in former times, both in terms of timber, but in particular due to the lack of heating options. Buildings had smaller windows and doors in the past (4, 5, 6, 8–17, 19; Fig. 5-4), some of the rooms had no windows at all, and only the more affluent owners could afford wooden windows or window jambs made of stone in a time when glass windows were not a common feature for houses (9). Formerly, windows were not decorated, whereas contemporary buildings adorn their windows stylishly (8, 9, 14). Traditional dry toilets were not usually integrated into the house (3), whereas water-toilets tend to be integral in modern houses (7). Also the location chosen for new buildings underwent change, as one interview participant (17) affirmed: people used to build their homes on higher ground, but now their preferred location is near to roads and fields. For the architectural style, a Westernised style is now often preferred, such as large glass windows and sloping roofs, as well as alteration in the distribution and function of rooms (19).

Concerning the construction materials employed for building, considerable changes were noted by many of the interviewees. Instead of relying primarily on earthen materials, houses were being built more and more

with cement (8, 12, 13, 15, 17, 20, 21). Two of the interviewees in the youth training programme in fact viewed the use of cement quite critically, saying that it is not sustainable compared to locally available materials (20). One monk from Skurbuchan had been advocating for the use of earth in his village, but pointed out that locals nonetheless preferred to build with cement (31). A young monk from Wanla, whom we came to know as a thoughtful and outspoken person with a keen interest in cultural heritage, even remarked that cement had become something of a status symbol (20). One interviewee affirmed, however, that cement is a better building material, without providing any additional reason (8).

To explore the reasons for the preservation of buildings, the interviewees were asked what they thought could be possible motivations. Some of them pointed out that the need for constant caretaking and repair was seen as a negative property of old buildings (1, 3, 5, 10, 11, 14, 16, 19), paired with an awareness of the particular positive characteristics of earthen buildings (5). Some believed the preservation of temples is connected to their religious power and value (6, 17, 18, 19), or their social value (8), age value (4, 6, 7, 11, 14, 18, 19), and use value (3). A few people provided yet another reason: the knowledge and skill of local architects and craftspeople guarantees the longevity and importance of historic (religious) buildings (7, 17, 20). The advantage of maintaining historic structures was thus directly connected to the continuity of local heritage and tradition (7, 15, 19, 20, 21), as well as a chance to gain economic benefits from increased tourism (16, 20). However, most interviewees were of the opinion that, except for important heritage buildings such as temples, all historic buildings will disappear and architectural styles will continue to change. Many observed that the younger generation strives to distance itself from the past, including traditional building materials and styles, wishing instead to embrace modernity and to benefit from a more comfortable living environment (7, 8, 10–12, 17–19). However, some negative aspects of modernity were also pointed out, such as the poorer quality of products, unhappiness, tension, greed, and competition (17, 19). Several interviewees affirmed that despite the negative consequences of modernity, changes are necessary (7, 13, 19). Fifteen people said they preferred change (1–6, 9–14, 16, 18) and three said they did not like it (17, 20, 21), whilst four voiced mixed sentiments (7, 8, 15, 19).

Based on these interviews, several conclusions can be drawn. Firstly, regardless of the age of the interviewees, there was a general awareness that significant changes are taking place and affecting many aspects of life in Ladakh. The majority of interlocutors welcomed the changes as contributing to an easier and more comfortable life, while recognising that they were not entirely positive. A few participants viewed the changes more critically, fearing the loss of customs and traditions, as well as negative social impacts. The main changes recognised in building traditions concerned the use of materials where earth has been substituted with cement, the changing function and layout of rooms, the larger size of doors and windows, the use of glass for windows, and the growing popularity of new architectural styles that were described as being more lavish and "westernised". These changes appear to have been motivated by the wish for a more comfortable lifestyle and to show that Ladakh's inhabitants have arrived in modern society, following models from other regions of India and abroad.

In 2013, the use of cement was not yet attracting serious criticism from the participants, with the exception of two youth training programme students who were already aware of the negative impact cement was having on built cultural heritage. This is particularly interesting because in 2021, eight years after the initial interviews were conducted, awareness of the positive effects of earthen building materials for ecological reasons, as well as for the preservation of Ladakh's building traditions, has grown, as shown in the following section.

A questionnaire was prepared for the five interviews that were conducted in spring 2021.[26] Although this number is too small to be considered representative, the interviews allow us to locate certain trends that support our empirical observations on the ground. In addition, this method enabled us to find out what motivated each interviewee to build with adobe or rammed earth. To allow for varying perspectives, the interviewees were carefully selected to reflect a broad range of stakeholders, namely: a local landlord whose building was for private use (A);[27] a local landlord running a hotel (B); a local contractor involved in building an NGO-led meditation centre (C), a national-level architect building for private use (D); and a national-level architect involved in constructing a hotel (E). The questionnaire was prepared in Ladakhi and English, including both open-ended and short-answer questions. It was designed to analyse the buildings

26 Due to Covid 19 and the resulting restrictions, the face to face interviews had to be suspended in spring 2021. This meant that many of the interviewees could no longer be reached, and the number of interviews originally intended had to be significantly reduced.

27 To protect the privacy of those interviewed, they are identified by letters instead of names.

themselves, the type of building techniques employed, to establish whether the earthen materials were modified, whether several different materials were used, and the extent to which the construction techniques and materials employed were based on science and skilled knowledge. Secondly, the questions aimed to investigate the intended use of the structures, whether as a private home, a venue for NGO activities, or as tourist accommodation. Thirdly, the extent to which the desire for a modern standard of living and ecological awareness was fulfilled was investigated. Further questions examined the role or relationship of the interviewee to the building process—as architect, owner or craftsperson—and whether building with earth may have been inspired by local, national or international projects. All of this data was relevant to assess the reasons and motivations the interviewees provided for the final segment of the questionnaire for building in earth.

	Gender (M/F)	Owner/ Architect	Age	Local (Y/N)
A	M	owner	65	y
B	M	owner	38	y
C	M	architect + contractor	43	y
D	F	architect	28	n
E	M	architect	32	n

Table 5-2: Details about participants 2021

Fig. 5-5 High quality clay quarry near the Monastery of Spituk.
Source: Christine Bläuer (2010).



ANALYSIS AND EVALUATION OF 2021 INTERVIEWS

Of the five people interviewed, three were local (A–C) and two were Indian citizens hailing from outside Ladakh (D and E). The latter two were relatively young (28 and 32 years old), while the local interviewees' ages ranged between 38 and 65 years. Three of the structures in question were built in Leh itself (B, C, E), and four were still under construction (A–C, E). Three of the buildings had one storey (A, B, C), one had two storeys (B), and the other consisted of three floors (E).

Analysis of the interviews shows that both the private and commercial structures had a water toilet, shower,[28] and electricity connected to the grid. Three also had a back-up diesel generator (A, B, E), three were equipped with solar energy (A, C, D), and one had a septic tank (D). Only one private house (A) was heated traditionally by burning wood branches. All the bathrooms/toilets were located inside the buildings and used water,[29] so were built with cement to avoid water damage.[30] All of the buildings except C had a traditional Ladakhi roof: flat and the edges covered with brushwood. However, according to Section 12 of the bye-laws of Leh Town, roofs should not be covered with straw or any other flammable material. Further research is needed to assess the extent to which this rule covers traditional roofing materials such as earth and brushwood, as well as the extent to which the rules are followed and enforced in practice. For two buildings, only adobe was employed (A, E). Rammed earth was used in three structures (B, C, D), of which two used CSRE[31] (B, D). In three cases, cement was employed for the staircase to improve sturdiness, and all the buildings used cement to manage the impact of water in the bathrooms. One interviewee additionally used cement for the tie beams (D).

The use of earthen materials for the construction of the buildings merits closer attention. The soil was obtained locally, either directly from the construction site (A, C, E) or from a distance of less than 25 km away (B, D). The clay, known locally as *markalak*, was mainly taken from Spituk, a village in the Indus valley close to Leh town (Fig. 5-5) (C). Only the cement-stabilised adobe bricks were brought from outside by the constructor (D). Most of the interviewees declared that the soil they used does not have agricultural properties, and thus the use of earth for construction does not threaten local agriculture. The poplar and willow wood used in construction was sourced locally, from the building site or nearby (A, D, E), whereas hardwood had to be imported by road from Jammu & Kashmir (D). Cement Stabilised Earth Bricks (CSEB) were bought from a local contractor (D), while non-modified adobe bricks were produced on site (A, E). It is clear from the interviews that earthen buildings in Ladakh are constructed more often as rammed earth structures than in recent history, and most of the builders prefer to add strength by using CSEB or cement for particular building elements or features. One interview question aimed to establish the extent to which the new constructions were inspired by existing or historic buildings. Interviewee A replied that his new house complemented the old structures in the compound where he grew up. Interviewee B stated that he was inspired to build with rammed earth after having seen a rammed earth structure in Leh, whilst interviewee C could draw from his rich experience as a contractor, having built more than 50 rammed earth structures in Ladakh. Interviewee D said she took her inspiration from the building materials that can be found locally and in terms of building technique from existing rammed earth buildings in Ladakh. In addition, she commented that as a non-local, the historic structures made from rammed earth had impressed her and inspired her as a designer to re-interpret and put them into a contemporary context by employing colourful earths and different surface textures.

The motivations given for constructing in earth were quite varied. All interviewees stated that they used earth to better retain heat compared to cement, which is particularly significant because heating in Ladakh is a difficult task considering that winter temperatures can drop to as low as minus 30°C. Interviewee C builds in rammed earth (Fig. 5-6 and Fig. 5-7) and prefers it to adobe for its greater strength and even better temperature retention. Three interviewees chose earthen architecture for aesthetic reasons (A, D, E) (Fig. 5-8 and Fig. 5-9), two wanted to preserve building traditions (D, E) (Fig. 5-10), two felt that it gives them a sense of identity (A, D) (Fig. 5-11), and two mentioned eco-friendliness (B, D) (Fig. 5-12). One interviewee employed earthen architecture to appeal to tourists (E) and one prefers rammed earth as it has the added value of being resistant to earthquakes (D).

Common to all examples is that temperature retention plays an essential role and that this favours the use of earthen building materials. This is particularly noteworthy because ce-

28 None of them has a bath tub.

29 Traditionally, dry toilets are used in Ladakh. The debris is collected in a chamber underneath the toilet and is regularly emptied to be used on the fields as fertiliser.

30 In addition, according to building bye-laws for Leh Town, section 13.4. specifies that "latrines, privy or urinal shall be constructed that these shall be adequate for the purpose of cleaning." N.B. These bye-laws have been modified in 2021, but as of August 2021 not published. The quotation refers to the bye-laws of 2012.

31 Cement stabilised rammed earth.

ment has been widely used in new buildings over recent decades, but many people are now realising that it is not an adequate building material for this region due to its poor thermal properties. Two exceptions are that cement has better water resistance when used in bathrooms and is also seen to have greater stability, which explains its continued use for tie beams and staircases. Regarding the negative aspects of earth and its need for continuous maintenance, one interviewee commented that does not pose a noteworthy problem if the building materials are used correctly.



Fig. 5-6 Interviewee C prefers the use of rammed earth over adobe for its compressive strength.
Source: Gawa Norboo (2021).

Fig. 5-7 Idem.
Source: Gawa Norboo (2021).





Fig. 5-8

Fig. 5-8 In this example of a private house of respondent D, wishes for modern living and personal aesthetic ideas are combined with elements of traditional building.
Source: Gawa Norboo (2021).

Fig. 5-9 Idem.
Source: Gawa Norboo (2021).

Fig. 5-10 Interviewee E strives to preserve the traditional building style and materials by installing unaltered adobe, but he combines this with aesthetic ideas of modern living.
Source: Gawa Norboo (2021).

Fig. 5-11 Detail of the privately owned house built in on-site produced adobe by interviewee A.
Source: Gawa Norboo (2021).

Fig. 5-12 Detail of an interior of a guest house by interviewee B built in rammed earth.
Source: Gawa Norboo (2021).



Fig. 5-9



Fig. 5-10



Fig. 5-11



Fig. 5-12

It is noteworthy that the non-local architect (D) managed to successfully combine his interests in modern comfort levels, local architectural styles, and contemporary design, resulting in an attractive, livable yet locally inspired building. The older local builder (A) drew inspiration much more from historic earthen buildings, although they share motivations connected to identity for constructing in earth. In terms of people's motivation for building with earth, the references to the importance of maintaining a sense of identity and preserving local building traditions are particularly intriguing. For the 65-year old local (A), building with earth reminds him of his childhood and provides a strong sense of identity and belonging. The two non-locals, in their late twenties and early thirties, expressed their wish to preserve unique local building traditions, despite lacking the sense of belonging referred to by the older Ladakhi builder. One of them also sees the potential to use her building as an awareness-raising tool, to demonstrate the effectiveness and beauty of local building materials and techniques.

While in 2013, the desire for comfortable and modern living was seemingly only possible by replacing earth with cement, it is clear that by 2021, building with earth—even if modified—is now becoming respectable, attractive, and feasible again. People are looking not only to national and international trends, but also to local models when deciding how and from what to construct new buildings. Compared to the beginning of the 2010s, there is evidence also of an increased awareness of the need to use building materials in a resource-efficient way.

In the villages, where land holdings are generally larger than in Leh, people have the option of harvesting the earth needed for adobe from their own land and contracting others, mostly Nepalis, to actually prepare the bricks. Such bricks are consequently much cheaper than readymade adobe bricks. Furthermore, wood and adobe from older houses are being reused, which further reduces the attractiveness of more expensive and newer materials such as CSEB. However, as many villagers are now building houses with internal bathrooms, running water, and other modern amenities, the use of at least some concrete bricks remains necessary, even in houses made largely of adobe.

Although Compressed Stabilised Earth Bricks (Fig. 5-13) are a relatively new technology in Ladakh and involve much higher costs than ordinary adobe,[32] they are becoming increasingly popular due to their better wet-strength and overall strength compared to adobe. At the same time, they offer much better thermal comfort than concrete bricks and can also be used more flexibly due to the variety of different mould sizes, while adobe and

32 A manual compressing machine needs to be purchased to make these bricks, costing more than INR 150,000 rupees (EUR 1,800) plus extra costs for additional moulds and transportation, since such machines must be transported from New Delhi or other cities. As the ideal ratio of stabiliser and earth requires testing, samples also need to be sent to New Delhi for analysis, further adding to operational costs.



Fig. 5-13 A construction in Leh where CSEB is employed.
Source: Gawa Norboo (2021).

concrete blocks are often available in one size only. In addition, the rough appearance of CSEB goes hand in hand with the trend of "shabby chic" and is not considered unattractive as it may have been in former times.

As of now, rammed earth is the most expensive form of construction in Ladakh due to the high cost of the moulds required to produce structural components, as well as the costs incurred by soil testing and the like. If a building site is situated in Leh town, the lack of available land from which to excavate the soil means the earth must be brought in from distant sites, further adding to the overall expense. Presently, only a handful of contractors specialise in rammed earth and only one prefers to build with unstabilised rammed earth. However, building with rammed earth is motivated by both historical continuity and contemporary aesthetic interests, which inspires hopes for greater popularity among tourists. It also represents a status symbol and a display of wealth, playing a similar role to that of cement a decade or two ago.

CONCLUDING THOUGHTS: NEW EARTHEN BUILDING IN LADAKH — IS THE BUILDING TRADITION CONTINUED?

It is clear that external influences have significantly impacted building traditions and practices in Ladakh over recent decades, primarily through the introduction of contemporary designs and modern construction materials. However, our research reveals that a parallel development can also be observed, as many people are now rediscovering the climatic, social, and aesthetic advantages of historical earthen buildings, such as their large communal spaces, far better thermal properties, and attractive surface appearance. For some years now, one can even speak of a real "back-to-earth" trend taking hold in the region. The private building sector, architects, contractors, and individuals are increasingly interested in building with various forms of earth. The wish to preserve precarious building craft traditions and to maintain a sense of distinct local identity can be keenly felt here. At the same time, increased awareness among tourism entrepreneurs that the unique local architectural style may appeal to visitors and draw them to the region in larger numbers fuels the trend. The tourism department of the government of Ladakh is thus encouraging local building styles for hotels and guest houses by providing a higher capital subsidy for earthen buildings (Gupta 2020). In addition to the economic and regulatory concerns that promote the use of earthen materials for mass housing, the government is aware of the importance of preserving cultural heritage.[33]

Let us reflect back on the questions formulated at the beginning of this chapter. Although the current increase in earth building in Ladakh seems to be motivated in part by a wish to revive building craft traditions, less culturally rooted desires for sustainable, ecological building methods also appear to play an important role, above all for the younger generation. In principle, almost all buildings try to strike a balance between modern comfort, safety considerations, and a traditional appearance. However, with the increasing use of cement-mixed earthen building materials, local knowledge of suitable earthen deposits and how to utilise them are increasingly being lost, while external expertise and imported materials are becoming more necessary.

Evidently, building culture has changed considerably in the region over recent decades in terms of housing needs, settlement patterns, and architectural styles, as well as the materials and skills being used. Furthermore, the worldwide trend towards ecological building materials, healthy house climate, and sustainability has not passed Ladakh by. This chapter started with the broad question of how the revival of earth building is manifesting itself in Ladakh. More specifically, it asked to what extent the recent increase in the use of rammed earth and adobe — mainly in the urban context — represents the revival of historical building traditions, and to what extent the changes follow science-led discourses and practices, or the global trend towards (supposed) ecological sustainability, which actually tends to ignore or replace rather than continue or revive established local building traditions.

Despite the observable trend towards renewed appreciation of earthen construction, studies in India and other countries show that traditional earth building is still widely associated with a lack of stability, the need for constant maintenance, and the stigma associated

33 Ladakh was separated from the state of Jammu and Kashmir in October 2019, when it became a Union Territory (federally administered region). The local government in Leh is yet to formulate new local bye-laws and building codes for the region. However, whenever new bye laws are drawn up, they have to stay within the codes and standards set by the National Building Code of India and the Bureau of Indian Standards.

with backwardness, in fact being seen as an indicator of poverty. Ladakh is no exception to this. Earth still has the image of being a poor building material, offering little resistance to external influences such as weather and earthquakes,[34] and requiring considerable maintenance. A way out of this dilemma was sought through two concepts. The first invokes the use of rammed earth. Indeed, a monolithic rammed earth structure promises more stability than an adobe building, whose mortar joints make the structure weaker. However, although there are significant historic buildings that used this technique in Ladakh, recent building history mainly involves adobe. Comparable to developments in other parts of the world, building with adobe is reminiscent of a difficult, barren, poor, and labour-intensive past that has only just been overcome (see McDuie-Ra and Chettri, this volume). Rammed earth buildings instead seem to hark back to a significant and turbulent history with proud fortifications, but is today prohibitively expensive to use. Yet a revival of earthen building without the inclusion of adobe ignores a very important part of Ladakh's building history, especially the vernacular building tradition,[35] as well as the influence of local material deposits in deciding the most appropriate construction method.

The second concept to supposedly revive the earthen building tradition uses modern scientific research to combine earth with inorganic materials such as cement, supposedly imparting greater stability. In today's Ladakh, more and more buildings are being constructed that are declared to be earthen buildings. However, because they are mainly built with processed earthen materials, they are only earthen in appearance and actually have little in common with the vernacular constructions of the past. Recent scientific studies have revealed that the mixing of cement or other industrial stabilisers with earth seems to provide none of benefits of either earth or cement. It severely reduces the inherent benefits of a pure earth structure as it reduces porosity of the earth and reduces its ability to regulate temperature and humidity. Even if there is initially a small increase in strength, this advantage is no longer present when the building material is recycled, because the chemical bonds, once broken, are irreversibly destroyed. Thus, the ecologically valuable building material earth becomes an only temporarily improved building material that is also difficult to recycle. Additionally, local knowledge about building earth deposits and its processing seem to be lost, because mixtures of earth and modern building materials require external expertise, have to be imported, and thus are now increasingly oriented towards international science and modern building standards.

The popular global image of earth as an ecological building material that can positively influence the domestic climate becomes problematic when actual traditional house forms are considered, and when questions are raised over the continuation of building craft traditions and the maintenance of cultural identity. The examination of contemporary earthen building in Ladakh has shown that, apart from the obvious desire to find a middle way between tradition and modernity by mixing earth and modern building materials, there is a danger of only using set pieces of historical architecture more or less arbitrarily, which becomes a form of facadism (see Dujardin, this volume). Tradition is a complex and slippery concept, in this case bringing several aspects into tension. Building craft traditions may imply the use of the same materials, construction techniques, styles and designs, as well as continuity in the use of buildings, and in the people and skills involved in their construction. If we were to judge tradition in the most rigid manner, as an exact emulation of the past in terms of processes, practices, materials, and uses, we would be forced to conclude that the earthen building tradition is fast disappearing in Ladakh. However, if we accept that tradition has always been a process of negotiation between proven concepts and new promises, we might rather see evidence of the emergence of evolving, hybrid traditions that occupy particular social, economic, and physical spaces in a constantly changing sociotechnical and cultural context. It thus appears vital to engage as broadly and deeply as possible with emergent patterns of continuity and change—in this case with both the historical and the contemporary earth buildings of Ladakh.

34 Ladakh is also increasingly feeling the effects of climate change. Cloudbursts and floods in particular are becoming more frequent (see Ladakh Floods: A Timeline of Disaster; https://www.thewire.in/environment/Ladakh-floods-timeline-disaster). Earthen buildings are less able to withstand heavy rainfall and their lack of earthquake resistance is also a recurring theme. However, the problem is not so much the building material itself, but the often inadequate construction methods (see Blondet & Villa Garcia 2004). As of now, there are guidelines prescribed by the Bureau of Indian Standards under IS (Indian Standard) 13827 for improving the earthquake resistance of earthen buildings. Currently there is also a draft paper being circulated for comments by the Bureau of Indian Standards for establishing guidelines for the use of Cement Stabilised Earth Bricks (CSEB).

35 Local labour in the building sector has declined sharply in the last decades. Often Nepalis are engaged, with both men and women involved. Many Nepalis have settled permanently in Ladakh with their families, especially in the villages, from where many local people have moved to urban centres like Leh. This rural-urban migration has created opportunities for Nepalis to work as farmhands and construction workers. Labourers from other parts of India (notably Bihar) are mostly male and migratory in nature. They arrive in Ladakh in spring and leave as winter approaches.

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VI

Building Modernity in Sikkim, India

Duncan McDuie-Ra and Mona Chettri

Name: Duncan McDuie-Ra
Designation: Professor and Head of School
Affiliation (Institute): School of Arts and Social Sciences, Monash University Malaysia
E-mail address for correspondence: duncan.mcduiera@monash.edu

Name: Mona Chettri
Designation: Post-doctoral research fellow
Affiliation (Institute): University of Western Australia
E-mail address for correspondence: mona.chettri@gmail.com

Biography

Duncan McDuie-Ra

is a Professor and Head of School at the School of Arts and Social Sciences, Monash University Malaysia. McDuie-Ra's main research interests are urban culture, urban surveillance technology, and urban play in Asia. Recent monographs include *Skateboarding and Urban Landscapes in Asia: Endless Spots* (Amsterdam Univ Press, 2021); *Skateboard Video: Archiving the City from Below* (Springer, 2021); *Ceasefire City: Militarism, Capitalism and Urbanism in Dimapur* (co-authored with Dolly Kikon, Oxford Univ Press, 2021).

Mona Chettri

is a post-doctoral research fellow at the University of Western Australia. She has worked as a post-doc in the Netherlands, Denmark and Australia. She is the co-editor of *Development Zones in Asian Borderlands* (Amsterdam University Press, 2021) and author of *Constructing Democracy: Ethnicity and Democracy in the eastern Himalaya* (Amsterdam University Press, 2017). Her current research focuses on the intersections between gender, labour, and infrastructure in the Sikkim-Darjeeling Himalaya, India and regional Australia.

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INTRODUCTION

India's frontier state of Sikkim is littered with concrete. From flyovers traversing mountain topography to towering walls casing pharmaceutical factories, concrete is integral to Sikkim's urban and rural landscapes and blurred spaces in-between. A small state of extreme geopolitical significance sharing borders with Bhutan, China, and Nepal, Sikkim is a frontier for the contemporary Indian state. As a frontier, Sikkim epitomises Cons and Eilenberg's characterisation as simultaneously remote and proximate, "a zone at once 'in relation to' and 'at a distance from' […] that licences certain forms of experimentation within it" (2019: 13). Sikkim aspires to be a pioneer of a specific form of frontier development, one that combines a public commitment to environmental stewardship with resource extraction by private companies. Concrete is integral to this duality. It is entangled in the production and maintenance of Sikkim's images of wealth and progress alongside pristine ecology. Only *bona fide* Sikkim subjects can own land in most of the state and thus concrete is integral to the vertical growth of towns and cities on land pressured by topographic and legal limitations. Vertical growth has helped migrants find housing while spreading landlordism among the Sikkimese upper and middle classes. It is not uncommon for even the un/underemployed to add another floor of concrete to their family building and begin collecting rent.

Our attention was drawn to concrete during months spent in Sikkim's landscapes during collaborative research on Himalayan towns and cities, and from changes witnessed by one author, a Sikkimese, during their lifetime. During mostly standard ethnographic work, we found that our conversations with residents, migrants, officials, and planners ended up focusing on concrete, either directly or as a shorthand for discussing rapid urban growth and economic development. During this work concrete was our constant companion: moving through concrete buildings, having conversations in them, clambering over their ruins and new foundations, and capturing concrete visually in photographs and verbally in discussions with residents. In this paper we opted to put concrete at the centre of our analysis of urbanisation in Sikkim to see what it could tell us. There is no data on the amount of concrete poured in Sikkim or the size and floor space of buildings, and migration from other parts of India is not recorded unless the migrant is starting a business. The only way to account for the proliferation of concrete is to follow the material itself; a journey we undertook during different periods researching in Sikkim between 2008 and 2019. We have travelled repeatedly from the supply town of Siliguri, the industrial zones around Jorethang, Rangpo, Ranipool, and Singtam and to the state capital Gangtok, district headquarters including Namchi and Mangan, and small towns including Martam, Ravangla, Rhenock, and Namthang. Rather than focus on what the government and the public said about concrete, we are concerned with what



Fig. 6-1 View of Gangtok from the ropeway.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

they do with it; the continual import, mixing, selling, pouring, and building that has transformed the landscape. We are also interested in researching Sikkim, and the Himalayas more generally, through an approach that puts the built environment at the centre of analysis; a significant reorientation given so much research on the region begins (and ends) with culture and/or the "natural" environment.

Through our research across Sikkim, concrete continued to find its way into our reading of place and landscape to the point where we could no longer ignore it, a reading shaped by Cloke and Jones' (2001) notion of dwelling. In their explorations of how "nonhuman actants are embedded in landscapes and places" (2001: 650) they write,

> [w]e argue that the idea of dwelling helps to account for the intimate, rich, intense, making of the world, where networks fold and form and interact in particular formations which include what we know as "places". We would add that this richness and intensity is not seen necessarily as "moral" or desirable or authentic in traditional terms, in any way, and can take bitter, tragic, and contested forms just as it can take more harmonious or hopeful forms (2001: 651).

Using dwelling as an ethnographic tool compels researchers to focus on the "natural" and "built" landscapes that surround, that are "there" so to speak, rather than landscapes and subjects that are carefully selected to tell a particular story. As Cloke and Jones add, "[t]he landscape surrounds you, it will often be unreadable from any one given position, and your orientation may be constantly or frequently, even habitually, shifting" (2001: 663). In rapidly urbanising Sikkim, the proliferation of multi-story concrete structures continually shifts the orientation of researchers and residents. New buildings block light, they alter torrents of water during the monsoon, block roads with construction material. Week-to-week, month-to-month, the landscape keeps shifting, making it difficult to articulate through standard techniques of conversation or interview. Even for residents the change is difficult to gauge or to pin-down with any precision. The only constants are change; change materialised in concrete. This has marginalised traditional building crafts, relegating them to either certain buildings—such as monasteries—or certain parts of existing buildings—decorative doorways, window frames or balustrades. It is common for traditional styles to be mimicked in whole, or in part, by concrete (see Dujardin, and Norboo et al., this volume). Even several showpiece traditional houses, such as the Limbu house in Gangtok or the Lepcha House in Mangan, are concrete versions of traditional building crafts.

The pace of change creates and obstructs vantage points, routes, light, air, temperature, and seemingly the only way to capture the lived experience of Sikkim's landscapes is to be attuned to the intimacies and intricacies of lives lived between un-insulated concrete walls from ridge to valley, regardless of whether those dwelling within have strong or coherent views on the material that surrounds them.

We argue that concrete is central to the ways development is conceived, politicised, and enacted in Sikkim. It has not entirely replaced other building materials, but among ordinary Sikkimese it is the preferred building material. It is perceived as inexpensive, extendable (vertically), impermeable (by rain), earthquake resistant, and a sign of status, of modernity, and of urbanity, even in rural or semi-urban areas. As Emily Yeh argues in the case of Tibet, another frontier region sharing an international border and a long history with Sikkim, "development gains its power in part from its dual reference both to the immanent unfolding of what is natural, and to a process of active intervention" (2013: 11). She adds, "at the same time, development as a project of government also works to shape the desire of its subjects, and the actions that stem from those desires" (2013: 11). In Tibet, urbanisation is central to these desires, and even functions as a "shortcut to development and modernity" that is "both the result of the inevitable juggernaut of progress […] and as a deliberate gift for which Tibetans are and should be very grateful" (2013: 203). This resonates with our position on development in Sikkim; constitutive of a near universal social desire, essential to the legitimacy and function of government, and tied to a larger schema of integration into India. Concrete is the main manifestation of development in Sikkim, both metaphorically and materially.

In addition we develop three further points of argument. First, concrete highlights the ways the dreams and aspirations of Sikkimese are materialised in its villages, towns, and cities. For many, the fastest way to wealth is to construct a building, an extra floor or two (or four), and begin taking rent. Second, concrete is central to Sikkim's political culture as it has evolved since the merger with India in 1975, assembled through coherent and disparate elements: Delhi-Sikkim finance, local patronage,

corruption, special laws and their transgression, materials supply, labour and labourers, and mountain ecology. Third, concrete exacerbates Sikkim's dependency on "mainland" India. To use Hodder's terms discussed below, as Sikkimese become further "entangled" in concrete as a material that enables and constrains their experiences of development, concrete further "entraps" Sikkim as a territory within India, dependent on the supply of cement and other building materials, cheap labour, and tenuous highways.

This chapter has five sections. The first discusses emerging literature on concrete with a particular focus on the work of Forty (2012) and Abourahme (2015). The second section provides background on Sikkim, its geopolitics, and the centrality of development in the state's ideational and material assemblages. The three sections that follow situate concrete vis-à-vis development in Sikkim: concrete and tourism, concrete and hydropower, concrete housing. The conclusion revisits the main arguments and poses possibilities for further research.

SITUATING CONCRETE

Unlike other carriers of modernity such as electricity, the Internet or commercial aviation, concrete underpins an assemblage of people: politicians, bureaucrats, architects, engineers and labour, technology, ideas and the material environment to converge and bring a new built form into being (Elinoff 2017). Furthermore, it is a conduit for relationships that are fluid, fragile and dependent. Once mixed and set, concrete is then reshaped by human (building, demolition, abandonment) and non-human activity. The latter includes seemingly mundane changes through decay, water stains, a sprouting of moss or mold or a hole gouged by monkeys, to spectacular destruction triggered by landslides, floods and earthquakes. As Harkness et al. argue, "concrete is a coming together of different elements […] continually generated and dissolved through their relationship to the world and everyday life" (2015: 310). Such a focus seeks the "human and non-human allies" that create different landscapes; what Jacobs calls "varied fortunes of sustained materialisation and dematerialisation" (2006: 22). In Sikkim one of these forces is the state government that seems to take on an unending amount of concreting works while also leaving the landscape littered with weathered, decaying and ruined concrete. In his ethnography of cement—a core ingredient of concrete—in Palestine, Abourahme captures the position of materials vis-à-vis agency that we feel aligns most closely with our position:

> The idea is not to simply shift the locus of agency from human subject to nonhuman object or to affirm some kind of subjectivity or personhood of objects or materials themselves (and replace one conceit with another) [...] Rather, the task is to uncover not only how what has been considered banal and inconsequential is in fact central to the mediation of what, for lack of a better word, is called agency but also how this mediation tends to happen not as part of intentional and directed causal chains but through excesses or spillovers (2015: 204).

The intentions and excesses evoke Hodder's (2014) notion of the entanglements of the human and non-human. For Hodder, writing with a long historical view, relational approaches to humans and non-human things pay insufficient attention to the dependencies of humans on things and things on humans. He writes,

> There are problems with the idea of a total mixing of humans and things in networks or meshes. At certain historical moments and in certain contexts, humans appear dominant over things, but at other places and times things seem to have the dominant hand [...] interconnections, it seems more accurate to talk of a dialectical tension of dependence and dependency that is historically contingent. We seem caught; humans and things are stuck to each other. Rather than focusing on the web as a network, we can see it as a sticky entrapment (2014: 23).

Sikkim, as a space, a polity, and a reasonably coherent social and cultural collective (especially in the Indian context) is entangled in concrete. Sikkim is "entrapped" by the desire to create bigger houses, to be developed, capitalise on restrictive property laws, engage in patronage politics, cash in on tourism, and the networks of production (not only of concrete



Fig. 6-2 Vernacular roof on Namchi plaza, completed 2011.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

but also reinforced steel bars or rebar, paint, and bricks—all produced outside Sikkim in nearby states of North India including West Bengal, Bihar, and Uttar Pradesh) transport, labour, land clearing, timber and water use, waste and hazard that come along with the concrete boom.

Sikkim has a long history of isolation from the economic and political developments in colonial and postcolonial India until the merger in 1975 (Das 1983; Hiltz 2003). Sikkim's colonial experiences of rule by proxy through an established monarchy, the Namgyal dynasty (1642–1975), has more in common with surrounding polities such as Bhutan, Nepal, and Tibet than with other parts of India. Sikkim was valued for its strategic location as a portal into Tibet and later as a border with China. Sikkim's cultural, political, and economic connections with Tibet had flourished throughout the reign of the Namgyal *Chorsgyals* (1642–1975), who were of Tibetan origin. However, in the face of increasing political interventions and incursions from India, the reinterpretation of Tibetan high culture as "Sikkimese culture" became a political project for the *Chorsgyal* Palden Thondup Namgyal. The *Chorsgyal*, along with the Gyalmo (Queen Consort) Hope Cooke embarked on a mission to protect Sikkim's independence by curating a distinct Sikkimese identity based on clothes, religious rituals, artifacts, and architecture that were heavily influenced by Tibet and Tibetan Buddhism (Hiltz 2003, 2011) despite the considerable ethnic, linguistic, and cultural diversity in the Himalayan kingdom. This had a profound impact on the institutionalisation of Sikkim as one of the last *sbas yul* (sacred hidden land), a religious and cultural refuge of Buddhism in the Himalayas (see Mullard, 2011). Vajrayana Buddhism and Tibetan art, architecture and culture became symbolic representations of Sikkim and have remained so, even many decades after the eventual merger with India in 1975. The idea and imagery of a Buddhist Sikkim persists and is ubiquitous, displayed in government emblems, official documents, souvenirs and most importantly, in the aesthetics and architecture of the urban landscape. The maintenance of Buddhist Sikkim has also been vital in defining and promotion of the state as an idyllic, peaceful tourist destination (Arora 2009).

Much of the built environment in urban and small-town Sikkim reflects this heritage, often in concrete. Standard local architectural forms now common throughout Sikkim include: a wrought iron fencing featuring the Buddhist *palbheu* (the endless knot) painted yellow and green, green painted buildings fronting public space decreed by the Sikkim Green Mission, sloped roofs reminiscent of a *gompa* (monastery) on public buildings, a statue of Gandhi (a feature of towns throughout India) and water fountains. Rural housing displays a mix of concrete and traditional building materials, with some older houses using timber, stone, clay, and bricks, while others mix these materials with concrete and steel, asbestos or zinc roofing sheets. Rather than viewing Sikkim as a space for extraction and capitalist expansion, colonial and postcolonial interventions in Sikkim were built around cultivating loyalty through financial and material dependencies. After 1975, dependency on Indian finance, goods, and protection intensified, accelerating following India's economic liberalisation in the 1990s. Successive state governments have entrenched Sikkim deeper in dependency on India and eliminated any alternative political futures, especially economic autonomy. Political power in the state rests on the ability to guarantee the status quo. Given Sikkim's border with China, India too wants to ensure the status quo and goes to great lengths to ensure a stable, loyal, and peaceful frontier state.

Concrete helps to create, and signify, what Michael Watts (2004), writing about the Niger Delta, has labeled "governable space" out of frontier space. Turning Sikkim into governable space has been successful, turning a monarchy with limited cultural connections to India situated in a sensitive geopolitical frontier into a loyal and obedient state in the Indian Union. Sikkim's governability—to stretch Watts a little further—is deemed successful when compared to the unruliness of other frontier states in India, from Manipur and Nagaland in the east to Jammu and Kashmir in the west. Concrete is central to the nation-building process in the frontier. It is central to the assemblage that deepens Sikkim's dependency on supply, finance, and labour from India. The proliferation of concrete marks a shift towards urban living and away from the production of food and agriculture; towards the production of landscapes for tourists, electricity for export, and ever-greater consumption of goods transported up the mountains from mainland India.

By focusing on concrete, we hope to encourage and embolden researchers to consider modern "things"—objects, materials, buildings—that have escaped detailed analysis in the Himalaya but are, arguably, as instructive as the established ways of narrating the past, present and future in this and other frontiers.

These things are interwoven into the fabric of the region, its past, its geography, its future, its contradictions and identities for residents as modern subjects of national (India) and local (Sikkim) power. There has been limited attention to the politics of concrete in India, including in the Himalayas (Belz 2013), though there is an emerging corpus of literature on the politics and rituals around infrastructure more generally in India ranging from pipes (Anand, 2011) to highways (Sabhlok 2017) to special economic zones (Ishii 2017). For these and other authors, infrastructure has been central to nation-building in India (as elsewhere), yet distinguishing the formal from informal components can be difficult, even within what appear to be public bodies (Roy 2009). As Cross argues, infrastructure is also deeply enmeshed in the imaginations—the dreams—of capitalists, politicians and their constituents, bound up in anticipation of an alignment of "divergent dreams for the future […] in ways that make flows of capital more powerful and effective" (2015: 426). Concrete, and its associated materials, takes form in public infrastructure such as dams, tourist sites and factories, and in private construction fuelled by steady employment in an expansive bureaucracy, personal loans guaranteed by this employment, and the demand for urban living space in a tightly controlled land market. Concrete is also evident in objects littered around these sites, not only as fragments of incomplete buildings, concrete debris, but garbage bins, ornate signage, and selfie-friendly mythical beasts.

Sikkim's concrete entanglements further its dependency on the rest of India, especially the sprawling city of Siliguri where the majority of concrete and other construction materials—rebar, sand, gravel, cement, plyboard, bricks, paint—is produced and amassed before being hauled up the erratic National Highway 10 (NH10) connecting Sikkim to the rest of India. Unlike other parts of India, almost everything that contributes to construction and development in Sikkim is first gathered in Siliguri. In his analysis of the Siliguri Corridor as a "choke point", Middleton identifies the paradoxes of "circulation/regulation" wherein "in/detectability has emerged as a distinctive problem—and art—of chokepoint life" (2018: 11). One member of the city's police administration estimated to Middleton that between "20,000 and 25,000 vehicles ply the busiest intersections in a single hour" (2018: 11), moving goods between India and its frontiers, including Sikkim. Middleton's research also demonstrates why accurate figures on the supply of goods through Siliguri is impossible. As he writes, "Customs agents readily admit the impossibility of regulating the corridor […] Customs now has redefined its duty as 'facilitating trade'." (2018: 12). There is more than one route from Siliguri into Sikkim, but Siliguri cannot be bypassed, not by trucks at least. There is a trading post with Tibet at Nathu-La, but this is highly regulated and securitised; most (legal) trade across this border is in clothes, household and food items. There are no trading posts at the Sikkim-Nepal border in west Sikkim, while smaller crossings into neighbouring Darjeeling are mostly used by day-labourers and smugglers (Chettri and McDuie-Ra 2018). Sikkim's geopolitics intensify the significance of concrete and the singular line of supply. Each truck that goes up NH10 from Siliguri deepens Sikkim's entanglement with India, depends its dependency, deepens the long-running project of national integration. Despite some similarities to the proliferation of concrete in other parts of India, notably form, there is a particular frontier quality to Sikkim's concrete addiction. Blockades on this highway, whether caused by political agitations, weather, wear, or accident make the supply of concrete (and food) extremely vulnerable, but have done little to shake the need, or perceived need for more.

In discussions of the proliferation of concrete, hydropower, waste and the spread of urban areas, many Sikkimese offer relative explanations about the future; at least there is still forest and scenic landscapes in parts of the state. A comparison is often made to Darjeeling District in neighbouring West Bengal, which is, admittedly, suffering far more from deforestation, erosion, water shortages, waste problems, and unplanned urban growth (see Drew and Rai 2016; Ganguly-Scrase and Scrase 2015; Mell and Sturzaker 2014). The seeming contradictions between the preservation of pristine landscapes and the desire for more development, more tourism, and more concrete generate little public anxiety. People across income, ethnic, and class distinctions in Sikkim covet and procure more and more concrete. As Hodder notes, "it is very difficult for humans to become less entangled because of the costs that have been invested in existing technologies and material and social worlds, and because unraveling one part of an entanglement often involves disentangling too many other parts" (2014: 32).



Fig. 6-3 Concrete Pheasant: the state bird of Sikkim.
Source: Duncan McDuie-Ra and Mona Chettri (2020).



Fig. 6-4 Tibetan style plaque at Namchi.
Source: Duncan McDuie-Ra and Mona Chettri (2020).



Fig. 6-5 Government Building Under Construction, Gangtok.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

We have focused on works by two authors to situate concrete for our purposes: Forty's work on concrete and culture, and Abourahme's work on concrete and assemblage. The overarching point Forty makes in *Concrete and Culture* is simple: "Concrete is modern […] it is one of the agents through which our experience of modernity is mediated" (2012: 14). We recognise the long and complex history of modernity as a concept, and the cultural politics of its regional variations (variations pronounced in India, see Sivaramakrishnan and Agrawal 2003), yet here we choose to focus on Forty's claim of modernity mediated in concrete. This is particularly pronounced in a frontier state like Sikkim, which had limited access to the material trappings of modernity through most of its recent history until the last few decades. Forty also points to a duality, given concrete can be made almost anywhere by anyone it is not exactly modern "in the sense of an advanced technology or industrial process" (2012: 41). This is why its rapidly growing presence in Sikkim is worth our attention. Concrete is malleable material, able to be thrown together in the high Himalaya; mixed in small mixers powered by generators and by hand on construction sites, in open fields and wastelands, or on the back of trucks parked across narrow mountain roads. Pouring usually slows down during the annual monsoon between June and September, and accelerates in the dry months, including the winter, particularly at low altitudes where the densest settlements are located between elevations of 300 m (Jorethang) and 1,650 m (Gangtok). While concrete can be mixed cheaply and rapidly in Sikkim, its component parts all come through Siliguri. The materiality that makes concrete so desirable also deepens Sikkim's entanglement with India.

Aside from the material itself, Sikkim's landscapes and the sides of the roads that connect it to the rest of India feature advertisements for concrete on walls and support structures (very common in the Himalayan landscape to flatten steep earth for building), billboards, and hoardings on kiosks, market stalls, and even police traffic control islands. Along NH10, ground-level government distance markers have been joined by small signboards sponsored by one of the major concrete companies; their logo larger than the town and distance information they are meant to convey. Prolific too along the route are advertisements for rebar, featuring Bollywood and sports celebrities demonstrating the strength of various makes of rebar. Concrete companies provide signs for shops and hotels along the route too, ensuring that reminders of the concrete that builds the hill settlements are never far from view. And for these companies Sikkim is clearly a rich market for concrete, making it a valuable part of the domestic territorial imaginary.

Of the major arguments Forty makes there are three that are especially relevant here. First, concrete is a crucial "technology of poverty" and "its use by self-builders in poor countries probably exceeds all other applications" (2012: 40). He adds that the use of concrete in poor areas "is characterised by ingenuity rather than innovation […] what matters is the way small amounts of reinforced concrete are made to go a long way" (2012: 40). We read this as admiration for concrete as a democratic material, not a condemnation of its aesthetics or associations. Second, concrete is mundane and numinous, secular and sacral. Its low-tech pragmatism appeals to secular ideologies seeking radical and ethical modernisation in mass housing, infrastructure, showpiece urban landscapes in places like Chandigarh (India) and Brasilia (Brazil), fortifications, bomb shelters, walls, bunkers, and military installations. At the same time concrete figures in both places of worship—especially 20th century churches, temples, mosques and monasteries—and in memorials (a contrast to the idea of concrete as soulless). Third, concrete has a reputation for requiring little skill—both its gift (empowers people) and its defect (considered cheap and lacking prestige) (2012: 225). Concrete can be used by both unskilled and semi-skilled labour, separating what Forty calls the "mental" and the "manual" aspects of construction. The "cheapness" of concrete is mostly realised in the unskilled labour costs. In Sikkim, migrants from outside the state do most of the unskilled labour—the manual in Forty's words—and are easy to spot hauling, mixing, pouring, and smoothing concrete.

While Forty aims for historical breadth, Abourahme analyses concrete objects (bricks) and structures in the material assemblage of the Deheishe Refugee Camp on the West Bank. He analyses it along with other "disparate elements"—bodies, political discourse, graffiti, sewage, pipes, national slogans—arguing that cement constantly slips between the "material lived" and the "symbolic political" (2014: 204). Deheishe has urbanised at "break neck speed" since being built in 1949, growing vertically and then sprawling out into Bethlehem. Abourahme notes,

> With cement, the camp became structurally dense, outstripped its support capacities and demanded constant maintenance, innovation and reworking. It has been assembled and reassembled through cement. Cement not only holds it together but also gives it the capacity to expand and spill out beyond its boundaries (2014: 211).

For Abourahme this is about "representation's remainders" and what they can tell us. It is about what happens when concrete is the principal ethnographic subject and is allowed to tell its own story as "the most ubiquitous single element in camp life, marking the particular possibilities and paradoxes, associations and conflicts it helped shape" (2014: 203).

Concrete has the capacity to generate affective and emotional responses from humans who dwell within it, on it, under it and between it, as well as those living in its shadows, especially those shadows cast by hydropower dams and other industrial facilities. Responses in Sikkim are intensified by the recent and rapid proliferation of concrete, the rapid ruin of existing concrete given the monsoonal climate and the penchant for shortcutting in construction—especially in civic projects, and the stark juxtaposition between concrete, forests, and mountains. Concrete is integral in the evolution of Sikkim into a space and culture of consumption. In his famous appeal to reconsider and revalue material cultures, Miller argues for taking seriously the "ability of groups to use the variable objectifications available in a range of commodities to create a much more subtle and discriminatory process of incorporation and rejection" (1998: 18), including the ways consumption rather than production can be integral to identities. When left to tell its own story, concrete in Sikkim narrates aspirations for a shortcut to development, for unfettered consumption after centuries of isolation, while also emphasising the acute dependency on financial transfers from the central government and the geographical dependency on Siliguri.

SIKKIM: SUSTAINABLE DEPENDENCY

Sikkim is a small state with an official population of 610,577 (Census of India, 2011).[1] After being merged with India, controversially, in 1975 (see Datta-Ray 2013) Sikkim has enjoyed extensive (and excessive) finance from the Indian Government. Sikkim is governed by a state assembly, like other states in India, but also has a series of special constitutional provisions that protect its subjects and their land rights. India has many border states each with their own geopolitical complexities. Sikkim's geopolitics is produced by two interwoven anxieties for India: one, its history as an independent polity for over three centuries with religious/cultural and territorial ties to Nepal, Tibet and Bhutan; and two, its contemporary border with China. These anxieties ensure a constant flow of financial resources to the state from Delhi, as well as a substantial military presence of regular Indian military and paramilitary forces, ostensibly to patrol the border and protect Sikkim (and India) from potential Chinese incursions.

Through four-plus decades of this largesse, development has become a singular political force underwriting the legitimacy of successive state governments and altering Sikkim's Himalayan landscape in astounding ways. Sikkim is widely touted as a development success story and a responsible ecological steward. Sikkim performs well in many human development indicators, evident in reduced poverty rates, alleged universal sanitation, extensive electricity provision, and strong education indicators (GoS, 2015a: xxxvi–ii, 18f., 21f., 29, 69). Development success is claimed and attributed to the long-serving Chief Minister Pawan Chamling and his ruling Sikkim Democratic Front Party, in power between 1994 and 2019. Though recently voted out of power, the SDF's legacy ensures constant development—constant construction—remains an irrefutable goal for Sikkim.

Despite the trappings of its geopolitical circumstances, or perhaps because of them, Sikkim struggles to generate internal revenue. There is no income tax in Sikkim for *bona fide* "Sikkim subjects" under Sikkim Income Tax Manual 1948 (now under Section 10 of the Indian Income Tax Act, 2005). Sikkim's economy is almost entirely financed through transfers from the Central Government in three main forms: a share of central taxation, plan grants (for "non-productive areas" including salaries, subsidies, loans), and non-plan grants (projects under various ministries).[2] Transfers

1 This figure is likely to be a significant underestimate considering the large seasonal and floating population that tend to evade census counting, a phenomenon pronounced in Sikkim given protective laws make it very difficult for non-Sikkimese to claim residency.

2 The distinction between plan and non-plan grants was collapsed in 2016.



Fig. 6-6 Concrete buildings in Chungthang.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

from the Indian Government constituted 76 % of revenue in 2016–2017 and 79 % in 2018–2019. Centrally Sponsored Schemes transfer additional funds directly to implementing agencies in Sikkim for specific development policies being rolled out all over India. Market borrowing is also a substantial part of Sikkim's debts and liabilities, comprising a reported 62 % of state debts and liabilities in 2016–2017 (GoS 2018: 27). In addition, Sikkim receives funds through the specialised Ministry for Development of the North-East Region, a number of state specific grants for schemes such as border areas development, police infrastructure, and subsidies and concessions for state enterprises. Although many states in India are heavily subsidised by the Central Government, Sikkim's status as a sensitive border state abutting China — a country that fought a war with India in 1962, continues to dispute the border and made incursions into the Doklam Plateau in 2017 (Tibet-Bhutan border) — produces a level of financial dependency deeply ingrained into the ways Sikkim is structured, governed, and developed.

Development in Sikkim rests on the tripartite strategy of tourism, industrial growth (particularly pharmaceutical manufacturing and hydro-electric power projects), and the infrastructure that connects and enables these sectors; all of which require concrete. Unlike other parts of India, the Sikkim Government exercises a high degree of control over the built environment through a combination of new legislation and the "Old Laws" safeguarded by Article 371F of the Indian Constitution (Kazi 2009). These laws protect the transfer of land from "Sikkimese subjects" to non-Sikkimese and a series of additional restrictions protect "tribal" groups within the Sikkimese population (Bhutias, Lepchas). Members of these communities cannot sell land outside their communities but can lease and/or rent out property on it, incentivizing owners to maximise revenue on owned land, manifest in the creation of buildings with multiple residences, all enabled by concrete. These laws also determine where migrants can settle, whether they can own property, the sectors of the economy within which they can sell their labor, and whether they have to pay taxes.[3] Throughout Sikkim the government controls the height (and sometimes even the colour) of buildings depending on location ("based on the stability map of the area") ranging from 1.5 to 5.5 storeys (Government of Sikkim 1991/2001: 1). Buildings are stipulated to have at least 25 % of a roof "constructed in sloped gabled of traditional roofing" (Government of Sikkim 1991/2001: 2), though we note that this applies only to completed buildings and many residential buildings feature an incomplete upper-most floor in lieu of traditional gabled roofing. The government regulates non-residential space by controlling street vending, parking, public transport, and has strict rules on advertising, signage, and graffiti when compared other parts of India. Yet in many areas, both urban and rural, height restrictions are ignored or their transgression permitted. It has become so common that few people even notice. The malleability of concrete means that buildings can conform to the dimensions of land size on their ground floor, then jut out more widely for additional floors, encroaching on vertical space.

While laws on height seem to be easily transgressed, other laws are closely monitored and enforced, particularly land ownership and transfer. This vertical urban expansion is common across the hills of the eastern Himalaya and as Brown et al. (2016), writing in the context of urban growth in Darjeeling, suggest, can also be read as a signifier of the changing character and class relations in the hills, especially in the context of increasing rural-urban migration. Similar to Sikkim, in Darjeeling new constructions intended for hotels or rental properties are generally high-rise concrete structures intent on maximizing financial returns with little consideration for the town's heritage, ecology, or building safety.

Between 2001 and 2011, Sikkim's urban population increased two and half times from 59,870 to 153,578; or from 11 % to 25 % of the total population of the state (Census of India 2011). Urban local bodies (ULBs) — a catch all for municipal corporations, municipal councils, and Nagar Panchayats (city councils) — are increasing in number, they are receiving higher levels of direct finance from the state government, and Sikkim has been successful in bidding for flagship national urban schemes including the Smart Cities Mission (Namchi and Gangtok) and the Atal Mission for Rejuvenation and Urban Transformation (Gangtok). Finance for these schemes is manifested in new buildings, drains, pathways, and public car parks; most of which are made in near identical concrete form across the state. More infrastructure projects provide more opportunities for subcontracts and remain one of the few ways to bring public money to a locality, village or area. These schemes and the public works they finance provide opportunities for the well-connected to win construction

3 Under Revenue Order No. 1, 1917 land belonging to members of the Bhutia and Lepcha communities cannot be transferred to members of other communities. Non — Bhutia-Lepcha land cannot be sold to non-Sikkim Subjects. There are several exceptions tightly regulated by the state, including the provisions of the Sikkim State Site Allotment Rules 2012, Land Acquisition and Rehabilitation and Resettlement Act 2013, Municipalities Act 2007.

contracts, which are usually sub-contracted multiple times before the project is completed, leaving concrete testimonies in various states of glory and ruin throughout the landscape.

Entangled with this culture of patronage are pronounced consumer aspirations among the population, proliferating ethnic identity movements, fluctuating anti-migrant political discourse, the constant presence of the military and various paramilitary border forces, rapid urbanisation in big and small towns, and the need for the Sikkim Government to generate revenue — even symbolically — which it does through hydropower development and pharmaceutical manufacturing along with legalised gambling. This gathering of things, this assemblage of, to return to Abourahme, the "material lived" and the "symbolic political" (2014: 204) is the focus of our explorations of concrete in Sikkim. We do so by following three configurations of concrete in Sikkim: concrete and tourism, concrete and hydropower, and concrete housing, which juxtapose the spectacular with the mundane and the public with the private.

CONCRETE AND TOURISM

Despite natural scenic beauty and rich cultural history, tourism in Sikkim caters to the desire of tourists, mostly domestic,[4] to see something that can be touched, photographed, and ideally reached by vehicle. Of the different experiences offered by Sikkim Tourism, the religious tourism circuit is extremely popular. This circuit begins in Buddha Park, Ravangla, where a 130 ft. (39.6 m) copper and gold-plated statue of Lord Buddha sits mounted on a concrete pedestal. Within the concrete pedestal is an exhibition space displaying 13 relics of Lord Buddha donated by important Buddhist *sangha* from across South-East Asia. The inner walls of the pedestal are painted with bright frescoes depicting different aspects of Buddhist religious philosophy and stories from the *Jataka Tales*. Outside, the statue is surrounded by several large concrete *ting* (bowls of water offerings) and placed at the foot of the steps are prayer wheels, fountains and flowerbeds.

Food and handicraft stalls are located near the elaborately decorated gate and during tourist season (April-June and October-January), a line of taxis wait outside to take the passengers to Samdruptse, 20 km away, where a 135 ft. (41.1 m) copper, gold-plated statue of Guru Padmasambhava, the patron saint of Sikkim, is seated on a lotus overlooking the hills and valleys. There are no permanent metal workshops for statues so, like giant pieces of Lego, different parts of statues are either imported from other states and assembled, or are constructed in makeshift construction sites in Sikkim. The statue rests on a large concrete block decorated with Tibetan prayer wheels, snow lions and other religious inscriptions. Tourists and locals visit Samdruptse, marvel at the gigantic statue, take photographs, spin prayer wheels and pray before making their way down to Namchi town; itself a gathering of extraordinary concrete structures including the semi-defunct Namchi Plaza in the centre of town. From Namchi, visitors make their way to Char Dham at Solophok; a Hindu temple complex comprising of concrete renditions of the four most important Hindu religious sites (Badrinath, Jagganath, Dwarka and Rameshwaram), a statue of Lord Kirateshwar (local reincarnation of Lord Shiva) and a mix of smaller statues, watched over by an 87 ft. (26.5 m) high statue of Lord Shiva.

These statues and religious complexes have been built by the Sikkim Government over the last decade as a part of its larger tourism strategy to make "tourism the main livelihood of the people of Sikkim, and each and every household and individual a skilled force for

4 The number of Indian tourists increased from 552,453 in 2011 to 1,375,854 in 2017. The number of foreign tourists (inclusive of Nepalese and Bhutanese tourists) increased from 23,945 in 2011 to 49,111 in 2017.

See online: http://www.sikkimtourism.gov.in/Webforms/General/DepartmentStakeholders/TouristArrivalStats.asp (accessed: 17.7.2018).

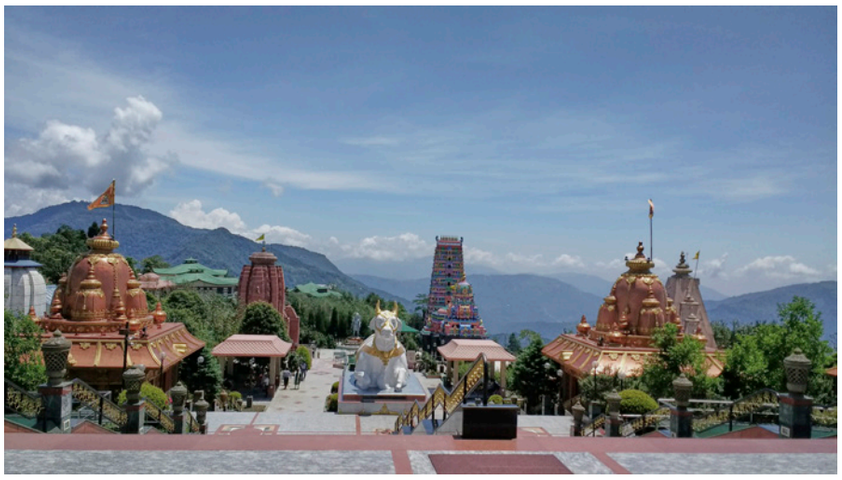


Fig. 6-7 Char Dham Tourist Complex.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

the tourism industry" (GoS 2015a: 76), though some sites seem to defy any discernible use or prospect for profit, instead reflecting Simone and Pieterse's observation that some of the most powerful forays of this kind of capital "attempt to go beyond rationality as if seeking to become some mystical power" (2017: 61). The positive impacts of tourism are limited only to specific areas and to those who can invest in hotels, shops and taxi owners/drivers who shuttle tourists from one location to another. The tourism sector contributes only 8 % to the state's State Gross Domestic Product, yet more resources are allocated to this sector than to rural development, agriculture, and education.[5] Furthermore, much of the expenditure under Water Supply, Sanitation, Housing and Urban Development is spent on infrastructure to improve access to designated tourist sites and areas seeking to benefit from increased tourist traffic (GoS 2017), bringing roads, water and electricity to previously ignored towns and villages.

Concrete temple complexes incorporate the remote frontiers into the fold of the nation-state, especially the Hindu *rashtra* (nation). For instance, the sprawling Vishwa Vinayak temple (which according to a local newspaper was conceptualised by the then Chief Minister himself) in east Sikkim was inaugurated by the General Secretary of the Vishwa Hindu Parishad (World Hindu Council), a right-wing Hindu nationalist organisation affiliated to the ruling Bharatiya Janata Party. These temple complexes and their highly publicised endorsements by leading Hindu organisations in an otherwise pre-dominantly Buddhist landscape heralds a new state-building strategy in the frontier. As more statues, temples, and cowsheds get commissioned in different parts of the state, it cements Sikkim's position as a loyal border state worthy of more financial aid and support. While gigantic structures and sprawling religious complexes dominate the landscape in the lower hills of Sikkim, concrete is materialised as hotels and resorts in the mountainous northern and western districts. Layers of buildings, mostly hotels and guest-houses, dominate the landscape of small villages and towns such as Lachung, Lachen, and Pelling; areas once considered too remote to be viable tourist destinations but are now well-connected to the tourism circuit. Sikkim relies on mass tourism and the majority of tourists come to enjoy the landscape rather than partake in culture. While there is a small demand for "authentic" village tourism ('authentic' usually in terms of food, cultural and livelihood practices, not necessarily in terms of architecture), most domestic tourists come on tour packages, which are the most economical option. The itinerary is fixed and the tourists travel between places, staying overnight in multi-storeyed hotels and lodges. With the increasing number of tourists arriving in Sikkim each year, the real estate value of these areas has continued to increase, especially given the afore-mentioned restrictions on land transfer and acquisition. To circumvent the strict land and property ownership laws, hotels are built and owned by Sikkimese citizens, but leased out to hoteliers from West Bengal and other parts of India who arrive with their own retinue of "Indian" staff. Only home-stays and a handful of hotels are managed by the Sikkimese themselves, though most hotels hire a few local staff to navigate unforeseen problems with local residents or taxi-drivers.

The majority of the construction workers and shopkeepers in these areas are migrants from Bihar and West Bengal, contributing to a change in the sensory experience of a location. For instance, Lachung in north Sikkim has developed into a pit-stop for travellers. Lachung valley is littered with multi-story concrete hotels frequented by Indian tourists, with a few local cottages sprinkled on the edges. Here more tourists are visible than locals. Most hotels do not serve meat as the majority of tourists are vegetarians, despite meat being a major part of the local diet. This evokes Chio's accounts of tourist landscapes in southern China where she discusses the ways ethnic minority communities must cater to the concepts of leisure for the (mostly domestic) tourist market and find ways to present themselves

5 See online: http://sikkimfred.gov.in/FRBM/Documents/2017–18/Sikkim%20MTFP%20-%202017–18.pdf (accessed: 1.9.2018).



Fig. 6-8 Hotel Under Construction, Namchi.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

visually. She argues that focusing on landscapes of travel reveals the ways "rural ethnic villages undergo material, structural alterations to better suit tourism and achieve ideal modern, sanitised living conditions; and how village residents learn to be touristic in order to successfully build their village-based tourism industries and attract potential visitors" (2014: 10). She adds that the resulting landscape must be "generic enough" and "specific enough" to satisfy the demands of different tourist cohorts and the residents' "aspirations for a place in modern China" (2014: 10). Places, people and culture are an integral part of the culture of consumption through advertising, packing, market position and the management of staged cultural attractions and "natural spectacles" through material intervention in the landscape (Norton 1996). In Sikkim, the commodification of the urban and natural landscape is geared towards fulfilling the expectations of tourists who want to see mountains (snow, specifically) as well as spectacular statues, temples and other attractions like religious parks, skywalks, viewpoints, etc.; though have less interest in the local population, especially when not dressed in exotic costume. The desire to fulfill these expectations and to attract more tourists has led to the creation of a hybrid landscape of nature and concrete.

Tourism fuels the clamour for the miraculous, transformative power of concrete as it has the power to create real changes in peoples' lives. The construction of statues and religious-themed parks has emerged as an easy way through which to promise and deliver development; a convenient distraction from the failures and shortcomings in other socio-economic sectors, especially in the labour sector.[6] Nonetheless, every year different local government bodies, *panchayats* and municipalities lobby the government to be "developed" into tourist destinations, whether that be temples, monasteries, viewpoints or memorials, in a bid to attract tourists as well as the infrastructural development that comes with it.

Dwelling in these microsites animates the shifting orientation, to return to Cloke and Jones' language, of the resident and visitor and highlights their juxtaposition to the landscapes carefully presented for consumption. The process of "developing" towns and villages into tourist destination necessitates more concrete: hotels, guest-houses, restaurants, parking plaza, shopping malls, pedestrian fly-overs, all of which are essential for a modern Himalayan experience. Concrete provides access to the landscapes that tourist come to consume, enabling hotels, retail outlets, pathways, and lookouts to hang over the steep mountain topography, colonising one hillside to afford views of another. The profits from landscape consumption and the construction of scenic spots, theme parks, and hotels are poured into more concrete; taller houses, expanding city and town boundaries, more shops, more carparks, more pressure to be employed, to find a patron, to embezzle. At the same time, they create new forms of social stratification around property ownership, access to capital, and connections to the political and business elites that can transform a family plot of land into a multi-story hotel and maybe instant riches.

6 The 2012–2013 Annual Employment and Unemployment Survey states that Sikkim has the highest unemployment rate in India with 136 per 1000 people aged over 15. The contributions of agricultural and allied industries, one the key economic sectors, to the Gross State Domestic Product (at current prices) declined from 18.71 % in 2004–2005 to 9.97 % in 2014–15, contributing to the overall unemployment rates in rural areas (GoS 2015b).



Fig. 6-9 Concrete Buddhist religious motif on a rock, North Sikkim.
Source: Tashi Chopel (2022).

CONCRETE AND HYDROPOWER

Hydropower projects tell a different story of hope, decay, and abandonment, though emanating from the same assemblage discussed above. Originating in north Sikkim, the river Teesta and its tributaries traverse through mountains and valleys of Sikkim and Darjeeling Himalayas and the plains of West Bengal, before finally merging with the Brahmaputra in Bangladesh. This network of perennial, fast-flowing rivers are also sites of major hydropower projects that are being developed to supply power grids in north India (Dutta 2015). The Indian Government has identified 168 large dams in the Brahmaputra river basin with the capacity to generate 63,328 megawatts of electricity (Asia Foundation 2013: 9). Hydropower development is part of a larger state mission to transform marginal, sparsely-inhabited wastelands into productive space.

Imageries attached to the idea of a borderland—barren, backward, remote—are crucial in legitimising the incursion of capitalistic development and commodification of natural resources as "corporate raw material" (Tsing 2003: 5101).

Sikkim and the entire north-eastern region of India is deeply embedded within this problematic and essentialised imagery. Hydropower is alleged to be a green resource with the potential to fulfil the energy requirements of heavy industry outside Sikkim, urbanising cities, and rural electrification whilst lowering carbon emissions. Blending with the discourse of green and organic Sikkim, the notion of green energy eases its spread across the fragile Himalayan environment. Sikkim is located on one of the world's most geologically and seismically sensitive active mountain ranges with many steep, fast-flowing, silt-laden rivers, and yet, hydropower developers and promoters continue to build more dams. Combined with other anthropogenic activities (urbanisation, deforestation, and infrastructure development), hydropower projects have intensified the pre-existing "hazardscape" producing new geographies of uneven risks (Huber 2019; Gergan 2016). Despite the abundance of perennial rivers and strong potential for hydropower (4286 MW), Sikkim remained isolated from the national energy market until the 2003 National Electricity Act. This Act catalysed Sikkim's transition from an agricultural kingdom to India's resource frontier by encouraging privatisation and de-regulation to attract private investors to the renewable energy market and minimise state intervention (Thakur et al. 2005). The Act was welcomed by the Sikkim Government to help the state begin exploiting "its huge hydropower potential" (GoS Energy and Power Department)[7] and by 2007, 32 Memorandums of Understanding had been signed with hydropower developers, the majority of which were with private companies.

However, as Dharmadhikary (2008) notes, the people of the region face huge environmental, social, and economic risks, but gain little benefit from these hydropower projects. Supported by the state government, private investors were able to acquire land and facilitate labour migration in a state that has extensive and strictly regulated rules around the sale and transfer of land, migration, and employment. Despite many controversies, protests, and anger around land acquisition, damage to the environment and the negative impact on local communities (see Arora 2009; Chettri 2017; Chandy et al. 2012; Fernandes et al. 2016; Gergan 2014; Wangchuk 2007) 12 dams are currently under construction in Sikkim. Thus, the construction of these dams by Indian developers and the sale of electricity to India is another way to integrate the frontier into the nation; the fragile ecology meets the sensitive geo-polity. This recalls Nehru's famous adage of dams as the "temples of modern India"; an adage he later came to qualify in his lament over India's obsession with large infrastructure (D'Souza 2013).

Walls of concrete across the rivers and on the riverbanks divert the flow of the river to a system of tunnels burrowed under hills, leaving vast stretches of the riverbed dry for long periods. Dams change the volume and flow of the rivers, making it unpredictable for fishing, bathing, recreation, and cremation. The collection of water behind the concrete barrages slowly floods the land, submerging trees, plants and riverbanks leading many families to abandon their homes, often without fair compensation (see Eden and Wangchuk 2018). While riverbanks disappear under the water, locals in the vicinity of the tunnels have been observing decreasing water levels in their neighbourhood springs. Many locals consider this to be a result of dynamite blasting during dam construction and the network of concrete tunnels under the hills, which have diverted underground water away from the springs and towards other outlets and cracks inside the tunnels themselves (Sharma et al. 2014; Rao and Prakash 2015: 182).

7 See online: https://www.sikkim.gov.in/portal/portal/StatePortal/Department/EnergyAndPowerDepartment (accessed: 19.7.2018).

The apparent indestructibility of concrete generates confidence in these projects and their power to harness the rivers and mountains of the frontier. However, there are several projects that have been abandoned prior to completion and lie deserted, with incomplete concrete columns in the middle of the river, unoccupied labour quarters, decaying, leaking tunnels, rusting vehicles, and machinery stored inside the tunnels and along the road. For instance, the Teesta VI hydroelectric project was stalled due to financial insolvency of Lanco Teesta Hydro Power Private Limited and was served with a notice of contract termination by the Sikkim Government in 2017. While litigation continues, incomplete concrete pylons across the river and on the riverbanks are left to the elements; to decay and be reclaimed by nature. These projects, half-formed and incomplete, await new investments, weathering rain and time, waiting to be resuscitated by new investments or investors. As Harvey (2015) states, "this particular mode of decay, which speaks of a bleak incapacity for absorption into the wider environment, collectively provoke complex associations of hope and despair", leaving local communities in a state of suspension.

Hydropower projects are sites of in-migration especially of labour (manual, technical and administrative) from different parts of India and out-migration of locals who have either lost their livelihoods or have been displaced by the projects themselves. Project developers function with impunity, helped by a network of local elites who profit from the industry. Concrete structures lock people, the state and private finance in unequal relationships built around patronage, power, and control. Each network spins another network, its impact percolating all the way to the ground. Yet, unlike concrete, these relationships and networks are fluid, fragile and changeable, dependent on the longevity of the structures themselves, flows of finances and changed political and/or developmental agendas at the local, regional, and national levels.



Fig. 6-10 Hydropower Dam in Progress, South Sikkim.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

CONCRETE HOUSING



Fig. 6-11 Mist rising over Deorali, Gangtok.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

In contrast to the spectacular modernity of hydropower dams, the mundane modernity of housing and commercial buildings is the most common manifestation of Sikkim's concrete entanglements. Many of the most intimate spaces for communities in the region, such as houses, religious spaces, cremation grounds and memorials, are made from concrete. It materialises the relationships that shape and have shaped the last two decades of development success. Concrete—rendered and reinforced—materialises the aspirations of wealth, status, and a "better life" (however conceived) in private property. Private dwellings capture Abourahme's "slippage" between the political symbolic and the lived material throughout the state. In this section we focus on the ways property owners utilise concrete (almost exclusively) to improve private property, generate revenue, and show off success in local systems and networks of power and/or the success of a family member living and working outside the state, or better yet, abroad.

At first glance most of this concrete is clustered in urban areas, and as Sikkim's towns and cities grow on limited land, private dwellings expand vertically. Multi-storey buildings have become the norm for private dwellings. Very often they house several generations of one family, however, they also provide rental income for different tiers of the rental market: cheap and small for short-term labour migrants, large and expensive for wealthier migrants legally excluded from owning property. It is common for a single family to own many buildings to lease or rent and pass on to their children.

Concrete buildings are not limited to urban areas. In small towns like Ravangla and Namthang in south Sikkim or Rhenock and Rumtek in east Sikkim, wooden cottages have given way to multi-storied buildings, often perched precariously on hill slopes. As noted above, in some rural areas there is a mix of concrete with traditional materials, and in many instances preserved traditional housing is evidence of limited capital rather than of deliberate heritage conservation. Houses built with traditional materials (wood, mud, bamboo, and stone), are few and far between in urban areas. In rural areas, while it is becoming increasingly rare to come across completely traditional houses (made with local materials, in a style particular to a specific tribe or ethnic group), it is becoming more common to see the traditional co-exist with and complement new concrete extensions. For instance, some traditional aspects or areas (usually the kitchen or the prayer area) are maintained in conjunction with the new. Although most of the buildings in rural and semi-urban areas are built for residential purposes, there is an increasing trend among wealthy urban residents to construct bigger and more opulent houses in rural or semi-urban areas as their second home and these are made almost exclusively from concrete.

Walking through neighbourhoods and dwelling in the laneways, corridors and living spaces of all this concrete raises questions about how these microsites have proliferated so rapidly: what drives their construction? Success? Debt? Remittances? Corruption? Success at corruption? Rumour and gossip about the people who constructed these buildings reveal much about the assemblages; the "inside and outside things" that gather in one place—in these buildings and the areas where they cluster. A single dwelling with multiple extra floors, extended balconies, and vertical encroachments is subject to myths about the family, the money, the rise—and in some cases the fall—of those living in it. Amongst Sikkimese, our discussions about a building or street would generate avid discussion about the local landowner and/or builder who made it happen, where they got their money, who they know in the non-local capitalist world, and how the owner's children will never have to work. For the already propertied class, the next level is to own residential flats in Siliguri. These flats are primarily used in the winter months and remain empty for the majority of the year, yet they are important status symbols for the owners.

It is not just the large extravagant houses that are worth our attention. While, the dwellings of the rich (and indebted) are one manifestation of concrete aspirations, small improvements to modest dwellings are also significant and highly visible. For those living in *kutcha* houses (made of stone or wood), the aspiration is to upgrade to concrete, a desire recognised and promoted under the Chief Minister's Rural Housing Mission,[8] aimed at converting existing dwellings in rural areas to single storey, earthquake resistant *pucca* (concrete) houses free of cost. Aspirations for the stability and permanence of concrete therefore becomes the conduit for political patronage, mixed with expectations of gratitude and po-

8 See online: https://www.sikkim.gov.in/portal/portal/StatePortal/Government/CMHRM (accessed: 1.9.2018).

litical loyalty. There are mundane stories too, families expand, relatives from villages come to live, revenue from a plot of land far away is cashed, someone gets a new job, a small loan is secured—concrete is added. Towns and cities in Sikkim exhibit one of the most universal signs of incremental savings, the cluster of steel rods protruding up or out from parts of a completed dwelling; a sign of hope, aspiration, optimism (Forty 2012: 29).

Concrete has proliferated in slums in Sikkim's towns and cities, a phenomenon once unthinkable and one that remains on the margins of public discussion. The increase in the size and number of slums is also related to the demand for cheap housing for migrant labour who come to work in various (public and private) construction projects.[9] For example, the construction of Sun Pharmaceutical and MacLeod's Pharmaceutical factories near the town of Ranipool have led to the rapid vertical expansion of Setipool slum, located between these two factories. From interviews in this area, it emerges that, on the one hand, relatively lower rents in this slum attracts migrants working in these factories and on the other, opportunities for additional rental income has spurred the construction of buildings and other smaller concrete dwellings. Property owners push the boundaries of their dwellings into neighbouring plots or vacant land with ambiguous title; concrete is thrown up quickly—while disputes take time to resolve.

Among Sikkimese, there is some nostalgia for former times when there were few concrete buildings, yet this is often expressed as frustration at rapid urban growth, migration, traffic, inflation, and lack of greenery and open spaces, rather than at the proliferation of concrete itself. Vertical growth causes anxiety for Sikkimese, often among the same classes that profit from landlordism. Clusters of vertical buildings on short-term rental are seen as enclaves of out-of-towners who supposedly erode local cultural sensibilities through physical, sonic, visual, and olfactory affect. Furthermore, the buildings block light, exacerbate traffic jams, and stress existing water and pedestrian infrastructure.

This is a counter-narrative of Sikkim's development success; the way it illustrates an exceptional space away from the showpiece developments that garner awards, funds, and political power for the Sikkim Government. Yes, these are "just" houses and flats, but they offer an alternative script about development and change in the region, wealth, money, profiteering, licit and illicit work, mobility within the region and out of it, and power in gradients of relativity. They demonstrate what Colin MacFarlane calls the "gathering process" which is "particularly useful for grasping the spatially processual, relational and generative nature of the city" (2011: 650); or in the case of Sikkim, the town, the neighbourhood, the settlement. They also demonstrate municipal ineptitude to enforce—and complicity to ignore—planning laws and/or their absence, and offer fascinating examples of the multiple and often contradictory rules governing

9 The Sikkim Government defines slums as areas: "unfit for human settlement" due to danger of landslides, etc., dwellings that are "detrimental to safety," 'under-serviced" settlements, lack of adequate infrastructure and amenities, unregulated construction, where sanitation is not in accordance with Sikkim Sanitation Rules, lack of proper water and electricity supply (Government of Sikkim 2003). Five cities in Sikkim have areas that qualify as slums: Gangtok, Jorethang, Namchi, Rangpo, and Singtam.



Fig. 6-12 Mangan town in North Sikkim, one of the fastest growing towns in the state.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

land. There is much more that private property can tell us about dreams and design, the concrete expertise and predominantly "outsider" labour force, and the relationships forged through construction—relationships that cross ethnic and Sikkim/non-Sikkimese lines.

CONCLUSION



Fig. 6-13 Carpark access ramps near the secretariat, Gangtok.
Source: Duncan McDuie-Ra and Mona Chettri (2020).

In rapidly urbanising towns and villages across Sikkim and other parts of the eastern Himalaya concrete, in all its manifestations, is everywhere. As more open spaces get covered in concrete, it becomes the focal point of conversation and everyday life in explicit and implicit ways. Concrete therefore provides an alternative reading of frontier politics, of the ways a geopolitically sensitive frontier is further entangled in financial dependency, the supply of materials and labour, and despite protective laws and severe ecological limits, the pursuit of endless growth of towns, cities, and scenic spots. For a formerly independent kingdom merged into India in 1975, concrete is an integral part of the assemblage of human and non-human allies that have transformed Sikkim's landscape, integral to the "banal and inconsequential" agency to return to Abourahme (2015: 204), that has produced a loyal border state out of a suspect frontier, exhibiting the shift to governable space.

Assembling and assembled by this shift, concrete is central to the ways development is conceived and enacted in Sikkim; constitutive of a near universal social desire, essential to the legitimacy and function of government, and tied to a larger schema of integration into India. It offers a critical reading of the ways landscape is imagined, reproduced and politicised in Sikkim's public culture. At the local level gigantic statues and hotels for tourists, hydropower dams and rapidly rising vertical housing are entangled in the pursuit and projection of development and progress in Sikkim. In a polity where the local state's development strategy is based on more concrete construction, concrete creates opportunities and allows access to networks of patronage and power; enrolling many Sikkimese into the dominant political culture and leaving others to make do, to dream of ways to secure some kind of government contract, a connection to the worlds of concrete through a relative or a party member.

Anxieties too are entangled in concrete, both the anxieties of the Indian state over its sensitive frontier space and the anxieties of Sikkimese around labour and rural-urban migration threatening local sensibilities. Yet these anxieties seemingly co-exist with the desire to demonstrate cultural symbiosis with India through concrete renditions of sacred Hindu sites by the local government and for new housing built cheaply by migrant labour among Sikkimese; making it difficult to disentangle anxiety from aspirations. Provided things keep being built, it appears that the frontier is booming. Concrete in all its manifestations—statues, dams, houses—entangles and entraps the lives of the people in Sikkim in ways that were not possible or even desirable in generations past. Concrete is a component, one of the "disparate elements" of the assemblage, without it dependency would continue given the geo-politics and history of colonial and capitalist relations between Sikkim and what is now India, yet such a scenario is difficult to imagine. Without concrete there would be almost no ways of claiming modern subjectivities in Sikkim, and India's state-making project in the frontier would also have failed, given that it rests upon the transformation of "backward" into "modern". Perhaps another material would take its place in the assemblage, yet given the cost, malleability, popularity, and social value imbued in concrete, it is difficult to envisage what such a material might be.

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VII

The Munshi House: Restoration and Adaptive Reuse in Leh Old Town

John Harrison and Monisha Ahmed

Name: John Harrison
Designation: Architect, Research Fellow
Affiliation (Institute): Liverpool School of Architecture
E-mail address for correspondence: harrison_john_gb@hotmail.com

Name: Monisha Ahmed
Designation: Executive Director
Affiliation (Institute): Ladakh Arts and Media Organisation
E-mail address for correspondence: ahmed.monisha@gmail.com

Biography

John Harrison

is a British architect who has been travelling in the Himalaya since 1985, documenting and restoring historic buildings in Ladakh, Nepal, Pakistan, and Tibet. He is a research fellow at Liverpool School of Architecture, and has lectured on the architecture of the Tibetan Himalaya at universities and cultural institutions across Europe and Asia. Published books and articles on the Himalayan work include *Mustang Building: Tibetan Temples and Vernacular Architecture in Nepal Himalaya* (Saraf Foundation for Himalayan Traditions and Culture, 2019).

Monisha Ahmed

is Co-founder and Executive Director of Ladakh Arts and Media Organisation, Leh. She is an independent researcher, writer, and curator whose work focuses on art practices and material culture in Ladakh. Her doctoral degree from Oxford University developed into the book *Living Fabric: Weaving among the Nomads of Ladakh Himalaya* (Orchid Press, 2002). She has co-edited *Ladakh — Culture at the Crossroads* (Mārg Publications, 2005), and collaborated on *Pashmina — The Kashmir Shawl and Beyond* (Mārg Publications, 2009 and 2017), and published several articles on textile arts of the Himalayan Buddhist world, as well as other parts of India.

INTRODUCTION

The Munshi House stands in the centre of the Old Town of Leh, at the foot of King Sengge Namgyal's vast 17th century palace (Fig. 7-1). Ladakh, unified under the Namgyal dynasty, was at its most powerful under Sengge Namgyal (ca. 1570–1642) and the growing town became a major entrepôt for caravans heading east, west, north, and south as part of the flourishing Central Asian trade routes.[1] The mansions of rich traders and aristocratic courtiers followed the building of the palace, situated among a warren of smaller houses and narrow lanes on the lower slopes of the rocky site, surrounded by a rammed-earth city wall. There was no formal urban planning in Leh until the 19th century, when the Dogra rulers and the British developed wide market places on the flatter land below the hillside. The Old Town gradually declined in importance after the royal family moved across the Indus river to Stok in 1837, although some big houses remained in family occupation until the demise of the long-distance trade routes in the mid-20th century. After Indian independence in 1947, a government quarter was built to the east, development extended down towards the airport and army cantonment, and towards the end of the century, guest houses and hotels for tourists spread south and west across the fields. By then, abandoned houses in the Old Town were being taken over by Ladakhi incomers or let out to migrant workers attracted by the tourism-inspired building boom.

At the start of the 21st century, architectural conservation in Ladakh was limited to the restoration of the few National Monuments listed by the Archaeological Survey of India (ASI).[2] In Leh, the ASI were working on the collapsing palace, which had been purchased from the royal family, but although there was supposedly some statutory protection for buildings near to a National Monument, the Old Town continued to deteriorate. There was no meaningful protection for vernacular architecture, nor for historic urban ensembles. A Leh conservation and development plan had been prepared by Romi Khosla for the Indian National Trust for Art and Cultural Heritage (INTACH) in 1988,[3] but no action had been taken by Jammu and Kashmir State authorities or by the Ladakh Autonomous Hill Development Council (LAHDC).

In 2002, Ladakhi architect Deldan Angmo and John Harrison began to explore the possibility of launching an urban conservation project in the Old Town with the LAHDC and other local bodies. Then in 2003, Andre Alexander, with whom Harrison had worked in Tibet, established the Leh Old Town Initiative (LOTI) based on the methodology his Tibet Heritage Fund (THF) had developed in Lhasa during the 1990s.[4] In Lhasa, THF made contact with elderly building craftsmen (they were all men) and persuaded them out of retirement to pass on their skills to younger workers, rapidly building up a large workforce to conserve and upgrade historic houses in the old city. All this was done in partnership with local government, but in 2000 local and national political pressures closed the project and forced THF and other foreign NGOs out of Tibet. In Leh, THF started work on the prominent Guru Lhakhang at the foot of the palace, while Harrison worked on the Lonpo House next door, one of a list of threatened buildings. The Munshi House was next on the list.

1 See Rizvi (1996, 1999).

2 Harrison (2014: 390–393). The Namgyal Institute for Research in Ladakhi Art and Culture (NIRLAC) has now produced five volumes of the *Legacy of a Mountain People: Inventory of Cultural Resources in Ladakh*, including many examples of vernacular architecture, but to date this has not led to any legal protection for buildings other than the National Monuments. Volume 2 covers the Leh area (NIRLAC 2008).

3 Chaturvedi (1989: 82–89).

4 For more details concerning THF's work in Tibet, see Harrison (this volume).

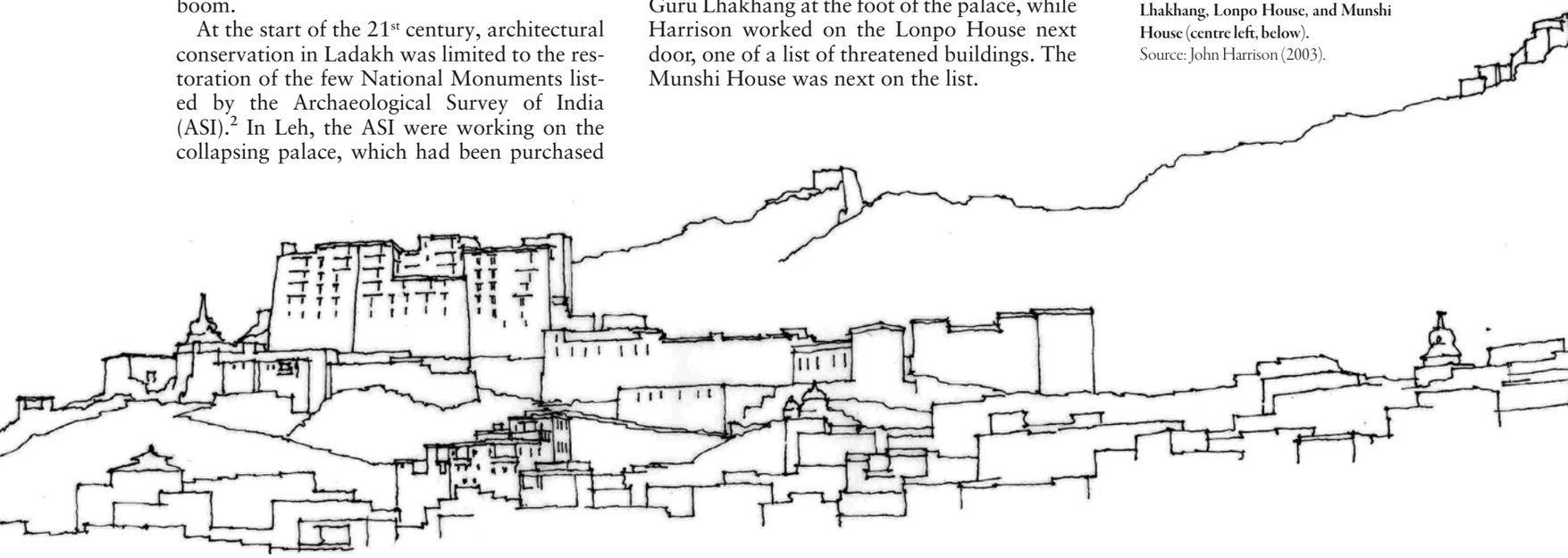


Fig. 7-1 View of Leh Old Town from the south showing the palace, Guru Lhakhang, Lonpo House, and Munshi House (centre left, below).
Source: John Harrison (2003).

THE MUNSHI HOUSE

The construction of the Munshi House most probably began in the 17th century, as Leh town developed below the new royal palace. No documentary sources have been found on the origins or development of the house, other than several distant 19th century photographs, and so one can only rely on the evidence of the building itself (Fig. 7-2). The earliest parts of the house—the winter kitchen, the store rooms and stables below—were built inside the north-south city wall. Later extensions to the Munshi House, and the Kalön House to the east, were built on top of the wall after its defensive function had been superseded.

This early Munshi House (Togoche,[5] to give it its original Ladakhi name) is not a particularly large structure when compared to its later development, or to the lost house of the Kalön (Prime Minister) next door. If we assume that the location is some indication of status, then the Togoche site (most likely allotted by the king) is close to the palace at the upper edge of the urban area. The size of the building is comparable to the first phase of the house of the Lonpo (minister), built hard against the southwest corner of the palace. Francke says that "the *To-go-che* used to be an official who ranked between a minister and a *Grong dpon*, or mayor".[6]

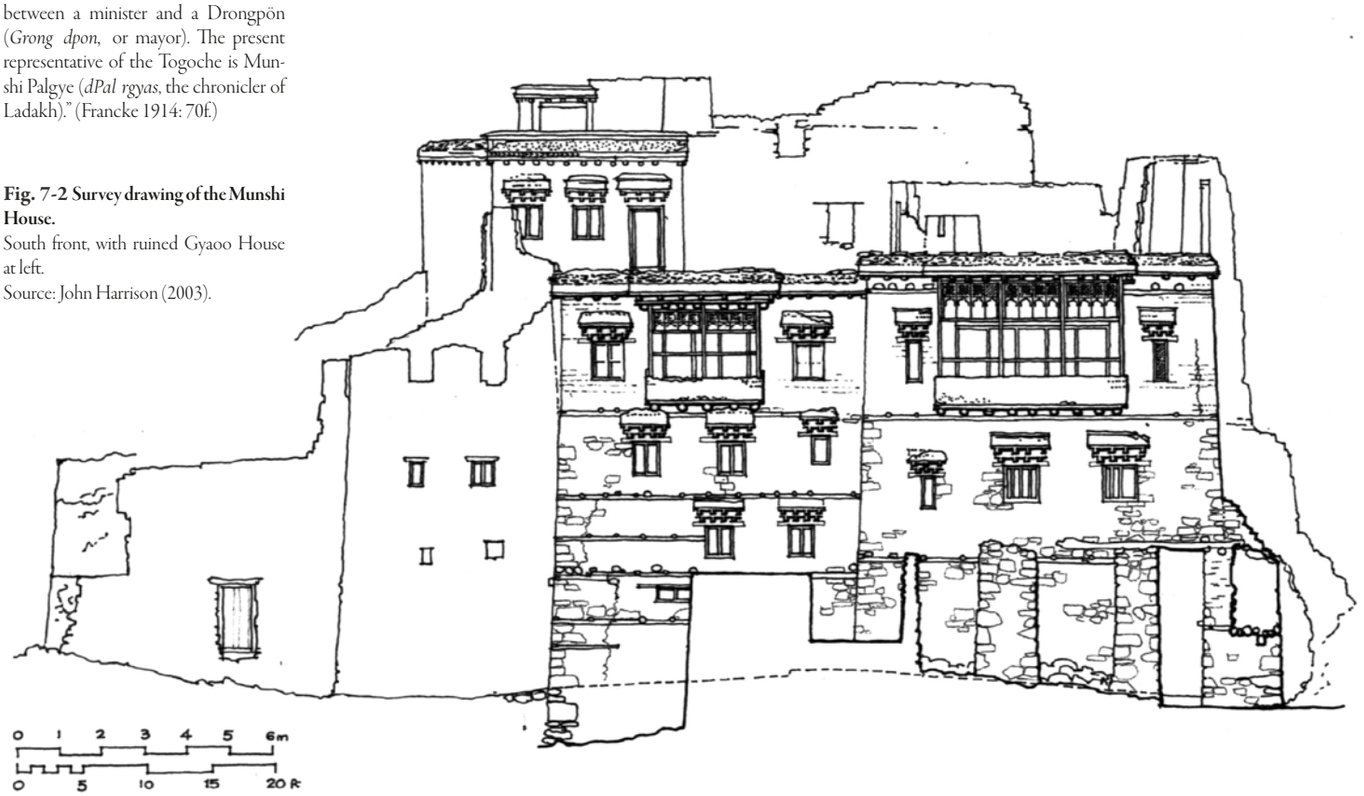


Fig. 7-2 Survey drawing of the Munshi House.
South front, with ruined Gyaoo House at left.
Source: John Harrison (2003).

5 According to Dr Munshi, Togoche means "tax collector" and was not the family house name. The Munshi retained this function after the Dogra occupation of Ladakh in 1834. In the later 19th century, Munshi Palgyas was the *Keshar* or treasurer for Ladakh and operated from the Munshi House, as there was no separate treasury. The actual "treasury" may have been the stone storeroom next to the summer kitchen, now converted into a sound studio.

6 "The Lönpo (*Blon po*, 'Minister') House is situated directly below the castle, on the south-west corner; the Gonpa Soma (*dGon pa so ma*, 'New Monastery') is situated on the southeast corner of the same castle. Both these buildings can be distinguished in Trebeck's picture of Leh. Below the Gonpa Soma and the Champa (*Byams pa*) monasteries, is situated the Kharchung (*mKhar chung*, 'the little Palace'), and exactly below the latter the ruined site of the Kalön (*bKa' blon*, 'Prime Minister') House, possibly the very same house in which Moorcroft was received in audience by the then Prime Minister. West of the Kalön house we see the Togoche House, which used to be an official who ranked between a minister and a Drongpön (*Grong dpon*, or mayor). The present representative of the Togoche is Munshi Palgye (*dPal rgyas*, the chronicler of Ladakh)." (Francke 1914: 70f.)



Fig. 7-3 Looking down on Munshi and Gyaoo houses from the palace.
Source: John Harrison (2003).



Fig. 7-4 Munshi House from the east, showing the room traces of the lost Kalön House and the rammed earth city wall.
Source: John Harrison (2003).

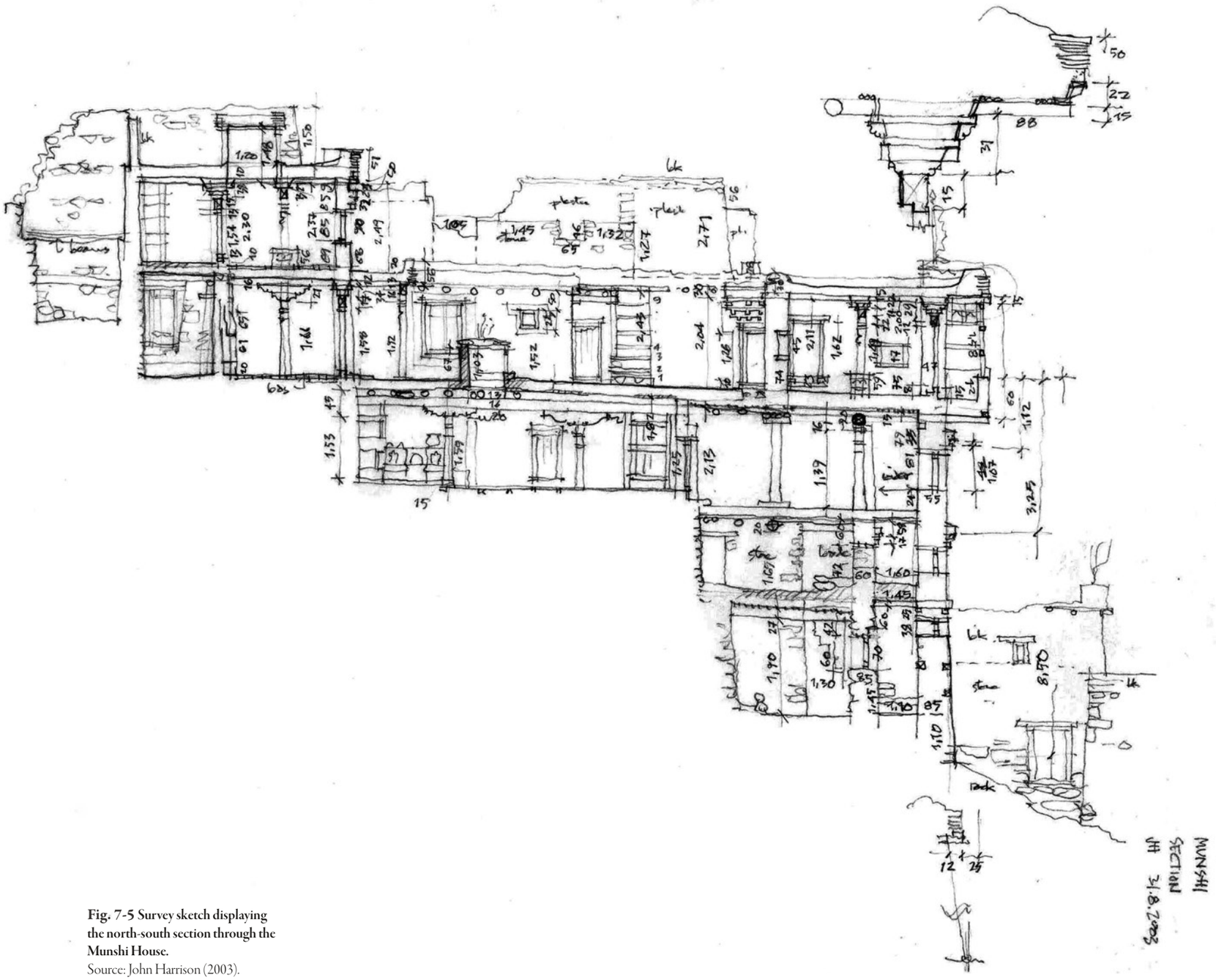


Fig. 7-5 Survey sketch displaying the north-south section through the Munshi House.
Source: John Harrison (2003).

The adjoining Gyaoo House was built against the Munshi west wall and Munshi itself was extended in several phases during the 19th century, building upwards on the constricted site (leaning against the Kalön house to the east), and outwards over a public footpath (Fig. 7-3 and Fig. 7-4). A grand, richly carved and painted reception room, the Rabsal Room, was built at the southeast corner, with a traceried balcony looking out over the town. As Ferrari says: "A *rapsal* (also *rabsal*, *rabsel*) is an architectural element epitomising a family's wealth. In the past only the king, people affiliated to royalty or very prestigious families were allowed to have one".[7] A family chapel, or *chodkhang*, also richly decorated, was built on the roof at the northwest corner, and a second balcony room on the southwest front (Fig. 7-5). Unfortunately, these imposing new rooms were raised on inadequate foundations, sometimes with complete disregard for the earlier structures below. By the end of the 19th century, the Munshi House extended over five floors on the steeply-sloping, rocky site.

By the time the Munshi House was surveyed in 2003, it had been unoccupied for roughly 20 years. The Gyaoo house had been abandoned for much longer and had lost its roof and top floor, while the lower floors of earth on flimsy beams were in poor condition. There were serious structural problems in the Munshi House also. The heavy loads of the newer upper floors had caused settlement as well as deflection and fracturing of the beams, and much of the masonry was cracked and disintegrating (Fig. 7-6).

7 In Ladakh, limited and expensive timber made the *rabsal* a real sign of wealth, but also meant that carpentry did not develop to such a high level as it did in Nepal and Bhutan, where timber was much more abundant. For more details concerning *rabsal*, see Ferrari (2021: 55) and Dujardin (this volume).

Fig. 7-6 The interior of the Rabsal Room.
It was richly decorated with painted wall patterns, carved and painted beams, pillars and screens, and plaster modelling on the capitals. The room had severe structural problems however, with subsidence of pillars and beams, and movement and cracks in the east wall, caused by inadequate foundations below, and collapsed in 2007.
Source: John Harrison (2007).



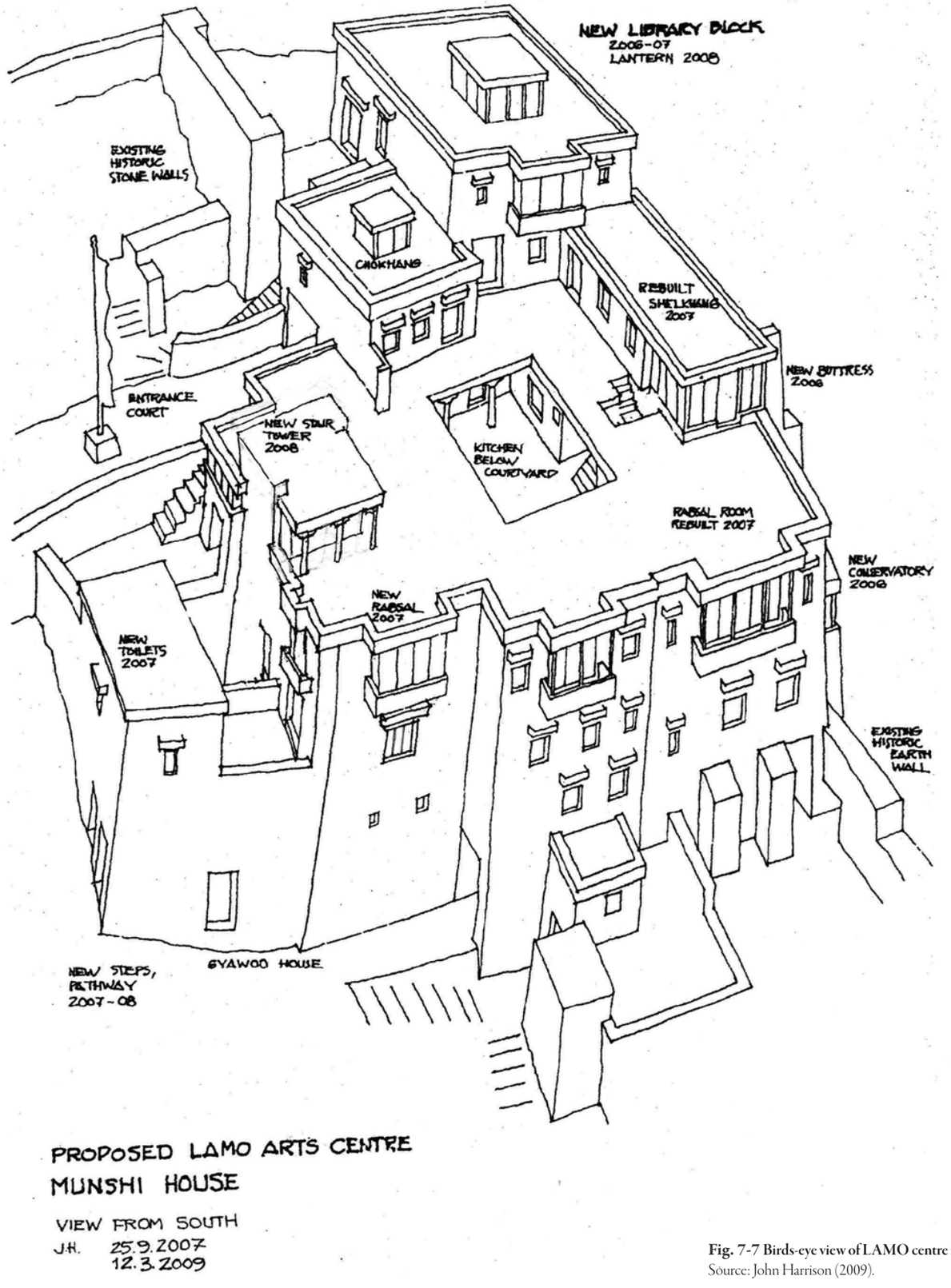


Fig. 7-7 Birds-eye view of LAMO centre from southwest.
Source: John Harrison (2009).

THE LAMO PROJECT

The Ladakh Arts and Media Organisation was formed in 1996 by Monisha Ahmed and Ravina Aggarwal, both of whom had long experience of studying and working in Ladakh.[8] In addition to its educational, cultural and social aims, LAMO wanted to identify an old building in Leh, renovate it, and establish it as an arts resource centre. They wanted to demonstrate how an historic building could be revitalised and reused, while contributing to the social and cultural life of the community. The LAMO team thought the Munshi House could meet their needs and so a brief was developed for its restoration and conversion. Initially, only the historic Munshi House was considered, but as the library and exhibition elements in the LAMO brief could not satisfactorily be housed in the existing rooms, it was decided to build on the ruined foundations to the north. When the owner of the ruined Gyaoo House to the west approached LAMO, the decision was made to include this building in the project also. (Fig. 7-7)

8 See online https://www.lamo.org.in

REPAIR AND DESIGN PHILOSOPHY

One of the principal aims for the restoration of the Munshi House was to retain as much as possible of the original fabric of the building. Elements such as walls, beams, pillars, and windows were to be repaired rather than replaced, and to be repaired in situ rather than rebuilt. This was not always possible of course and some rebuilding of earth brickwork did take place: the cracked and settling front wall of the Chodkhang for instance, and the entire Rabsal Room at the southeast corner, which collapsed before repair work on it could begin. Where rebuilding was necessary, the materials were salvaged and reused. Intact earth bricks were re-laid, while broken bricks were remixed and remoulded. The twisted wooden entrance frame to the Chodkhang was taken out, realigned and built back into the new wall. The Rabsal Room balcony frame was re-assembled from the salvaged fragments, with some new timber sections pieced into the shattered main posts. In both these cases, weathered woodwork was retained not only because it was still functional, but also because it spoke of the age and history of the building.

Traditional materials and construction systems—masonry (stone, sun-dried brick, or rammed earth) walls and timber post-and-beam with earth roofs—were to be used, both in the repair of the existing building and in the new-build sections. In the case of the historic building work, there was no question that some modern materials such as cement would be inappropriate or actively deleterious. Even in the new-build sections, both the client and the architect wanted to demonstrate that generous, positive spaces for 21st century public use could be created in a "traditional" building, using original materials and local craft skill.[9]

The building' s continuous history of accretions and adaptations over several hundred years was to be displayed, not hidden away. Visitors would see the various layers and phases presented as a part of the educational function of the building itself. Outside the east wall, the earth and stone fill on the hillside was excavated down to the bedrock, in order to show the stone foundations and massive rammed earth structure of the old city wall, onto which the Kalön House had been built. The surviving corner of the Kalön House was consolidated as a buttress, and the traces of the lost Kalön rooms left exposed on the outside wall. Inside, in the screened "*king's room*" behind the Rabsal Room, the stone corner of the Kalön House was also exposed, but leaving a panel of the later Munshi painted plaster. At the rear of this room, the collapsed 19th century brick wall was not rebuilt, but left open to show the earlier stone wall behind with its small, barred window.

In the new-build areas, the principal influence was the form and detail of traditional Ladakhi building, but with the introduction of features that would say to an informed eye that this was not only an historic building. The horizontal runs of windows with repetitive mullions are a case in point, located on the east side of the Reading Room and the Bokhari Room Conservatory, as well as at the main entrance in the Gyaoo House, where the stair tower and the wooden staircase circle around the reused beam as centre post. These areas all used traditional materials and design elements, but in new ways.

9 Several other chapters in this volume address questions of material choice, such as the massive increase in concrete and cement use (McDuie-Ra and Chettri; Norboo et al.; Feiglstorfer and Michette), the decline and re-emergence of earthen building materials in Ladakh (Norboo et al.), and the resurging use of timber in Eastern Tibet (Wozniak).



Historically, doors and windows were kept small in Ladakh, to conserve heat before glass was introduced, to save costly timber, and to prevent thieves entering, but also to keep out malicious spirits.[10] Ceiling and door heights in the new-build sections of the Library and the two new floors of the Gyaoo House could be increased to modern dimensions, but this could not be generally done in the restoration of the Munshi House without completely losing the character of the historic building. In the Winter Kitchen, the principal entrance doorway remained unchanged so that the original door could be retained, but a small and particularly low door nearby was increased in height when the wall around it was rebuilt. The doorway into the Bokhari Room, again, without decoration, could be increased in height when the wall above was rebuilt, but the doorway into the Rabsal Room could not be altered without the loss of its important decorative features. (Fig. 7-8)

Larger windows could be introduced during the rebuilding of the Gyaoo House, to allow more natural light into the two exhibition floors. Full height windows on the west side, and double windows for thermal insulation, suggested the new *rabsal* onto which the windows open. On the south side, the upper window took the form of a projecting glazed box: a conservatory to capture the sun's warmth in winter.

The Library is perhaps the most "traditional" part of the new-build work. Smaller windows were dictated by the need for large areas of internal wall space to accommodate bookshelves, and any "modernist" statements were thought inappropriate for a large structure so close to the palace. However, both outside and in the interior construction there are simplified woodwork details that avoid the over-elaboration of much recent Ladakhi carpentry and decoration. The aim was very much to create forms sympathetic to the surrounding historic buildings, but not to attempt perfect replication of these structures.

Fig. 7-8 Door into the Rabsal Room.
Source: Monisha Ahmed (2007).

LABOUR

There has been a rapid growth in domestic Indian tourism in Ladakh since the beginning of this century, fuelled by an expanding and wealthier middle class, and (it is said) by Bollywood popularisations of Ladakh's mountain scenery. Concrete and brick now cover the fields around Leh, as local entrepreneurs and landowners throw up new hotels and guesthouses, and new houses for themselves, in an accelerating building boom.[11] Migrant building workers flood in each summer from Kashmir, Bihar, and Nepal to supplement (and far outnumber) the local workforce. Within Ladakh, building craftspeople leave their villages each season to find ready work on Leh construction sites. Rapid work on reinforced concrete framing and thrown-together brickwork is seen as easier and more lucrative than the slower repair of traditional buildings. Indeed, it was sometimes difficult to find craftspeople for restoration projects in the Old Town, as there was so much building activity elsewhere in the city.

Envisioning a rolling programme over a number of years and at a number of sites, THF addressed this problem by assembling a full-time workforce of local craftspeople who were employed, and paid, throughout the year. The "*wet trades*" such as masonry work and brick making can only take place in the summer building season (May to October), but carpentry and much other work can continue year-round, even through the freezing winter months. LAMO, working on only one site, had to find sufficient seasonal labour each summer, as discussed below.

While documenting the Munshi House in 2003 and planning the restoration of the building as the future base for LAMO, Harrison was working on site at the Lonpo House just to the west, while THF were repairing the adjacent Guru Lhakhang. Finding local craftspeople for the Lonpo project was initially problematic. Work began with a migrant Nepali team of two master builders supported by two Ladakhi women labourers and a Ladakhi carpenter. Later, a team of migrant masons and labourers from Doda in southeast Jammu and Kashmir also joined the project. The Doda team arrived by road each spring, as soon as the snow had melted on the Zoji La pass on the main Srinagar to Leh highway, usually in late May. They rented accommodation in the town, worked through the summer

10 Ferrari (2018: 147–155).

11 For further discussion of the current building boom affecting Leh, see Norboo et al. (this volume).



Fig. 7-9 Ladakhi and Doda workforce on site, 2007.
Source: John Harrison (2007).

months, and left again before the road closed in October. Building workers for hire assemble in the early morning at several recognised sites in Leh, with the Muslim Doda workers filling the square in front of the Jama Masjid at the foot of the Old Town.

The Lonpo site promised a continuous season of work, so a regular team of Doda masons and labourers was established, all friends and relatives from the same home villages. This enabled work on the Lonpo and Munshi Houses to be started as soon as the road from Srinagar opened each spring. Thus, Abdul Rehman and his team of ten Dodas were there at the beginning of June 2006 to start work on the Munshi House. For some time, they were restricted to external brick and stone work until two Leh master builders, or *mistri*, were found to begin the internal structural timber work.[12] Ladakhi *mistri* are primarily known as masons or as carpenters, but most are skilled in working with brick, stone and wood. The Doda masons, on the other hand, are highly skilled in stonework but have no idea what to do with a piece of wood.

The next year, 2007, there was again a delay in finding Ladakhi *mistri*, but fortunately the Doda masons were fully engaged on the massive stone walls of the new library block. Then a team of six men arrived from Kanji village, with whom Harrison had worked in 2002 repairing the 14th century Tsuglagkhang (*gtsug lag khang*).[13] They had heard that there might be employment available for them at the Munshi House. In Kanji, this team had comprised two senior *mistri* and four young assistants or labourers, but now they all claimed to be *mistri* and were asking for full *mistri* wages. There was some negotiation on this point, but the Kanjipa were in a strong bargaining position, so in the end six *mistri* were engaged (Fig. 7-9). They worked throughout the building season and major progress was made on the project, fashioning and erecting the interior timber structure of the library—pillars, beams, and floors—and re-assembling the repaired timbers of the Rabsal Room (Fig. 7-10 and Fig. 7-11). Unfortunately, however, they were not available to continue their work the following year.

13 Harrison (2007).

12 *Mistri* is the Urdu word for master builder, but is commonly used in Ladakh as well as Himachal Pradesh (see Thakkar and Shah, this volume).



Fig. 7-11 A new capital (left) replaced an original broken by structural movement before the collapse. New floorboards laid by Bihari carpenters in the Rabsal Room.
Source: John Harrison (2007).



Fig. 7-10 Re-assembly of the timber structural and decorative elements in the Rabsal Room in 2007.
The inner screen with its painted beam and brackets, the central beam and two pillars, and the window screen leading onto the balcony. Using the photographic survey made before the collapse, the small painted wooden panels were refitted between the brackets above the beams. Remarkably only two panels out of 180 were lost in the collapse.
Source: John Harrison (2007).



Fig. 7-12 Salvaged *burtse* re-laid in the courtyard parapet.
Source: John Harrison (2007).



Fig. 7-13 Gyaoo staircase was built around a recycled beam from the lower floor.
Source: John Harrison (2007).



Fig. 7-14 Repairing and reassembling the salvaged pieces of the balcony screen.
Source: John Harrison (2008).



Fig. 7-15 Painting the rebuilt east wall of the Rabsal Room to match the original decoration.
Source: John Harrison (2008).

Fig. 7-16 New bricks being made from the earth on site to match the old brick size.
Source: John Harrison (2008).



Fig. 7-17 Materials for the mud roof: earth (*kalak*) river sand, *markalak*, straw.
Source: John Harrison (2008).

By 2008, much of the major structural work was complete and there was less need for *mistri* to bring together the various crafts. Two older *mistri* from Skurbuchan village were engaged in laying traditional *burtse* and *talu* parapet facings (Fig. 7-12), and two young Leh carpenters were also on site, whose skills ranged from making the new staircase in the rebuilt Gyaoo House (Fig. 7-13) to the careful, detailed repair of damaged tracery screens (Fig. 7-14). The next year, however, the carpenters preferred to stay in their new suburban workshop to carve elaborate window heads, or *shingsak*, which had become fashionable for new houses and commercial buildings.

Once the window frames had been built into the masonry walls, a large number of window casements were required. A migrant Indian carpenter from Bihar State was hired for this purpose, working on site with hand tools (plane, chisel, and saw) on timber rough-sawn to size at the local sawmill. His workmanship was satisfactory, but he left after it was found that he was acting as gang-master for the other Bihari carpenters and taking a considerable part of their wages. Finally, three traditionally-trained painters from the Tibetan refugee community in Choglamsar, just outside Leh, copied the surviving sections of wall painting patterns to redecorate the rebuilt walls of the Rabsal Room (Fig. 7-15).

MATERIALS

Traditional building makes use of the materials available locally—stone, earth, and wood—and crafts them in ways that change only gradually, sometimes over centuries. For these crafts to operate effectively, it is vital to have access to the right materials, whether recycled or freshly sourced.

The stone used for the Munshi House was recovered from fallen walls on the site and used to build the base of the new library walls and the new foundations in the Gyaoo House and below the Rabsal Room. It was not necessary to procure additional stone. Earth bricks for restoration work in the Munshi House were made on site to match the old brick size (5 × 8 × 16 inches, or 120 × 200 × 400 mm), using earth from the site, river sand, chopped straw, and yak dung from the old stables (Fig. 7-16). They were made on the roof in a steel mould and left to dry in the sun for two weeks. A steel mould had been made for the Lonpo House construction by a local metal fabrication workshop on the recommendation of the *mistri*, as it is easier to slip off the cast brick than when using a traditional wooden mould. Old damaged bricks were broken up and mixed with water to make new bricks or mud mortar. The new-build construction in Gyaoo and the library used smaller, modern-sized bricks (6 × 6 × 12 inches, or 150 × 150 × 300 mm) bought from a brickyard in Stok, across the Indus river. It was not felt necessary to match the historic brick sizes where new construction was taking place. All the bricks and stone were laid in mud mortar and cement was avoided entirely.



In the latter stages of construction, when all the earth available on site had been used, new earth was brought by truck from beyond Phyang, to the west of Leh. River sand was brought from the Indus at Shey (Fig. 7-17). All truck deliveries were made using the road up to the palace, but then the materials– bricks, earth, sand, *markalak* clay, slate, and timber—had to be carried by hand down steep slopes to the site, a distance of roughly 100 metres. Municipal regulations prohibited truck movement within the town during daytime, so all deliveries were made at night. The

Doda labourers were paid overtime for this work, and sometimes additional Doda workers were hired in the market to help them.

Markalak is traditionally used in the waterproofing of earth roofs across the Tibetan cultural area.[14] The sample tested by Feiglstorfer is an off-white or light grey coloured clay with a low sand content (0.1 %) compared to a higher content of clay (31.4 %) and silt (68.5 %) (Feiglstorfer 2019: 230). Within the clay fraction, illite is the dominant clay mineral (76 %), with the remainder comprised of chlorite (15 %), kaolinite (6 %), and smectite (3 %), as tested by Feiglstorfer (ibid.). These mineral constituents have an important impact on the clay's behaviour when wet. The high content of non-swellable illite and relatively low proportion of swellable smectite lessens the potential for shrinking and cracking when drying compared to clays with higher levels of swellable minerals.[15] Due to the fine mineral structure and the dominance of clay and silt, more moisture is held in the upper layer of the roof than when clays with a higher sand content are used.[16] The moisture then evaporates quickly in Ladakh's dry climate. However, prolonged rainfall can saturate earthen roofs and this has increasingly become a problem over recent years owing to climate change. Many settlements in Ladakh have a local source of *markalak*, including the famous "moonscape" at Lamayuru. The *markalak* for the LAMO roofs was brought from a quarry owned by Spituk monastery, situated just outside Leh.

Yamang (slate) was brought from Chilling by truck, a two-hour drive away on the Zangskar River. Thin pieces were cut to size for the copings of the roof parapets, while larger pieces were laid as flooring and yard paving (Fig. 7-18). At the time of the restoration, it was easy to procure a truck full of slate, sand or *markalak* free of charge (apart from the cost of the truck and labour involved). This has now changed, perhaps in light of the building boom, so the villages from where these materials are obtained now have to be paid in cash, in addition to the transportation and labour costs.

Wood is a particularly precious resource in the high mountain desert of Ladakh, where there are no forested hillsides and the only trees that grow have been planted in oases, where irrigation is possible. Historically, all the timber used in building was from local sources, but now much is imported from Kashmir: pine for main beams and pillars (*magdung, ka, kaju*) and round poles of poplar for roof and









14 For more on *markalak*, see Bläuer (2021) and Feiglstorfer (2014, 2019 and 2022).

Fig. 7-18 Slate (*yamang*) being split and cut for parapet tops: Doda mason Mansoor experimenting with a bolster chisel brought from England.
Source: John Harrison (2008).

15 Correspondence with Feiglstorfer, November 2022.

16 Correspondence with Feiglstorfer, November 2022.

Fig. 7-19 New *chotsek* moulding being carved by Kanji *mistri* Sonam Wangchuk to match an existing damaged section.
Source: John Harrison (2008).

Fig. 7-20 New capital (*kaju*) cut from salvaged timber by Skurbuchan *mistri* Bulu.
Source: John Harrison (2008).

Fig. 7-21 Bituminous roofing felt laid as a waterproofing membrane around roof edges.
Source: Deldan Angmo (2008).

floor joists (*dungma*). Willow sticks for ceilings (*talu*) are still grown locally. The larger sections of timber are generally bought pre-sawn in the market, but for the library bookshelves complete tree trunks (said to be *simar*) from Jammu were bought from a timber merchant and taken to the Leh sawmill. All the timber was worked by hand on site using saws, adzes, chisels, planes, and bow drills (Fig. 7-19). There are some power tools available in Leh, but the electricity supply remains unreliable so the workers mostly used their traditional hand tools.

Sound sections of wood from broken beams were saved and reused. For instance, the two new capitals in the Gyaoo house were carved to match the original pieces (Fig. 7-20). The parapets on the south front of the Munshi House and around the courtyard were faced in twigs of *burtse*, a mountain shrub. This was salvaged and re-laid. New *burtse* could not be found, even though a local man spent two days searching the mountains, so willow stick facings were used for some of the rebuilt parapets. The original willow stick south parapet of the Chodkhang was salvaged and re-laid, while new willow stick parapets were made on the west and north sides.

Water for construction purposes was carried by hand from street taps in the town below. This required two men working full-time, carrying jerry cans up to a plastic tank on site. The Tibet Heritage Fund had supplied some of their sites by pump or gravity feed from the palace road above, but it was decided that for the distance to the LAMO site, a plastic water pipe would be too vulnerable to damage or theft.

Although traditional construction methods and materials were used for both the restoration work and the new-build sections, some new techniques were also introduced. However, the choice was restricted by the limited range of materials available in the local market. Bituminous roofing felt was laid around roof edges and built into the brick parapet walls as a waterproofing membrane at the weakest point in the traditional flat earth roof (Fig. 7-21). Wire netting was laid over the felt to act as a key for the earth topping. At roof drainage positions, sheet metal flashings were formed on top of traditional wood water spouts. Cardboard sheet (recycled brown cardboard boxes from shops) was laid over the *talu* ceilings to stop dry earth from the roof layers falling into the room below.[17]

Providing an adequate slope on "flat" earth roofs for rainwater to drain to the water spouts can result in a great thickness and weight of earth. Various ways to reduce this weight were investigated. On the Chodkhang roof, a small area above the overloaded main beam and central pillar was fabricated in plywood sheet on timber bearers, but it was thought that this approach would not be suitable for larger roof areas. Clay pots had sometimes been enclosed in thick Moghul roofs in India (but not in Ladakh), and so a modern and locally available equivalent was sought. Plastic drainage pipes were laid below the earth in the first section of the Library roof, but were far too costly to be used extensively. An architectural student project at SECMOL[18] had proposed the reuse of discarded plastic bottles for insulation. To test this idea, a load was applied to a small panel of two layers of plastic mineral water bottles set in mud (the architect jumped on it), and it performed satisfactorily. This approach was then adopted generally, but on roof terraces where considerable foot traffic was expected, glass bottles were used in place of plastic bottles (Fig. 7-22).

Where new brick walls were thick enough, such as in the Library and the Gyaoo house, a central cavity for thermal insulation was filled with wood shavings from the carpentry workshop. Double windows for thermal insulation were fitted wherever possible in the new-build sections. The new *rabsal* balcony on the south front of Gyaoo (Fig. 7-23) and the glazed extension to the Bokhari Room were designed to act as conservatories, trapping heat from the sun in winter. *Yamang* floor paving stones also act as heat stores in winter, as they are warmed by the sun shining through large south-facing windows. Acrylic sheets from a motor vehicle supply shop were used to glaze the skylights in

17 Instead of cardboard sheet, THF laid sheets of straw matting, imported from Srinagar and available in Leh market.

18 The Students' Educational and Cultural Movement of Ladakh (SECMOL), was "founded in 1988 by a group of young Ladakhis with the aim to reform the educational system of Ladakh." The SECMOL Alternative School is based in an eco-friendly campus near Phey village, 17 km west of Leh, involving numerous experiments with earth and solar construction techniques. See online: https://secmol.org (accessed: 1.2.2022).



Fig. 7-23 New *rabsal* conservatory on south front of Gyaoo to trap solar energy.
Source: John Harrison (2008).



Fig. 7-22 Glass and plastic bottles have been recycled and set in the base layer of earth to reduce the weight, and also improve the thermal insulation of the roof.
Source: John Harrison (2008).

the Munshi courtyard floor (Fig. 7-24). However, the acrylic was too easily damaged in these exposed locations, so was replaced in 2022 with the toughened glass now available in Leh. Steel reinforcement was introduced in the Chodkhang to overcome weaknesses in the original timber construction, with custom-made pieces cut and welded by a local workshop. The steel is visible as a new element on the rear face of the wooden posts, to make clear its structural function.

LAMO was connected to mains electricity distribution network by an overhead cable to the north, leading down through the Library to the main switchboard in the stables below. From there, distribution was taken through plastic conduits buried in walls and floors, via a number of secondary switchboards. Exposed cables led to lighting points in the *talu* ceilings. In the two Gyaoo exhibition spaces, there are separate circuits for general lighting and display lighting. From 2016 onwards, spot lights have been added to the exhibition areas of the Munshi and Gyaoo houses.

The principal building work on the LAMO project took place over the three summer seasons from 2006 to 2008, from May to September or October each year, with a further month in 2009 when Kashmiri carpenters completed window casements framing and glazing. Finally, by 2010 the organisation was operating in the completed Munshi and Gyaoo Houses.



Fig. 7-24 Acrylic sheet from a vehicle repair shop for glazing the skylights in the courtyard.
Source: John Harrison (2009).

ESTABLISHING THE LAMO CENTRE — THE WAY FORWARD

So many historic towns and heritage buildings in the Himalayas have been lost or irrevocably damaged through wars, colonisation, natural disasters, and redevelopment. In contrast, many old buildings in Ladakh survived until the beginning of the 21st century. However, as the pace of modernisation accelerates in the region, this situation is changing fast. Threats to built heritage are now imminent and increase with each passing year.

Alarmed at the neglect of heritage buildings in Leh and the rate of demolitions taking place, LAMO wanted to demonstrate how an historic building could be rejuvenated while contributing to the social and cultural life of the community. They were encouraged in this aim by the words of the then Principal of the Moravian Mission School, Elijah Gergan: "The successful restoration and rehabilitation of one historic structure in Leh, will be the most effective statement to demonstrate the potential and value of the much-neglected architectural heritage of the town."[19]

LAMO was aware that conservation was not a familiar concept in Ladakh and that the few projects that were being conducted there focused on the protection and restoration of palaces, Buddhist monasteries, mosques, and other religious structures. The LAMO team decided that they wanted to take an approach



Fig. 7-25 View of a contemporary art exhibition by emerging Ladakhi artists, 2015.
Source: LAMO Visual Archive (2010).

19 Personal communication, 2002.



Fig. 7-26 Opening of first contemporary art exhibition in Leh "Among these Mountains — Nine Contemporary Artists in Ladakh".
Source: LAMO Visual Archive (2014).

firmly rooted in a community-based and participatory framework, rather than one that emphasised only material infrastructure. The organisation also wanted to focus on a private, vernacular building to demonstrate the potential of the space, while also drawing attention to the fate of less iconic urban structures.

In 2003, conservation architect John Harrison introduced LAMO to the Munshi family. It was another year before they were able to work out a long-term lease with the owners of the house (said to be first such agreement in Ladakh), without which the organisation was not prepared to start the restoration work. It was another two years into the project before the Gyaoo family came into the picture, inspired by what was happening at Munshi. They did not want their ancestral home to look dilapidated while the neighbouring Munshi house was returned to its former glory. Funding for the project was organised by Monisha Ahmed through private sources, while the architect's expenses were supported for the first two years by the INTACH UK Trust.

LAMO then worked with Harrison to draw up a plan to convert the houses into a community arts and media centre. The organisation's brief was that it wanted a space from which it could conduct outreach programs, research and documentation projects, workshops, artist residencies, performances, and exhibitions that showcased Ladakh's material and visual culture, performing arts, and literature. The restored buildings were accordingly designed to accommodate a library, offices, an artists' studio, and spaces suitable for exhibitions, performances and workshops (Fig. 7-25). A sound studio was added in 2017. At the same time as offering these new cultural possibilities, the LAMO Centre would in itself provide an example of the best of Ladakhi material and visual culture, as well as the best that local building craft traditions could still achieve. Both LAMO and the architect wanted to demonstrate how generous, positive spaces for 21st century public use could be created in a "traditional" building. So many old buildings were collapsing or being demolished at that time and LAMO wanted to demonstrate the potential for restoration combined with adaptive re-use.

In the years since the restoration, the LAMO Centre has become a vibrant space, holding art exhibitions and festivals, workshops, music performances, and film screenings amongst many other activities and events (Fig. 7-26). The Centre is extremely popular with the youth of the region, who see it as a space that enhances their creativity while encouraging open discussion of contemporary issues. LAMO has conducted several projects focusing on issues relevant to young Ladakhis, mainly concerning the fragile ecology of the area and the challenges it is now facing, such as restricted water supplies and receding glaciers. Many emerging contemporary artists in Ladakh have first shown their work at LAMO, while artists from other parts of India, Japan, Korea, and Canada have also held residencies there (Fig. 7-27). It is notable that several similar cultural spaces have also been developed in the area, most probably inspired by LAMO: Spindle Studio in the old Onpo House and Shesrig in the Choskor House.

LAMO has also been raising awareness of Old Town Leh's vast historical importance, its cultural, social, and economic contributions, as well as the imminent problems and threats the area faces. It has worked with stakeholders and residents from the area, as well as local leaders and policymakers, to increase understanding of the significance of this part of the town and its importance to future generations of Ladakhis. The organisation has carried out numerous research and documentation projects on the area, made short videos and films, initiated a visual archive, encouraged new photography, published children's books, held art exhibitions, conducted heritage walks, and hosted talks and presentations on the Old Town of Leh.[20]

20 In 2013, LAMO held an exhibition entitled *Mapping Leh Old Town — Archival Studies and Contemporary Responses*. It has also published two books focusing on the Old Town: a children's book *Ghost Stories from Old Town* and a graphic novel by Jigmet Angmo, *Dungjunma and her innovative ride*.

Fig. 7-27 'Your Dream Home — Old Town Leh', detail of a site-specific installation by Baptist Coelho.
Source: LAMO Visual Archive (2013).



CONCLUSION

At the time of writing, development continues apace both in Leh and right across Ladakh, much of it fuelled by the vibrant domestic Indian tourist market. This is resulting in more and larger hotels and commercial buildings spreading across the town and outwards along the improving road network. There is also an increasing Indian army presence, as more and more troops are amassed to protect the threatened borders with Pakistan to the west and China to the north and east. Almost all of this development concerns new-style buildings made from imported materials—concrete, steel, aluminium, corrugated roof sheeting—trucked in from the south and assembled by migrant workers from elsewhere in the sub-continent.

Seasonal migrant workers from Doda, Bihar, and Nepal are also involved in much of the historic buildings work now taking place in Ladakh. Such restoration work requires skilled craftspeople and the labour situation has changed considerably over recent years. The old generation of Ladakhi *mistri* (master builders) is dying out, but is not being succeeded by a younger generation. Construction is not seen as a suitable occupation by an increasingly well-educated youth, nor is it as financially rewarding as tourism. Skilled carpenters and masons from further south can adapt to local styles and techniques, as we have seen, but they have not been born and raised in Ladakhi building traditions. In response to this situation, THF have retained a largely Ladakhi workforce by providing year-round employment and have now established an "Artisans, Artists and Architects House" in Leh Old Town. This "Himalayan Bauhaus" acts as a sort of multi-craft guild, bringing together painting, metalwork, and weaving as well as carpentry and masonry under one umbrella organisation.[21] Given these developments, it appears appropriate to ask: what progress is being made today with the conservation of the surviving historic and traditional buildings in Leh Old Town?

The ASI continues its work on National Monuments, particularly the royal palace in Leh, but is hampered by poor relations with the major monasteries, who object to government interference, as they see it, in their religious affairs. The 200 metre protection zone around Leh palace has occasionally been applied (enforced would be too strong a word) to developments in the Old Town. However, the Gompa Soma, a branch of Hemis Monastery, was recently completely rebuilt immediately below the palace entrance, in clear defiance of these unpopular rules.

The THF has by now refurbished over forty houses in Leh Old Town, with funding from foreign governments, NGOs, and house owners. Their student volunteers from national and international schools of architecture have documented these projects and many more houses besides. At the same time, INTACH Delhi is currently publishing a series of books documenting the historical sites of the six sub-regions of Ladakh, written by archaeologist Quentin Devers in collaboration with the Ladakh Chapter.[22] The INTACH Ladakh Chapter has also undertaken some conservation projects (such as the Gya stupa and the Saspol painted caves) and is developing a Cultural Heritage Regulations document to be discussed and agreed with village communities, before it is presented to the Ladakh Autonomous Hill Development Council (LAHDC). The LAHDC themselves have approved the "Leh Guidelines for Conservation & Preservation of Heritage Sites through Panchayats". This has not yet been put into action, but represents an important step towards a future "Cultural Heritage Policy of Ladakh". The new Union Territory administration for Ladakh, installed in 2019, is also talking a lot about heritage policy, but nothing has yet been implemented.

The Himalayan Cultural Heritage Foundation (HCHF) was established by Dr Sonam Wangchuk, with a wide brief including documentation and support for the intangible heritage of Ladakh, as well as the conservation and restoration of historic monuments. They have restored over 30 stupas in various villages and completed four ancient wall painting projects.[23] They are based in the Lonpo House, situated just below Leh palace. This house was restored by Harrison in 2003–2005 with funding from INTACH UK Trust and is owned by Chemre Monastery and partly occupied by Chemre monks.

The Achi Association, a Swiss-based NGO founded to restore temples of the Drikung Kagyu order of Tibetan Buddhism, has been working in Ladakh since 2000 with extensive inputs from European painting conservators and architects, as well as a youth education project funded by the Getty Conservation Institute (see Norboo et al., this volume). This organisation was recently succeeded by Achi Association India, with a wider brief that now

21 THF, see online: http://www.tibetheritagefund.org (accessed: 1.2.2022).

22 INTACH, see online: http://www.intach.org (accessed: 1.2.2022).

23 Himalayan Cultural Heritage Foundation: www.heritage-himalaya.org, and interview with Sonam Wangchuk 10.10.2022.

includes secular buildings. They are currently engaged in the restoration of abandoned traditional houses in Phey village, to the west of Leh.[24] Other projects restoring stupas and temples in Zanskar, Nubra and Shey have been undertaken by Czech, and Hungarian groups during the last 20 years, but none of these are active at present.

This overview shows that the conservation of historic buildings is gaining momentum in Ladakh, through an array of individual initiatives led by Ladakhi, Indian, and foreign agencies, yet with little concerted support from local or central government to date. However, the separation of Ladakh from Jammu and Kashmir State and the granting of Union Territory status brings the promise of generous central government funding, albeit mainly in relation to tourism promotion. Mass domestic tourism is already seen locally as a threat to Ladakh's fragile natural environment and to Leh's over-burdened infrastructure. To illustrate something of the scale of this, amid post-Covid euphoria half a million domestic tourists visited this town of 30,000 inhabitants during 2022, with more than 15 flights arriving every single day.

Although there is some evidence to suggest that tourism can benefit historic buildings conservation, such as the restoration of the Ensa temple in Nubra by Achi Association India (funded by J&K Tourism Department), the general sense is that it focuses attention and resources on new hotels, commercial properties, and transport infrastructure, while largely neglecting the region's many threatened vernacular and religious buildings. Owners of traditional buildings are beginning to realise that their often abandoned houses could have an economic value if restored as hotels and guest houses. An early example was the Nimmoo House, a fine 19th century mansion in the Tibetan style, which was recently restored by a French company as a boutique hotel. The example of LAMO in Leh inspired the conversion of the abandoned Muljok House in Saspol

24 The Achi Association, see online: http://www.achiassociationindia.org (accesed: 1.2.2022).



Fig. 7-28 LAMO in 2012, with the completed entrance courtyard and terraces.
Source: John Harrison (2012).

into a small hotel, which was led by the son of the family. LAMO has also prompted a local artist to take on another old house in Nimmoo, an hour west of Leh, which is being converted into a residence and studio.

This chapter has amply demonstrated that historic private houses can be renovated and upgraded for modern living, and that derelict buildings can be revitalised in ways that both support local building craft traditions and provide valuable community services. If the restoration of the Munshi and Gyaoo houses, and the establishment of the LAMO Centre, set a precedent for the rejuvenation of other buildings in the Old Town of Leh, and perhaps the larger Ladakh area, it will have served its purpose well. The LAMO project has shown how, simultaneously, these restored buildings can bring pride to local residents and a rich source of potential livelihood, as well as knowledge about their history and the life of the people who created them.[25] These buildings will now endure as precious parts of the region's legacy, standing as beacons of hope for future generations to come (Fig. 7-28 and Fig. 7-29).

25 In 2018, LAMO received the Award of Distinction from the UNESCO Asia-Pacific Awards for Cultural Heritage Conservation. In 2019, the organisation received the "Project of Influence" award at the Best in Heritage conference in Dubrovnik, Croatia. These awards represent both a validation of our work and encouragement to future generations.

Fig. 7-29 South front of the completed LAMO building.
Source: John Harrison (2010).



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VIII

Stupa Thoughts, Occasioned by Building a *chörten* in Tibet

John Harrison

Name: John Harrison
Designation: Architect
Affiliation (Institute): Research Fellow, Liverpool School of Architecture
E-mail address for correspondence: harrison_john_gb@hotmail.com

Biography

John Harrison

is a British architect who has been travelling in Tibetan and Himalayan regions since 1985, documenting and restoring historic buildings in Ladakh, Nepal, Pakistan, and Tibet. He is a research fellow at Liverpool School of Architecture, and has lectured on the architecture of the Tibetan Himalaya at universities and cultural institutions across Europe and Asia. He has published numerous books and articles on his Himalayan work, including *Mustang Building: Tibetan Temples and Vernacular Architecture in Nepal Himalaya* (Saraf Foundation for Himalayan Traditions and Culture, 2019).

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In memory of

Pala Migmar,

Tenzin,

Kuchu Tongme,

Nawang Dorju,

and Andre.

INTRODUCTION

The *stupa*[1] is the archetypal Buddhist structure, symbolising to the initiate the teachings of the Buddha nature and taking a multitude of forms, from tiny clay Tibetan offerings to vast domed and pyramidal buildings such as Borobodur in Java and Bodhnath in Kathmandu. Although the *stupa* form originated in the funerary mounds of ancient India and in its Buddhist developments may contain relics of the Buddha or the remains of lamas, it is usually a purely votive offering, erected to spread the *dharma*, the teaching, and to gain merit for the builder.[2]

The *stupa*, or *chörten* (*mchod rten*) in Tibetan, is a constant feature of the landscape across the Tibetan cultural area, appearing around monasteries and temples, along trails, as the entrance gateway to villages, in fields, and on the highest mountain passes. In Tibet itself, however, the *stupa* virtually disappeared during the destruction wreaked by China's Cultural Revolution from 1966 to 1970, a target for the anti-religious zeal of the Red Guards. The widespread iconoclasm was directed at all religious buildings: most Buddhist temples were demolished (although some structures were retained in secular use), while sculptures and wall paintings were generally destroyed.[3] A very few such buildings were preserved by the state as historic monuments, such as the Jokhang Temple in Lhasa, the Potala Palace, and the Great Stupa at Gyantse (rGyal rtse). Despite the efforts of the Chinese Communist Party, Buddhism remained a potent force in the Tibetan population and when the Cultural Revolution ended, local communities immediately started to rebuild their temples and *stupa*. The period of destruction had been relatively short (compared, say, to Mongolia)[4] and traditional skills had remained in use for much small-scale secular building work.

THE SITE

Riwo Tsenga (Ri bo rtse lnga) as mount Wutai Shan is known in Tibetan language is a holy mountain and also known as Mountain of Five Peaks. In Tibet this mountain finds its counterpart in the Lhari Tsenga, also known as Tibetan Riwo Tsenga, which rises above the left bank of the Kyichu (sKyid chu) River some 30 km south-west of Lhasa, in Chushul County. Locally it is regarded as sacred to Jamyang ('Jam dbyang) Manjushri, the bodhisattva of supreme wisdom. Both the lHa ri rtse lnga (i.e. Tibetan Ri bo rtse lnga) and the adjoining holy mountain Gangri Tokar (Gangs ri thod dkar) attract circumambulating pilgrims; both have Nyingmapa[5] nunneries including the flourishing Shugsep (Shug gseb) nunnery on Gangri Tokar, and both have revered meditation caves. The Sangyak Drak[6] nunnery on the south-west side of Lhari Tsenga is built around a meditation cave of the Guru Rinpoche, Padmasambhava, who is said to have spent three months here. The cave contains a self-formed statue of Padmasambhava and a neck-dislocating hole into which one's head is inserted for blessings. The most precious relic at Sangyak Drak is a tiny Padmasambhava figure, 'Kutsap Jéma Ardrong', displayed on the breast of a clay Guru statue in the main temple, the only one of five formed from drops of blood from Padmasambhava's nose which survived the Cultural Revolution, hidden by the nun Jigme Chunzom (Akester 2016: 232–235).

Guru Rinpoche concealed various treasures around his cave and prophesied that *terton* (*gter ston*, treasure-seeker) Guru Jotsé would reveal them. In the 13th century, Guru Jotsé, a reincarnation of King Senalek Jingyön (Sad na legs mjing yon),[7] duly discovered texts and *purbu* (*phur pa*—ritual daggers) there. However, there is said to be still a *dzi* (*gzi*) stone the size of an eight-year-old child (*dzi* are usually two to three centimetres long) under the large rock below the nunnery, which flew from India attracted by Padmasambhava's power.

The early history of the site was Nyingmapa, but then in the early 20th century Drukpa Yongdzin Rinpoche ('Brug pa Yongs 'dzin Rin po che) founded a Drukpa Kagyu nunnery. Shugsep Ani Lochen meditated there before moving to Shugsep just to the east, and she records in her autobiography that she built a *stupa* for the relics of her guru Pema Gyatso (Pedma rgya mtsho) who died there around 1915.[8] However, the building of the original *stupa* is attributed locally to Guru Rinpoche.

The buildings and the *stupa* were destroyed in the 1960s during the Cultural Revolution,

1 *Chörten* (*mchod rten*) is the Tibetan word for *stupa*, but I have retained the term *stupa* throughout. Tibetan terms are rendered phonetically throughout this chapter, followed in brackets by the properly transliterated Tibetan term, if known, using the Wylie system. Tibetan words are rendered the same way in English whether singular or plural, so *stupa* can be either, depending on the context.

2 There is an extensive literature on the art, architecture, and symbolism of the *stupa*, including Dallapiccola (1980); Dorjee (1996); Snodgrass (1982); Tucci (1988); and Wassman (2001).

3 Shakya (1999: 320ff.) refers to the destruction of religious art and architecture by local Tibetan Red Guard groups during the Cultural Revolution: "All large and small *chörten* must be destroyed".

4 In contrast to Tibet, religious practice and building was suppressed in Mongolia as early as the 1930s and it was not until the 1990s, after the fall of the Soviet Union, that lost traditional building skills could begin to be revived (Alexander 2005: 5, 105).

5 Nyingmapa, "The Old School", the oldest of the four main schools of Tibetan Buddhism.

6 Also called Sangmar Drak, Sang yak drak is an abbreviation, according to Kushu Tongme, of Drak mar sang yak nam ka dzong, the red rock infinite sky fort. See Dowman (1998: 145) and Chan (1994: 491).

7 King Senalek Jingyön (*Sad na legs mjing yon*), Tride Songtsen (*Khri lDe srong btsan*), Mutik Tsenpo (*Mu tig btsan po*) 761–815, one of the three or four sons of Trisong Detsen.

8 Information provided by Matthew Akester in 2000, who translated parts of the Rongtha text.

although by that time the *stupa* was little more than a heap of stones piled up by visitors and villagers. The nunnery was re-established in 1990 as a Nyingmapa community by Jigme Chunzom, who had already been living and meditating in the cave for some years.

The nunnery was rebuilt along with other structures at the base of the cliff and a number of houses on the slope below (Fig. 8-1), and the *stupa* re-erected. However, this was a rather crude construction and it subsequently collapsed in heavy rains. A visiting scholar heard that the *stupa* was to be rebuilt once more in concrete and in 1999 the Tibet Heritage Fund (THF), then working on building restoration in the Barkhor, Lhasa, was asked to assist on the project. Not on a major pilgrimage route and not in itself a major centre for pilgrimage like neighbouring Shugsep, Sangyak Drak had a struggle to survive financially, and was officially permitted to house only 16 nuns. Physically too it was hard, with no water supply — water had to be brought by donkey over a kilometre from the polluted Kyichu River which carries all of Lhasa's sewage. THF considered piping water to the nunnery, but the nearest source was 15 km away up the mountain. For the nunnery the support of THF was certainly welcomed as a source of funding, but perhaps also as a sign of a wider outside interest in the face of local official indifference or even opposition.

TIBET HERITAGE FUND

Tibet Heritage Fund was founded in 1996 by German researcher Andre Alexander and friends to promote the restoration of historic buildings in the old city centre of Lhasa, as an alternative to the municipal policy of demolition and redevelopment.[9] By 1998, THF had secured an agreement with the municipal planning office and the Cultural Relics Bureau, and restoration had started on houses in the Oedepug conservation area immediately to the east of the Jokhang temple, together with mains water supply and sewerage (Alexander 1998). THF assembled a workforce of Lhasa building craftsmen and persuaded elderly master-builder Migmar out of retirement to pass on his skills. At the time, very little historic buildings restoration work was taking place in Lhasa. Building workers and construction companies were largely employed on new office buildings, commercial premises, and multi-storey housing in the expanding Chinese city to the west. Even at sites such as the Potala Palace and the Jokhang temple, there was concern about the extent of rebuilding rather than repair.

At that time, there were no facilities for higher technical education in the construction field in the Tibet Autonomous Region. New building was done almost entirely in low quality concrete, requiring only legions of unskilled labourers, and causing further erosion of traditional skills. Some skills appeared already to have been lost, and it was difficult to find enough masters who had learned their trade before the dismantling of the traditional guilds. However, there were still a fair number of building craftsmen interested in the THF project and by 1999 the workforce was some 200 strong. Master builder Migmar, master carpenter Chuchok and other masters trained the younger workers on site in traditional carpentry, masonry, painting, and metal work, not only reviving but also passing on the ancient building skills and arts. Energetic international fund-raising brought financial support from Western governments and foundations.

THF was interested to learn the traditional way to build a Tibetan *stupa* and decided to fund the Sangyak Drak project as a case study. A total of USD 2,172 for the rebuilding and consecration of the *stupa* was provided from Britain by HRH the Prince of Wales. With this funding, THF was able to second carpenters and stoneworkers from Lhasa to work at the nunnery, to supply timber and brass, and truck transport for stone, earth, and *arga* (see Feiglstorfer and Michette, this volume) when there were insufficient local materials in Chushul. The village agreed to provide free labour.

9 Andre Alexander had been visiting Lhasa since 1987 and had established the Lhasa Archive Project in 1993 to study and document all aspects of the old city of Lhasa and lobby for its preservation, working with universities and organisations in Berlin, Trondheim, Paris, Hong Kong, and the Tibetan Academy of Social Sciences.



Fig. 8-1 View of Sang yak drak nunnery, built around the Padmasambhava cave at the base of the cliff.
Source: John Harrison (1999).

THE MASTER BUILDER AND THE *STUPA* DESIGN

At Sangyak Drak, the very determined head nun, Jambe Churtun, had already obtained the necessary official permissions from the Chushul district government for the rebuilding, and had engaged master builder Tenzin from Lhokha, southern Tibet, to direct the project. Tenzin had been educated as a monk before 1959, but he left the monastery to marry and raise a family. He worked for many years as a builder in Lhokha and then while at Samye Monastery met a Nyingmapa rinpoche from Anzon in Kham, Trulku Pelo. They decided to work together to combine the rinpoche's knowledge of theory and design contained in the scriptures with Tenzin's lifetime of practical experience. They first collaborated on rebuilding a *stupa* in 1990 at Drak Yerpa (Brag yer pa), the hermitage power-place east of Lhasa, then at Samye, and extensively at Drigung til ('Bri gung thil) Monastery and Shai Lhakhang (Zha'i lha khang), another early foundation of the Drigung School. Historically, building workers have always travelled in the Tibetan world to wherever work is available and craftspeople with particular skills in design, management, or certain techniques have always been in demand. Tibetan painters, travelling to decorate new temples, have been studied in considerable depth (Jackson 1996), but historical evidence on other building craftspeople is now gradually emerging from the study of village and monastery records.[10]

According to Tenzin, Trulku Pelo regarded Jigme Lingba (1729–1798) as his teacher, the disciple in turn of Kunkyen Longchen Rabjampa (Kun mkhyen Klong chen Rab 'jams pa, 1308–1363), known as Longchenpa. Longchenpa, incidentally, meditated and produced his seminal works on Dzogchen[11] in a cave on neighbouring Gangri Tokar. Trulku Pelo planned to stay at Drak Yerpa, but this was not permitted by the authorities and he had to return to Kham. However, before that he had been to Sangyak Drak drak three times, the first time on pilgrimage and then at the invitation of the nunnery. On his third visit, he arrived with an entourage of a hundred monks and nuns, stayed for two months and conducted many rituals, and left a footprint in a rock below the nunnery.

For the construction of the *stupa*, Tenzin worked from scale drawings which he had prepared himself, using the figures and proportions which Trulku Pelo read from the scriptures or commentaries (Fig. 8-2). The scriptures give a series of proportions, and Tenzin had translated these into metric dimensions for two sizes of *stupa*.[12]

There are parallels here with the architectural pattern books that proliferated in England in the 18th century, disseminating the revival of Greek and Roman Classical architectural forms that had started in Renaissance Italy. In 18th century England, Classicism was first filtered through the austere work of Andrea Palladio, until later in the century Neo-Classicism adopted the proportions and details being revealed by archaeological excavations in Greece. In these books, the Classical orders of architecture (Tuscan, Ionic etc.) were carefully analysed and their proportions set down as rules to be followed. For instance, in Battey Langley's *Builder's Jewel* (Langley 1741: 16) we read:

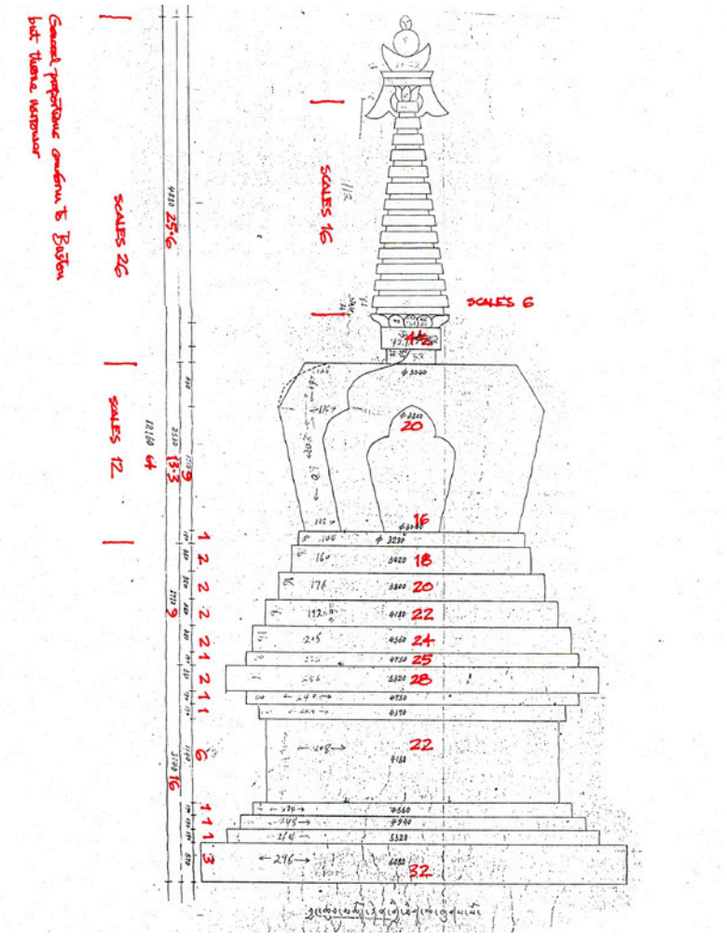


Fig. 8-2 Drawing by the master builder Tenzin for construction of the *chörten* at Sangyak drak.
From the proportions in the written text, he derived two sets of metric dimensions for two different sizes of *stupa*. The heavy red figures are my re-calculations of the original proportions.
Source: John Harrison (1999).

10 For instance, Harrison, Luczanits, and Ramble (2018: 23, 113–115), on the building of Gönpa Gang in Mustang, Nepal, in the 1690s.

11 Dzogchen, or "Great Perfection", is a tantric discipline transmitted within the Nyingmapa sect and in the Bön religion. For Longchenpa, see Akester (2016: 235).

12 Unfortunately, I do not know which scriptures Trulku Pelo and Tenzin were referring to, as I have only Tenzin's drawing.

> Rule II. To divide the Dorick entablature into its architrave, frieze, cornice etc. First, divide the height into 8 parts; give 2 to the architrave; 3 to the frieze, and 3 to the cornice. Secondly, divide the upper 1 of the architrave into 3, and give the upper 1 to the tenia; divide the lower 2, in 6; give the upper 1 to the fillet over the guttas, and the next 3 to the guttas [...].

If we turn to Desi Sangye Gyatso (sDe srid Sangs rgyas rgya mtsho), incidentally writing only 50 years before Langley, we find:

> The whole part above the frame of the throne has to be divided into 12 modules. Each of these is subdivided into 4 parts which are taken as quarter for the measure of the proportions of the various parts of the stupa. The "ten meritorious deeds" are a quarter in height; the collar of the 4 steps half a quarter each; each of the steps 2 quarters [...].

The Renaissance architectural books generally follow a consistent pattern: a written description of each of the classical orders amply illustrated with drawings showing the proportions and geometrical setting-out of the parts, followed by architectural examples from a particular architect or school showing how the proportional systems and details are translated into actual buildings. In comparable Tibetan texts, drawings are generally absent and the design has to be mentally constructed or physically drawn out by the builder from the description. Yet these texts too follow a consistent pattern: first an enumeration of the eight standard *stupa* types—the eight *stupa* of the Tathagatas commemorating the eight great deeds of the Buddha's life—and then a detailed description of one of them, giving the dimensions of all the parts and concluding with the colours in which the *stupa* is to be painted.

Giuseppe Tucci, of course, addressed the question of such texts in the first volume of his Indo-Tibetica series, *Stupa: Art, Architectonics and Symbolism* (1988). By 1932 he had located, or heard of, four texts, two of which he translated in his book. As Tucci predicted, many more texts have become available since then and an India-based scholar, Pema Dorjee, has listed a dozen construction manuals written by Tibetan scholars, in addition to references in the original scriptures (or rather, early Tibetan translations of lost Sanskrit originals)[13] Dorjee's book, *Stupa and its Technology: a Tibeto-Buddhist Perspective*, includes English translations of two texts from the Tantric sections of the Tangyur, and two later construction manuals by Butön and Sangye Gyatso. The latter is a newer and fuller version of one of the two texts earlier translated by Tucci.

Pema Dorjee's list of writers includes a volume by Rongtha Lobsang Damchö Gyatso, *Guidelines for technical design* (*Rong tha blo bzang dam chos rgya mtsho, thig gi lag len du ma gsal bar bzhad pa bzo rig mdzes pa'i kha rgyen zhes bya bzhugs so*), which was printed in Lhasa and available in the Barkor in 1999 (Fig. 8-3).

13 Chayet (1994: 149) refers to other recent sources not listed by Dorjee (1996).

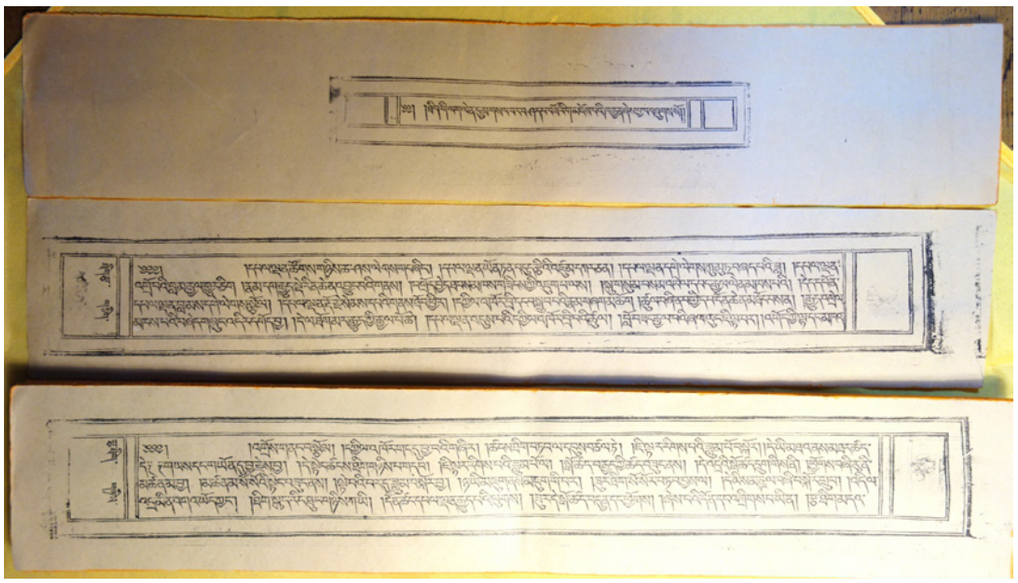


Fig. 8-3 The Lhasa book on design by Rongtha Lobsang Damchö Gyatso (first pages).
Source: John Harrison (2022).

This is a general design manual, covering *mandala*, *thangka*, and sculpture as well as *stupa* construction. The book was written at the request of Gyüme (brGyud smad) College in Lhasa, and the author says he follows the teachings of Tsongkhapa, the 14th century founder of the Gelug School, but there is no indication as to when it was written.[14] In the section on *stupa*, the author says he is following a book by a Trulku Tankawa, which suggests that it is a compilation from earlier books, perhaps a popularisation; a "how-to-do-it" book, *yabsang lo*, as it was described to the present writer by Tantric master Nawang Dorju from Drepung Tantric College.[15]

Butön (Bu ston), 1290–1364, was the great scholar who compiled the Kangyur and Tangyur canons, ordering the vast amounts of Indian Buddhist material which had been translated over the preceding three centuries. His work of classification included the *stupa* and most later Tibetan writers on the subject have followed his texts. One exception is Desi Sangye Gyatso (Sangs rgyas rgya mtsho), 1653–1706, the regent of Tibet during the Fifth Dalai Lama's last years and builder of the Red Palace at the Potala. He criticised Butön's *stupa* design (which surprisingly does diverge from Butön's stated sources in the *Vimalosnisa*, one of the texts translated from the Sanskrit original) and proposed improvements from what appears to be a purely aesthetic standpoint (Dorjee 1996: 66, 70)

Tenzin's drawing used for the Sang yak drak *stupa* generally conforms to Butön's proportions, but with a narrower lion throne and plinth, which borrows from Sangye Gyatso's proportions. A drawing prepared by an elderly Nechung[16] monk, which accompanies the Rongtha text, mostly follows Sangye Gyatso's proportions, with only some minor differences in the spire and finial. This is to be expected from a Gelug author and suggests that the book was written some time after the early 18th century, when Desi Sangye Gyatso died.

The *stupa* design chosen for Sangyak Drak follows the Changchub type, the *Stupa* of Enlightenment, probably the most popular and most often seen of the eight standard designs. The eight follow a similar pattern of a dome standing on steps, except for the Kadam, the Death of the Buddha *Stupa*, which has a vase shaped dome without steps. The differing design of the steps—square in plan, octagonal, circular, etc.—distinguish the other seven *stupa* (Fig. 8-4). The Changchub *Stupa* has four square steps below the dome.

14 Rongtha Lobsang Damchö Gyatso, 1857–1915 or 1863–1917, superior of Labrang Monastery, Amdo. De Rossi Filibeck (1987: 110, n. 9) cites another New Delhi publication of Rongtha.

15 Drepung Monastery, west of Lhasa, is a vast complex of Gelugpa temples and residences which housed around 10,000 monks in the 17th century.

16 Nechung Monastery, near Drepung, was the seat of the State Oracle of Tibet. Incidentally, in 1999 THF was restoring Meru Nyingba Monastery, the Lhasa residence of the oracle and closely connected to Nechung.

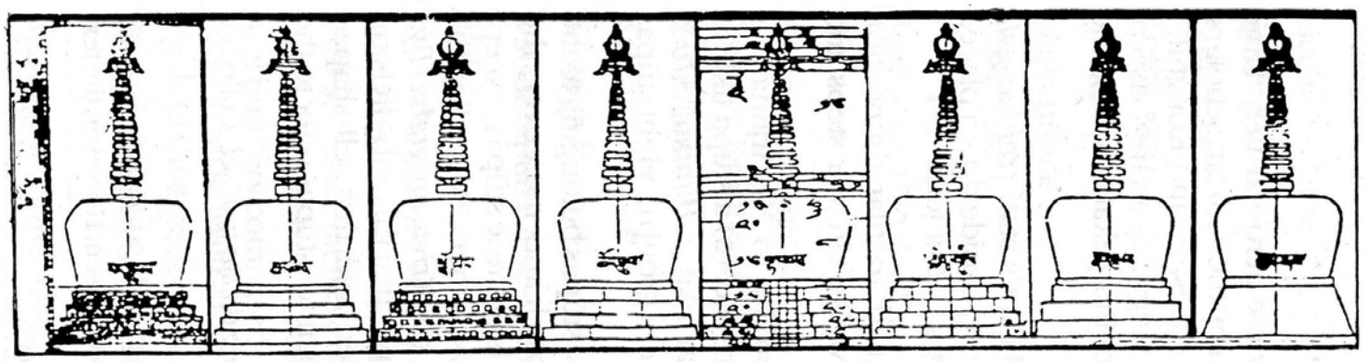


Fig. 8-4 The eight *stupas*.
In this woodblock print from a Sumpa Khenpo text, the Changchub *stupa* is second from the left.
Source: Dorjee (1996: 18).





Fig. 8-5 Bottom right: The surviving stone *stupa* base on the site below the nunnery.
Source: John Harrison (1999).

Fig. 8-6 Bottom left: Master builder and monks consulting the calendar for an auspicious starting date.
Source: John Harrison (1999).

BUILDING THE *STUPA*

The *stupa* was to be rebuilt on its original site, below the steepest part of the slope under the main nunnery buildings and the cave at the base of the cliff. The original stone platform survived, built on a 30-degree slope with rock outcrops suggesting a firm foundation, and so only the retaining wall on the lower side was refaced (Fig. 8-5).

The size of the *stupa* was first proposed as 5 metres square in plan, but the nunnery decided on 6 metres when more funding became available. They calculated that the two truckloads of *tsa tsa* (*sa tsha tsha*, miniature moulded clay *stupa* and Bodhisattva figures) they had would be sufficient to fill a 6 metre *stupa*.

Kuchu Tongme, an elderly monk at Sangyak Drak, said that a full site preparation ritual was necessary, as for a new site, but in this case it did not include the lengthy examination of the serpent-bellied earth lord which is described by Pema Dorjee (1996: 34) and by Thupten Legshay Gyatso (1979: 30–33) in *The Gateway to the Temple* According to Lama Nawang Dorju of Drepung, who studied that ritual as a young monk, it had not been performed in Tibet since the 1950s. The *nāga* (*klu*), or earth spirits, would still have to be pacified though, and their permission sought to disturb the ground. The master builder and the monks consulted the calendars to determine the most auspicious date for starting work on the site (Fig. 8-6). The accumulated *tsa tsa* and offerings were stored at the nunnery, where visiting monks conducted the ceremonial rites necessary before they could be placed in the *stupa*.

The soil had to be examined for any defects such as rocks, bones, and potsherds, which would have to be removed. A Lhasa patron who also donated the statues for the *stupa* provided soil, which had been consecrated by a high Nyingmapa lama, to spread on the cleared site. Construction then began with the building of the 6 metre square plinth and the steps to the lion throne, the large square pedestal on which the *stupa* proper sits (Fig. 8-7).

At this stage, the master builder and a Nyingmapa monk from Lhasa, a former student of Trulku Pelo, buried various weapons (swords, spears, and old guns) within the structure, together with metal farming implements such as sickles, and covered them with stones (Fig. 8-8).

The throne walls were built up around a central cavity, into which were placed clay pots, known as *bumpa*, containing five coloured cloths and fruit, butter, tea, rice, and barley. Master builder Migmar of Lhasa gave more information on the pots: there are two types, the *lhambu* or mountain with a painting of cloud and snow, and the *lumbu* or *nāga*, with a painting of water.

In addition to the central cavity in the throne there were four smaller corner cavities, which may be built in the shape of *mudra*—moon, circle, and triangle. They were filled with *tsa tsa* of Padmasambhava and Sakyamuni, and some clay Padmasambhava figures. The cavity was sealed over with a wooden floor, and the masonry construction continued with the "ten meritorious deeds" and the four steps up to the base of the dome. The central cavity here was filled with *tsa tsa* packed together with incense, and again was closed with a wooden floor and a central cross-beam to support the *sogshing* (*srog shing*), the axle-pole, the tree of life (Fig. 8-9 and Fig. 8-10).

Fig. 8-7 Right: The stone base of the *stupa* under construction.
Source: John Harrison (1999).

Fig. 8-8 Left: Construction of the lion throne.
Source: John Harrison (1999).





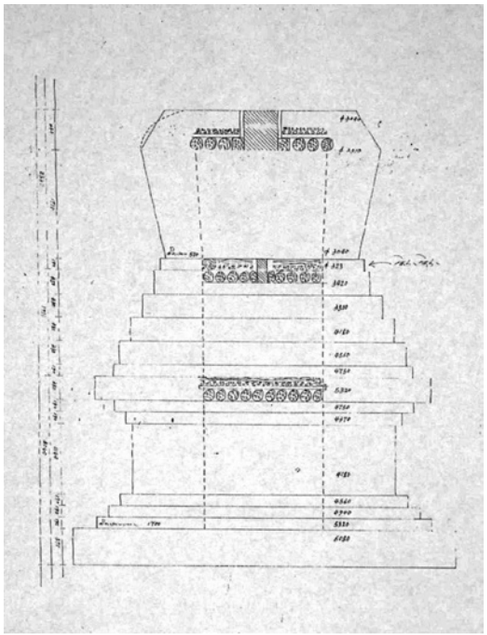


Fig. 8-9 Drawing by Tenzin showing the internal structure of the *stupa*, with the wooden beams closing off the compartments containing the ritual offerings.
Source: John Harrison (1999).

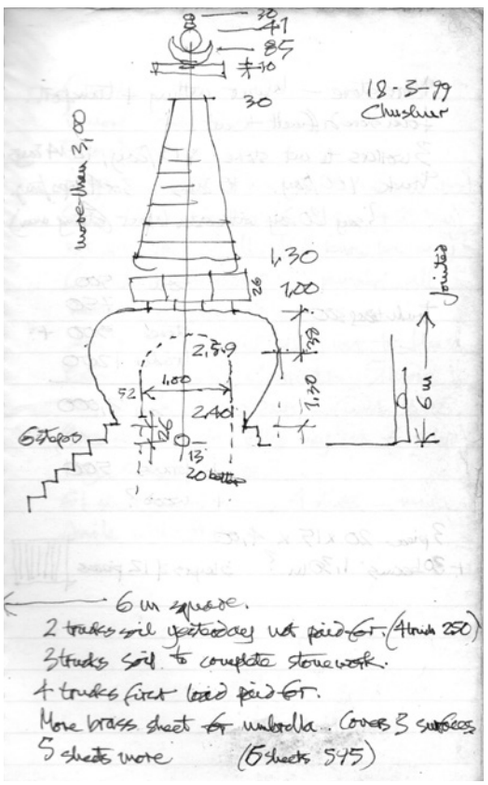


Fig. 8-10 Site notes: Tenzin's information on internal cavity dimensions and *sogshing* requirements.
Source: John Harrison (1999).

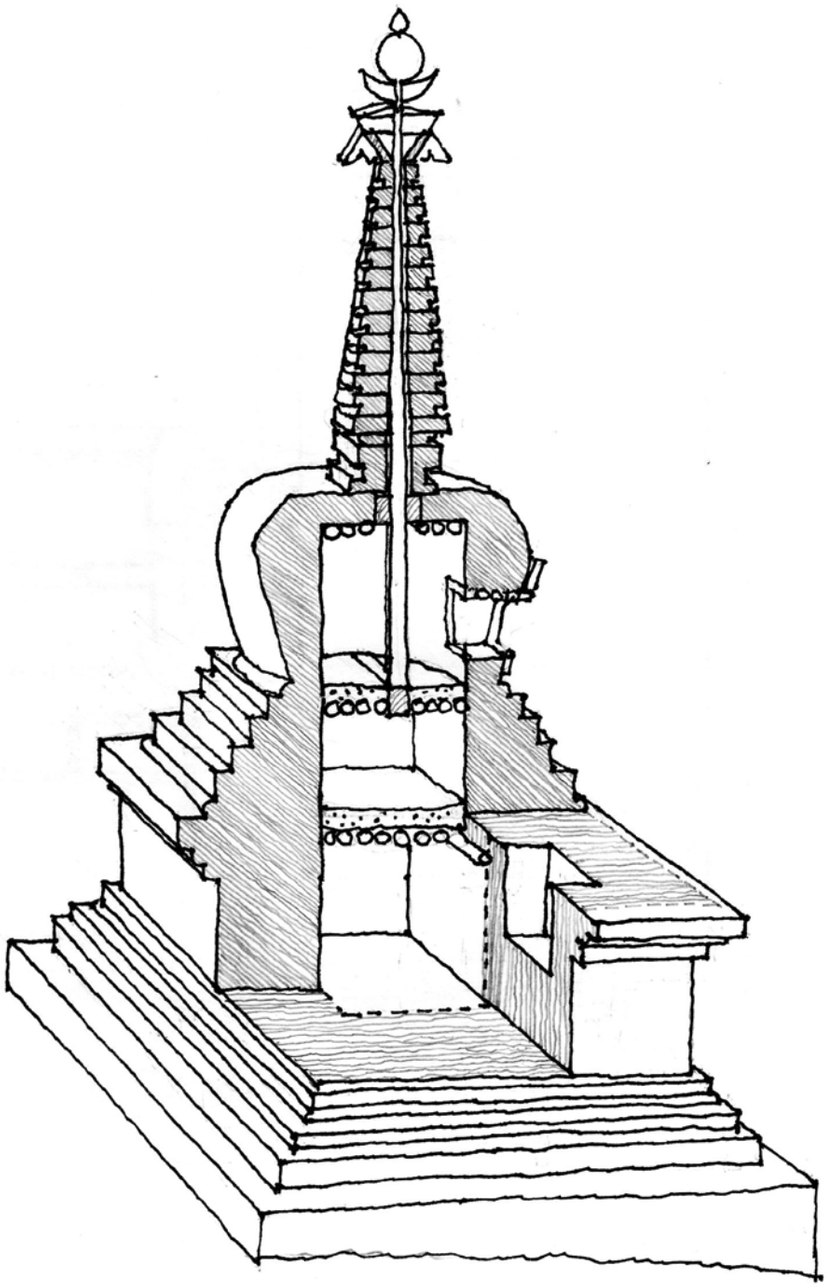


Fig. 8-11 Cutaway section drawing showing the *stupa* structure and internal compartments for offerings.
Source: John Harrison (2022).



Fig. 8-13 Working from the drawings, a full-size template of the spire is made to establish the diameters of the 13 wheels.
Source: John Harrison (1999).



Fig. 8-12 Masonry construction continuing on the steps and dome.
Source: John Harrison (1999).

Fig. 8-14 The carpenters' traditional tools: adze, square, frame saw and jack plane.
Source: John Harrison (1999).



While the four Lhasa masons were building up the lion throne, steps, and dome (Fig. 8-8 and Fig. 8-12), three local workers were cutting stone from the quarry on the north-west face of the mountain and transporting it by tractor to the nunnery. Local labourers were carrying and mixing earth for mortar, and the carpenters were cutting the timber sections for the spire and the central pole, the *sogshing*. All the timber was brought by truck from Lhasa except the *sogshing*, which was cut from a juniper tree growing on the mountain above the nunnery. The nuns recklessly felled five of the sparse trees to get one long enough. Tenzin made a full-size template for the tapering spire to establish the size of the 13 wheels (Fig. 8-13).

The substantial blocks of wood for the wheels were glued together and then later cut to a circular shape by the two Lhasa carpenters. Only traditional hand tools were used: frame saw, adze, wood plane, and chisels (Fig. 8-14 and Fig. 8-16).

The *sogshing* was adzed and planed to a square section with a carved base, then painted red with scriptural verses in gold (Fig. 8-17 and Fig. 8-18). The *sogshing* has to be installed in the *stupa* in the same position in which it grew, so the east side was marked on the tree when it was felled.

When the sides of the dome had been built up and an auspicious time was reached, there was a major ceremony to fit the *sogshing* in position. The nuns recited prayers and blew trumpets at the worksite while paper rolls of prayers were tied around the pole (Fig. 8-19).

A procession then carried the pole around the *stupa* and lifted it into position (Fig. 8-20).

The cavity in the dome around the pole was filled with prayer rolls, a complete hundred-volume set of the Nyingma Kangyur (Fig. 8-21), and gilded statues of Sakyamuni, four-armed Avalokiteshvara, and Padmasambhava in a fierce protector manifestation.

A fourth statue of Sakyamuni was later installed in the niche on the outside of the dome. When the cavity was completely filled with tightly packed offerings, the top was closed with wooden beams to hold the *sogshing* in position and then with stone. The tops of the dome and all the steps were later finished with waterproof *arga* clay, beaten into place, polished, and oiled. Tenzin thought the local *arga* was poor quality, and so THF brought a truckload from Phenpo, a considerable distance east of Lhasa. At the time, THF was laying *arga* on the roofs of houses being restored in the Barkhor, and employed a team of wom-

en specialists for this work. Five more carpenters came from Lhasa to complete the 13 wooden wheels which make up the spire, *chökor chogsum* (*chos 'khor bcu gsum*), and then the outer faces were covered in brass sheet. The sections were carried up on scaffolding and lowered over the *sogshing* one by one. Finally the brass umbrella, sun and moon, and pinnacle, all fashioned in Lhasa workshops, were fitted on top of the *sogshing* (Fig. 8-22). The construction took some four weeks, in March and April 1999.

A ceremony in the *gompa*, presided over by a high Nyingmapa lama, accompanied the completion of the construction work, to consecrate and empower the *stupa*. At the site there were cheers and clouds of thrown *tsampa* from the assembled nuns, villagers, workers, and visitors.





Fig. 8-15 Gluing the wooden sections of the spire.
Source: John Harrison (1999).





Fig. 8-17 Painting the completed *sogshing* cut from a juniper tree.
Source: John Harrison (1999).
Fig. 8-18 Idem.
Source: John Harrison (1999).

Fig. 8-16 Adzing the wooden sections of the spire.
Source: John Harrison (1999).



Fig. 8-20 The *sogshing* is carried up onto the *stupa* and lowered into the central cavity.
Source: John Harrison (1999).



Fig. 8-19 The finished *sogshing* is wrapped in ceremonial scarves and rolls of paper prayers.
Source: John Harrison (1999).



Fig. 8-22 Finishing the *arga* and whitewashing the masonry.
Source: John Harrison (1999).



Fig. 8-21 The volumes of the scriptures are carried round the *stupa* by the nuns and then packed inside the cavity around the *sogshing*.
Source: John Harrison (1999).

CONCLUSION

The rebuilding of the Sangyak Drak *stupa* took place in a period of relative liberalisation (very relative) after the end of the Cultural Revolution and the death of Mao Zedong, when for a few years foreign NGOs were permitted to operate in Tibet. Local communities and religious institutions could rebuild destroyed temples and *stupa*, but there was still strict control by government over what was permitted.

Sacred building had been forbidden for perhaps 20 years, but secular building with the same traditional techniques and materials had continued, and the craftspeople were still alive to start again. Modern materials were also available, for the massive commercial and residential expansion of Lhasa as Han migrants flooded into the city, and the nunnery might well have rebuilt their *stupa* in concrete but for the chance contact with THF.

Various material, social, financial, labour and religious elements all converged to make the *stupa* building possible: the wishes of the nuns, monks and lay villagers; international funding channelled through a foreign-led organisation; classical text-based designs, masterful technical knowledge, raw materials of local origin (juniper trees, earth and stone) and more distant origin (timber from Lhasa and Tibetan forests, brass, *arga*, consecrated soil); craftspeople from Lhasa and elsewhere, local labour; expert ritual knowledge; as well as the numerous votive offerings and religious texts that went inside the *stupa*. Twenty years later, it is most unlikely that such a project could happen now. THF and other foreign NGOs were expelled from Lhasa in 2000 and since then expressions of traditional Tibetan culture have come under increasing pressure, for example through Han in-migration, the restriction of religious observance, and declining access to Tibetan-language education (Buffetrille 2021). The conservation of some historic religious buildings, with the associated crafts and craftspeople, will no doubt continue as national monuments, preserved, like folkloric costumes and dances, primarily for the entertainment of Chinese tourists.



Fig. 8-23 The completed *stupa* below the nunnery at Sangyak Drak.
Source: John Harrison (1999).

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INTERVIEWS BY THE AUTHOR AND INTERPRETER NYIMA TSERING IN LHASA AND REGION

Jambe Churtun, head nun of Sang yak drak. March 1999.

Kuchu Tongme, an elderly monk at Sang yak drak. March 1999.

Master builder Migmar of Lhasa. 4.4.2000, 24.5.2000.

Master builder Tenzin of Lhokha. 7.4.2000.

Tantric master Nawang Dorju of Drepung Tantric College. 26.5.2000.

Matthew Akester, independent scholar. 1999–2000.

IX

Why did the Tiered Temples Collapse in the 2015 Nepal Earthquake? A Scrutiny of the Traditional Built Heritage of the Kathmandu Valley, based on Experiences from Post-Earthquake Reconstruction

Sudarshan Raj Tiwari, Prem Nath Maskey, Hans Christie Bjønness and Tore Haavaldsen

Name: Sudarshan Raj Tiwari
Designation: Professor of Architecture
Affiliation (Institute): Tribhuvan University, Nepal

Name: Prem Nath Maskey
Designation: Professor of Structural Engineering
Affiliation (Institute): Tribhuvan University, Nepal

Name: Hans Christie Bjønness
Designation: Professor Emeritus
Affiliation (Institute): Norwegian University of Science and Technology (NTNU)

Name: Tore Haavaldsen
Designation: Professor Emeritus
Affiliation (Institute): Norwegian University of Science and Technology (NTNU)

Biography

Sudarshan Raj Tiwari

retired as Professor of Architecture at the Institute of Engineering, Tribhuvan University in 2013 after a teaching career that lasted almost 40 years. He researches on historical architecture, urbanism and the culture of the Kathmandu valley and has published extensively on related topics. In addition to numerous articles and chapters in edited volumes, he has written three books, including *Temples of the Nepal Valley* (Himal Books, 2009). Some of these works can be read at www.kailashkut.com. He has also worked as a consultant for the World Bank and UNDP on projects relating to health, education, environment, and conservation.

Prem Nath Maskey

is Professor of Civil Engineering in the Institute of Engineering, Tribhuvan University, Nepal. He was the first person to receive a PhD in Engineering from this university, joined the faculty in 1975 and became the first Program Coordinator of the MSc in Structural Engineering. As Director of the Center for Applied Research and Development, he led the initiation of PhD programs in various engineering disciplines. His research activities have been focused on earthquake engineering and disaster risk mitigation of cultural heritage sites. He has published over 40 journal articles and conference papers on related topics.

Hans Christie Bjønness

is Professor Emeritus in Planning and Development Research at the Faculty of Architecture and Design, Norwegian University of Science and Technology, where he started programs in Urban Ecological Planning, as well as Visiting Professor at Tibet University, Lhasa. He has conducted various UNESCO assignments in Nepal on conservation, training and World Heritage discourses, as well as initiating the Trans-Himalayan University Network for Development of Education and Research (THUNDER). His latest research concerns historical villages in Tibet and post-disaster rights and conservation in Bhopal, India and Kathmandu. He is book editor for Sundari Chowk, Patan Durbar, as well as two volumes on drawings and architectural surveys (2014, UNESCO; forthcoming 2023, NTNU).

Tore Haavaldsen

sadly passed away in April 2023 at the end of a long and illustrious career. He started as a professor at the Norwegian University of Science and Technology (NTNU) in 1987, teaching Building Technology and Masonry Structures. He later went on to conduct research projects in Tanzania for NORAD and in Uganda, Yemen, and Iran for UNCHS as a consultant focusing on earthquake safety. In 2010, he was awarded NTNU's Internationalisation Prize after having been in charge of NORAD collaboration projects for 15 years, working primarily with Tribhuvan University in Nepal and Makerere University in Uganda. He was a board member of the World Seismic Safety Association and held visiting professorships at Stanford University and Arizona State University. His final post was Professor Emeritus at the Faculty of Engineering, NTNU.

INTRODUCTION

The gravity and scale of the disaster following the 2015 Gorkha Earthquake is generally communicated through three statistics: (1) 8,786 deaths and 22,491 injuries; (2) 469,000 houses destroyed; and (3) massive damage to heritage monuments—133 collapsed, 495 heavily damaged and 493 partially damaged. Government reports indicate an even larger amount of damage, with as many as 2,900 structures of religious and cultural value being affected by the earthquake. In the Kathmandu Valley alone, 33 listed monuments collapsed, while 107 suffered heavy damage and 140 sustained minor damages (Tiwari 2019a). Of the 17 monuments that collapsed in the seven Monuments Zones of the Kathmandu Valley World Heritage Site (KVWHS), 10 were built in the tiered style, the typical, traditional multi-roofed buildings (misnomer "pagoda") famed for their artistry and craftwork in wood and brick. In the aftermath of the earthquake, many people were asking why so many multi-tiered temples got damaged or collapsed, given that the recent event was much smaller than the 1934 earthquake. This is the question that this contribution seeks to answer.

Immediate reactions tended to point towards structural faults as well as questioning the materials and construction methods of these buildings. The government's Post Disaster Needs Assessment (PDNA) estimate of recovery needs for cultural heritage was pushed up so as "to build back better through the use of high quality building materials and structural improvements for structural strengthening" (GON 2015: 67). In particular, traditional building materials like mud, brick, and timber, as well as the associated technologies and structural crafts such as joinery and mortar, were singled out as key factors of weakness and under-performance. So much so that official policy documents even recommended making it mandatory to rethink its conservation laws and remove restrictions on use of modern materials and methods of construction while rebuilding heritage (GON 2015).

Given its geographical location in the Himalayan region and the geological conditions associated with active neo-tectonic processes, the Kathmandu valley lies in a highly seismically vulnerable zone. The huge damage suffered by its towns and monumental structures is attributed to the action of earthquakes of high magnitude, coupled with the deep and soft type of soil sediment prevalent in the valley. However, a studied consideration of the nature of the Gorkha Earthquake and its aftershocks, particularly its ground motion characteristics, will not give us reason enough to attribute the huge damage and destruction suffered by the tiered temples solely to the intensity of the earthquake. Also, given that the architecture, structure, construction materials, and technology of the tiered buildings had developed in the Kathmandu valley over a span of at least 1,500 years, within a prevailing environment of unrelenting annual monsoons and periodic destructive earthquakes, deprecating the materials and technology of construction and attributing its dismal performance in the Gorkha earthquake to some inherent fault in concept or development of the traditional architecture and the structures themselves also does not seem reasonable. It would be actually more logical to accept that the local society would have observed and experienced the efficacy of the architecture and structure of the tiered building type, and decided to continue building with these materials and methods precisely within such environmental contexts. Moreover, as none of the more than six listed buildings in the multi-tiered tradition in the Bhaktapur Durbar Square Monuments Zone (BMZ) of KVWHS, including the 55 Windows Palace, suffered collapse or heavy damage from this earthquake, explanations indeed need to sought elsewhere. One important fact that made the monuments in the BMZ distinct from others in the valley was that they all had been subject to restoration and maintenance interventions over the past four decades. With fresh findings from post-earthquake research, studies made in preparation for restoration and reconstruction works, and evidence from some actual reconstruction projects now becoming available, a more robust and detailed scrutiny of the structure and performance of traditional tiered temple buildings, their materials and methods, and of heritage as a social product with embodied community engagement, is now possible.

This chapter presents detailed studies and critical analyses of the tiered buildings from three perspectives: historical development; reported performance in recent earthquake events; and recent practices in post-earthquake reconstruction. First, we offer a detailed analysis of the historical development of the architecture, structure, materials, methods of construction, and crafting of the tiered temples, along with the traditional system of community led inspection, maintenance, and



Fig. 9-1 The rediscovered corner joint of cornice tie beam of Kashthamandap. Source: Sudarshan Raj Tiwari (2019).

reconstruction. Secondly, the behaviour and performance of these buildings in the context of the seismicity of the Himalayan region and the past and present earthquakes of Kathmandu valley is closely scrutinised using available reported, observed, and measured data. Thirdly and most extensively, evidence and experiences from a number of cases of post-earthquake reconstruction, including outcomes of their structural performance, vulnerability, and seismic capacity assessments, are examined in order to firm up our understanding of tiered buildings and their behaviour. This chapter argues in support of the following hypotheses:

1. The tiered temples have adequate capacities of resistance and resilience to earthquakes built in through plan configuration and design, materials and construction methods based in brick and wood craft traditions, making them deserving of more positive assessment and approval in terms of their efficacy.

2. The root cause of the severe damage to heritage architecture and the tiered temples seen in the Gorkha earthquake was not major inherent weaknesses of materials, methods and structures, but attributable more to the breakdown of traditions of cyclical repair, maintenance, and material renewal. It was mainly the consequence of a lack of regular maintenance, a general state of disrepair, and the deterioration of crucial materials and joints.

3. The breakdown of social and community engagement in the inspection, monitoring, and maintenance of temples built into the institution of the *guthi,* the loss of traditional building skills, and the inept interventions of recent times were critical in precipitating the disastrous damage to these buildings from a relatively small earthquake.

The applied objective of this chapter is to go beyond the testing of these three hypotheses and extend the findings towards the building of an indigenous strategy to address the future situation. The danger of loss of the tiered temples persists, which would represent the loss of an invaluable part of the Kathmandu Valley World Heritage recognised for its architectural uniqueness, tangible contribution to the development of Hindu and Buddhist faiths, and the living representation of a civilisation. It is hoped that such a strategy would reduce future earthquake disaster insecurity, thereby enabling the tiered temples to sustain as symbols of human endeavour, cultural continuity, civic strength, and safety. Moreover, as the efficacy of the architecture, structure and workmanship of the tiered building heritage is assessed and measured, the hypotheses are supported, and a way forward is drawn up, the chapter seeks to reiterate the importance of the art and craft of wood and brick work in defining the excellence of the heritage per se, while drawing out the central role of the craftspeople not only in its developmental history and reconstruction tradition, but also in post-earthquake reconstruction and its continuity into the future.

HISTORICAL DEVELOPMENT OF TIERED TEMPLE ARCHITECTURE

Optically stimulated luminescence (OSL) measurements made on a soil sample from the site of the Kasthamandap has dated the beginning of agricultural activities in the valley floor to the 9th century BCE (Simpson 2018), which compares very well to the 11th century BCE estimated period of the arrival of the Gopala (cowherd tribes and first prehistoric rulers of the valley) as per the Gopalarajavamsavali chronicles (GRVC). According to GRVC, the first large building built in the valley was the Pashupatinath temple, dated to circa 1st century BCE, and it had a sloping roof. The archaeological evidence from the Hadigaun Satyanarayana site (Verardi 1988) attests that buildings in brick were already well developed as early as the 2nd century BCE (Tiwari 2001: 10). A good production quality of fired bricks has been observed from this period, along with use of specialised (triangle shaped) bricks for paving courts with distinction. The same foundation ruins (tagged as HSN-S1) provide evidence that the prototype of the brick and wood rectangular *Dyochhe* temple was already set also. By the 5th century we find inscriptional evidence for the construction of temples in stone, with architecture in brick and wood flourishing in parallel.

The oldest piece of surviving building woodwork is from the early 5th century and this is the *metha* (head of the *tham* — timber post) piece making the capital set of the north-west post of the innermost frame of the Kasthamandap. A 6th century CE inscription records the renovation of a temple, built in brick and wood and with more than one floor. The building craft is highlighted by the use of coursed brick walls in mud mortar and wooden door frames, shutters, windows, and floor joists. The architectural terminologies used in this inscription suggests that the temple of Matindevakula is a developed continuation of the architectural style and constructional technology as indicated by the 2nd century BCE foundation structure HSN-S1, which was unearthed at Hadigaun. The famous palace of Kailashkut, with three courtyards and seven floors, was built in 6th century CE and its architecture and construction were noted by the then ambassador from China, Wang Xuanci, in the Chinese Tang annals (Regmi 1983: 253). The central temple of the palace was reportedly tiered and roofed in copper sheets. The Licchavi use of metal as an important architectural adjunct was quite extensive (Slusser 1998: 39). By the second quarter of the 7th century, Nepalese builders and craftspeople were already working on the building of Jokhang monastery and the Potala palace in Tibet. At the Jokhang, "the presence of walls made of baked bricks" as well as wooden doorway posts and lintels representing Nepalese workmanship have been noticed in recent conservation and research (Lo Bue 2009: 29). Clearly, by 640 CE craftspeople from the Kathmandu Valley were already very confident of their knowledge and skills in making and baking bricks, and in constructing large buildings in brick and wood in far-away settings.

As the Licchavis consolidated the socio-religious order in the valley and the application of rules of geometry and proportions of planning and design of buildings as held in their oral classical traditions of *vastusastra* (architectural science) and *silpasastra* (building trades) also entered into the local tradition of building in brick and wood, the inclusion of the arts and specialised crafts into architecture and building construction practices appears to have been formalised and the role of specialised craftspeople recognised. At least one Licchavi Inscription (507 CE) states that the indigenous society of Kathmandu valley was divided into 18 crafts groups, although it does not name them. From the activities noted in other inscriptions of the period, however, we can discern the existence of recognised groups of carpenters, masons, potters, stone carvers, copper worker, and several other crafts.

For example, the temple of Pashupatinath appears to have had a square sanctum room built in brick during the early centuries CE. Likewise, Changunarayan temple was already built with the plan configuration of a square *mandapa* temples of 16 posts by as early as the 5th century CE, much before it was codified in literature (Saradatilaka 12th century). While its sanctum core was built with stone posts and lintels, the perimeter frame was closed with brick infill (Tiwari 2009a). As ritual needs for temples with larger square sanctums became established, the construction of *mandapa* with stone posts and lintels were discarded in favour of using timber for posts and lintels. The re-detailing of *mandapa* with two square rings of wooden post and lintel frame construction in the superstructure, with commensurate partitioned floor foundations in the substructure for square temples, would have immensely increased the resilience of the building system against earthquakes. It is reasonable to conclude that the local builders' preference for wood-framed temples against others constructed in stone was the result of the newfound resilience of wood frames. That the change happened very quickly in time is evidenced by the Vimalsangha *linga* temple of Deupatan (486 CE) along with the Hadigaun Satyanarayana temple foundations (tagged as S23), both of which show brick foundations with no stone ruins around. However, as the principles of *vastusastra* required the sanctum room (termed *garbha-griha*, or womb chamber) of Hindu temples to be symbolically closed in and dark, the space between timber posts of both the inner and outer squares would be infilled with brick walls, leaving only small openings centrally for access. Also, as the circumambulatory did not need to be dark, some early tiered temples could have continued with the open outer perimeter support frame making a colonnade. In the 7th century, the temple of Kasthamandap was built on the *mandapa* plan configuration and the *navakunda* floor foundations on a huge plinth base of 19.5 m square, using a mixture of brick walls and timber post and lintel frames.

It is through such a sequence of developments that the form and style of the tiered temples, with two roofs like those of Changunarayan and Pashupatinath, became firmly established as the architectural standard for all state temples by the 9th century. These two basic sanctum level plan forms for Hindu tem-



Fig. 9-2 The 5th century CE *Metha* of the Kasthamandap (Lower right).
Source: Sudarshan Raj Tiwari (2022).

ples continued to be dominant in the Malla period (12th–18th century), during which the largest number of tiered temples were built. Such a sequence of evolution and development history of the tiered temples appears to have clearly led the *Silpakar*, the carpenters, to play coordinating roles among the craftspeople involved in building construction. By the 9th century, as the "multiple facets of Newar civilisation and culture became clear and recognizable", the specialisations of craftspeople had also increased from 18 to 36 *jata* or castes (Sharma 1997). Although not all of these castes would have been associated with buildings, those such as *Tama* (copper worker, *Tamrakar*), *Awal* (brick/tile layer), *Sikami* or *kami* (carpenter, *Silpakar*), and *Lohankami* (stone worker) were already well established in construction works. A late medieval construction manual prescribes the ritual process of the handing over of leadership of large constructions to the craftspersons (*betari boyakaya*) and places the carpenter as leader of the work team (Tiwari 2012). The contribution of the carpenter caste in the development of earthquake resilience in the tiered temples must have been significant.

MATERIAL, CRAFT AND CLIMATIC RESPONSE OF THE TIERED TEMPLES

The evolution of Kathmandu valley's vernacular architecture and building traditions clearly relate to its material and environmental setting (climate, geology, and vegetation). Local lacustrine deposits with seams of a variety of carbonaceous, sandy, and silty clays and an abundance of lean but strong trees seem to have set Nepali architecture on the course of maximum exploitation of clay as a building material, using it as mortar, as raw material for making bricks used in walls, and also for tiles to top off roofs. The role played by the conditioning environment of heavy monsoon rains in causing the selection of sloping roofs for quick draining and for the protection of structural joists and rafters in wood; of large overhangs to protect walls made with exposed baked bricks on mud mortar, and for the preservation of wooden doors and windows housed in them was clearly paramount in the development of architectural form and style. The Licchavi experimentation of building with stone was short-lived and ultimately rejected, despite the valley having a good deposit of stones and the regional cultural pressures to use stronger and longer-lasting materials. This does not seem like a simple case of love for traditions or an imperative of aesthetics, but more telling of some distinct understanding of the technological efficacy of building in brick, wood, and clay tiles. A close scrutiny of the development of the architecture and building technology of the tiered temples shows that protection of the architectural, structural, and decorative wood works built into brick walls from the dampness and wetness of the monsoons was foremost in the mind of these builders. The continued use of mud both as underlay of tiles and as mortar in brick work, all along working with the conflicting pair of objectives of keeping the wood away from dampness and allowing a minimum of moisture into the soil so that the earth was kept lustrous and did not turn to dust, appears to have given these builders a feeling of permanency in the use of semi-perishable materials. What they arrived at was a compromise position between resistance and resilience, dampness and weathering, and thermal performance in keeping the buildings either warm or cool as the seasons cycled.

The fact that bricks with different designs were being used in paving and in walls suggests that their specifications were being tuned to differing functional needs and wear and tear demands from very early on in the Kathmandu valley. Starting with the triangular bricks on the paved courts of the Hadigaun site, we find very thick paving bricks being used in water conduits by about the 6th century. These bricks, with drawn finger marks as "frogs", were made from clay mixed with rice husks, which must have helped achieve better firing and thus greater strength. We assume that the craftspeople went for thicker bricks in order to respond to the wear and tear associated with wet conditions. By the 6th and 7th centuries we find standardised fired bricks of excellent quality with stamped inscriptions. By around the 9th century, we already find the use of rectangular "*telia*-like" bricks (locally called *Ma-appa*) with glazing on exposed outer surfaces—a clear technological development of bricks with high consolidation and resistance to the ingress of moisture. What is even more interesting is that the glazing material itself was vegetable based

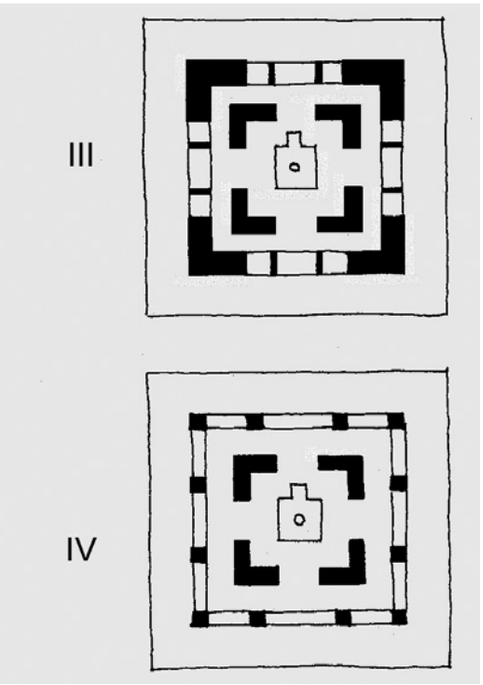


Fig. 9-3 Temples of Nepal Valley.
Source: Sudarshan Raj Tiwari (2013).

(red moss formed on wet straw) and applied before firing, with no extra firing required. Bricks had thus been made highly moisture resistant. However, excessive absorption of moisture by the thick mud mortar and consequent wetting of the brick wall was still a grave force deteriorating and disintegrating the fine woodwork, as well as the structural frames of doors and windows. These problems were significantly redressed with the discovery and development of wedged and glazed bricks (locally called *Dachi-appa)*, which entered the building scene during the 12th and 13th centuries, early in the Malla period. The use of these bricks greatly reduced the exposed mortar surface, thereby limiting moisture absorption to levels just enough to keep the mortar live, but without excessively moistening the brickwork as a whole. The technique of pointing these mortar joints with yellow earth known as *mahsucha* (a type of cotton soil that expands on moisture absorption) further restricted the ingress of moisture. The introduction of specially shaped bricks (locally called *Ba-appa*) for making cornices, or bricks for lintel shelves known as *mikha-fusi,* incorporated dripping action unto the brickwork, further protecting exposed woodwork on the wall surface while greatly adding to the aesthetic appeal of the brick building. Joint engagement of the *Awal* (maker and layer of bricks and tiles) in the development and detailing of bricks and brickwork, aimed at ensuring protection and proper functioning of timber structural and architectural elements such as posts and lintels of doors and windows (with or without carvings), with the *Silpakar* (carpenter) should have resulted in fertile interactive evaluations and learning opportunities concerning composite construction.

Combining classical knowledge from the *vastusastra* and *silpasastra* with experience gained in building with wood from indigenous trees appears to have led traditional Nepalese builders to consciously work on the cultivation of trees in gardens and public forests, so that appropriate wood was available for new building, as well as for the cyclical repair and reconstruction of old ones. We can see from the *vastusastra* manuscripts in the National Archives that cultivation, planting, and caring for various tree species, thus providing wood appropriate for use in various building parts, was encouraged at individual and community levels by also popularizing the herbs, fruits, and flowers they also produced, or emphasising the religious merit to be earned by so doing (Tiwari 2012: 19). This strategic sociocultural engagement of the population in active cultivation and preservation of trees, and in their maturing into building wood, appears to have helped the valley have a continuous and balanced supply of building wood while enriching its greenery at the same time. A 17th century manuscript names as many as one hundred different trees and makes several recommendation for specific timber types to be used for particular functions and parts of the building. For example, wood from *Dhunasi*, *Nyakhadi*, *Sinhyadi*, *Gvache*, and *Kudunilkantha* trees is good for structural elements like ridge beams, purlins, hip rafters, posts and beams; whereas *Devadaru (Cedrus deodara)* should be used in damp conditions and for areas exposed to water (Tiwari 2012: 32).

TEMPLE BUILDING CRAFTS — EVOLVING IN THE ENVIRONMENT OF EARTHQUAKES

As pointed out above, the introduction of the principles of geometric planning, proportioning, and symmetry, combined with the reconfiguration of the temple sanctum plan as a square with a correspondingly-shaped circumambulatory wrapped round it, resulted in increased resilience and resistance of the tiered temples against earthquakes. Larger gains in earthquake resistance capacity were made also when the 16 posts configuration of the *mandapa* was adopted and the timber posts and beams frame used to provide confinement as it were, to the heavy infill brick wall of the sanctum floor. We can thus infer that the adoption of Hindu rituals and edicts in the tiered temples directly contributed to developing their earthquake resisting capacity.

From the point of view of the builders and restorers of the tiered temples, earthquakes would have certainly appeared more damaging and destructive than the annual monsoons and were arguably more difficult to respond to with evolutionary actions and calculated change. Earthquakes were unpredictable and only very occasionally intense. The Kathmandu valley's situation over the major fault lines

at the northern margin of the Indo-Australian plate, whose tectonic collision with the Eurasian plate lies behind the rise of the Himalayas, has made it highly seismically vulnerable. Furthermore, within the valley itself the different towns and temple building sites show varying site amplification characteristics and susceptibility to damaging secondary seismic hazards such as surface fault rupture and soil liquefaction. This variability is due to the extant material variations in the formation of subsurface soils, notably riverbed layered deposits of clays, silts, sands, and gravel in the northern parts and lacustrine deposits of clays and silts in the southern region, as well as their largely unconsolidated nature. Seismic hazard research on the seven monument zones of the KVWHS using probabilistic seismic hazard analysis (Maskey 2014) has shown that the ground motion at the surface (free-field) varies from one monument zone to another even within KVWHS due to the nature of the soil sediment, even as the seismic ground motion at the bedrock of Kathmandu Valley is similar.

Given that the same earthquake acting on buildings of similar construction and design but located in different places would have precipitated varying levels of damage, the selection and augmentation of earthquake resisting features and details in traditional building must have followed a very complex iterative process of evaluation and reconfiguration of design, materials, and methods. The recurrence of big damaging earthquakes being spaced every three to five generations also would have made comparative observation harder for experiential learning. Yet, we do find local builders responding to these complex damage patterns through a mix of "preservation, restoration and reconstruction" actions, packaged within the traditional practice of cyclical maintenance, replacement, and recovery. This mixed nature of practice "has also meant that very few or none of the architectural heritage that we have, whether tiered or otherwise, are 'original', as a whole or even as parts, if we restrict definition of material authenticity to its initial construction" (Tiwari 2009b: 10; Tiwari 2017a: 169–186).

Even as damage patterns were generally varied, local builders appear to have noticed early on that huge earthquakes caused more severe damage and even collapse for particularly tall constructions. Kailashkut Bhavan, the seven-storeyed palace built in 598 CE and widely understood as the first tall building of Nepal, disappears suddenly from the historical records after about a century of use. The second, a Saptagranthakuta temple built in the 12th century to seven storeys also, appears to have collapsed when the valley was hit by the huge earthquake of 1255 CE. From there on, the construction of very tall buildings appears to have been discontinued. When the three-tiered temple of Taleju was built to a height of 37 metres in Kathmandu in 1564 CE, it was founded on a high multiple plinth which by itself made up almost a quarter of the total height. While all the earlier state temples were built two-tiered and stood on a single low plinth, Tajelu was made three-tiered and raised on a high, multi-step plinth. Although it was left for modern day engineering to learn about the exact relation between sub-soil geology, wave amplification, and the scale of earthquake devastation, the recurrent and painful destruction of buildings in most of their settlements and the observed safety of the temples and houses sited in rocky areas such as Kirtipur appears to have led the local builders to reconfigure the foundation of temples by building a massive platform of spreading multiple plinths at its base. The builders must have somehow been able to quickly confirm the efficacy of a massive base with multiple plinths in augmenting earthquake resistance, for we find many tiered temples built with multiple high plinths in the following century. Towards the end of 17th century, three roof tiers were added over Kumveswor temple, making it five-tiered and 24.3 m high. In 1702, the five-tiered Nyatapola temple was built on an 8.45 m high terraced plinth to a total height of 32.45 metres. The experience of the earthquake of 1934 (Richter 8.4), which saw the total collapse of Kumveswor temple while the Nyatapola suffered just the loss of its top tier, seems to vindicate this (Tiwari 1998: 7).

Just as observation of the disastrous action of huge earthquakes on tall buildings appears to have led the local builders to discard building tall, so also we find them reviewing and revising the construction craft and technology based on the long experience of facing up to the ever-present deteriorating forces. Tiwari (1998) identifies several details in the tiered temples that can be seen as specifically seeking improved response to earthquakes:

1. the layout of floor joists and rafters and their pinning to wall plates and ring ties using wedges

2. the double framing of door and window openings using inner and outer sets of jambs and lintels connected with cross ties

3. the use of double framed timber colonnaded circumambulatory and extensive use of ring ties at small height intervals in inner core walls

4. reduced wall thickness, as well as proportional reduction of the size of core walls and roofs in upper floors of the temple

5. the use of ring ties at cornices and on levels where roofs are rested on walls, and use of tightening pin wedges and detailing of the corner joint of ring ties

6. the use of pin wedges and their potential to absorb earthquake energy

It is evident that the basic concept of seismic resistant design was being realised and the best available materials and technology were being brought into play in a cumulative way to achieve ductility in the brick masonry construction, which had come to stay as the best among the available walling materials. The variety of places and ways of inserting the timber members have enabled the masonry to perform better during the reversal of stresses including tension due to ground motion while also complementing the system in transmitting shear as well as withstanding vibration by dissipating the energy faster. The important role of the craftspeople in making such observations, inferences, and improved details, and specifically adding to the knowledge system for building resilience, can be assumed here.

It may be because of the earthquake resistance gains accruing on the tiered temples through such configurations, the variety of ways and details of the timber members introduced into brickwork, multiple plinths and pin and wedge joints, that we find the tiered temples continuing to use brick masonry in mud mortar as the main structural load bearing element. The typical structural arrangement of the tiered temples is thus still deceptively simple, with two concentric square core walls made of thick brick masonry work laid one inside the other to make a square sanctum and a narrow internal circumambulatory. The core masonry walls are constructed discontinuously in vertical direction at each floor level, as they diminish in size as well as thickness at each storey. The beams at each floor level are tied together with the vertical posts and framing uprights. All fan rafters or the slanting roof members are tied to the wall plates or lintels at the lower level and to the wall plates and horizontal bands placed in the upper core wall, thus forming a structural triangulation. The same system is repeated for the upper storeys, eventually culminating as a pyramidal roof at the top. A nonlinear dynamic analysis showed that the pyramidal configuration with progressive reduction of cross section at each floor activated more shear resistance in its behaviour than the flexural one (Pejatovic et al. 2019).

Judging from the motifs used in the cornice string courses, *simhama* rows of lion-faced square brick or timber projections in particular, it can be inferred that floor joists inserted to span the circumambulatory between the inner core wall and the outer perimeter wall of the sanctum were projected so that they could be tied using pin wedges. The twin structural interventions of inserting the joists and pin wedges to hold the two walls in place, while reducing the vulnerability of the core brick wall by scaling down its slenderness, have also added to overall earthquake resilience through better absorption and dissipation of earthquake energy. All the while, the joinery between timber members was also being developed, making it more effective at taking the compressive, tensile, and torsional forces acting on the building, using such joints as pinned half laps in corners, mortice and tenon joints between timber posts and lintels, and dowel joints between posts and saddle stones.

TRADITION OF CYCLICAL MAINTENANCE, REPAIRS, AND RENEWAL

A typical tiered temple surviving to the 20th century is thus a lithic summary of a continuous seesawing between decay affected by a harsh monsoon climate on its construction that used natural and perishable materials such as wood and brick, recovery through cyclical repair and replacement, and the damage wrought by almost cyclical large earthquakes as well as the reconstructions that followed them (Tiwari 2017a: 169). Acts of maintenance and repair appear to have started first with a focus on images and objects of religious veneration and timed to the associated celebration and rituals calendared on the cyclical concept of time that takes its bearings from seasonal renewal. Religious buildings like tiered temples, which housed such ritual and celebratory images, were soon taken into the same cyclical routine of inspection, maintenance, and repair. Licchavi inscriptions from as early as the 5th century CE tell of the conservation of images, monuments, and urban utilities, as well as the establishment of local *guthi,* which were endowed civic trusts with pious objectives (Tiwari 2017a: 171). These trusts were set up both by the government and philanthropically oriented citizens to support the cyclical operation and maintenance of important buildings as a community service financed to perpetuity through the endowments of land grants or other fixed deposits. The land in trust was cultivated under tillage, with the tillers providing a fixed portion of their agricultural output annually to cover the costs of daily worship (*karana-puja),* maintenance (*khanda-futta-pratisamskara*), and ritual and festive activities known as *yatra* (Tiwari 2007). Such trusts were either composed of relatives (*svajana-gosthika*) of the person setting up the grant, a known private citizen and his appointees, or the collective (*sangha*) in the case of Buddhist institutions and installations. The *guthi* system effectively channelled individual wealth into public endowments that generated an annual income in perpetuity, which was used to manage a predetermined cyclical agenda for the operation and maintenance of religious, cultural or community entities and activities. They also enabled the organisation of community committees that perpetuated themselves through sets of hereditary and clan seniority-based appointments and leadership regulations. Since the major building crafts such as brick and tile making and laying and carpentry were undertaken by the members of the farming community, either as off-season trade specialisations or as full-fledged professions, the land-based *guthi* system also integrated the tillers into the building system, as craftspeople would also offer their services directly as tillage.

The day of consecration of each temple was celebrated as birth anniversary (locally termed *busadhan*) and *guthi* often used these dates for their annual inspection, repair, and maintenance activities, particularly focusing on the roofs. Such *guthi* activities expanded and flourished further into the Malla period as Newar society, made wealthier by the development of craft and trading economies, redoubled its celebration of religious faith and life through the pursuit of the fine arts of architecture, sculpture, painting, music, and dance. Most of the Malla rulers were also dedicated patrons of these arts and "the architecture and associated decorative works in carved wood and metal repousse" are seen as outstanding features of the Malla legacy (Slusser 1998: 74f.). As more temples were built, *guthi* were set up to manage, operate, and maintain almost all of them. Even when kings or queens commissioned national temples to be built, they set up similar *guthi* as individuals. By the end of the Malla period, the role of the state in maintaining the city, its temples, and associated festivals using money from the national coffers appears to have been reduced to a minimum, as royal, citizen, and community organised *guthi* increasingly took up these responsibilities. The proliferation of the *guthi* system also meant that much of the undeveloped land in and around settlements, as well as the prime agricultural hinterland of the Kathmandu valley, came under community ownership. It should be noted that as the maintenance needs of palace buildings and the many temples built inside the palace increased, an office for maintenance of such buildings (named *chhebhadel*) was also established, supported by royal donations of *guthi* lands towards the end of the Malla period.

The fall of the Kathmandu valley to King Prithvinarayan Shah of Gorkha not only caused a general setback and cultural stagnation in Newar society, but also affected the *guthi* system. In fact, the economic breakdown of Kathmandu had already set in a quarter of a century earlier with the Gorkha blockade of its trade and commerce with Tibet. The drying of royal coffers due to this blockade had been

so total that the ruling king had been forced to take money and gold resources out of the treasuries of temples like Pashupatinath and Guhyeswori in order to keep the state running. Such irreligious actions went against established traditions, not only causing great hurt to public sentiment but also a slide in organised religious practice and in royal *guthi.* The breakdown of trade also significantly reduced the ability of the community to finance ordinary *guthi*, their associated temples and religious institutions. Although the new rulers reconfirmed the *guthi* land and organisations associated with national level Hindu temples and festivals, the same support was not made available to hundreds of other *guthi* organised at neighbourhood and clan levels, or associated with Buddhist monasteries. The Buddhist monasteries of Patan generally claim that much of the community-owned land held in *guthi* for them were misappropriated by the new ruling elite and redistributed as *birta, jagir* or *khangi*, which are various ways that land was granted to battle commanders, brave soldiers or administrators in lieu of their services or contributions to war efforts. This situation led to a general slackness in the community management of repairs at temples and other public structures. Furthermore, within half a century the ruling elite was already discarding traditional architectural styles and construction methods in their palace and temple building projects, leading to the downgrading and loss of traditional building skills in the community, debilitating their capacity to continue maintaining and repairing such buildings. The downward trend in community supported *guthi* continued as large chunks of agricultural land were put to palace building and other urban uses, while the agricultural population faced impoverishment, particularly during the Rana regime (1845–1950). By the time Nepal arrived at its modern period in 1950 and started making efforts to bring such works under public institutions, it was not able to arrest the trend of the loss of *guthi,* the loss of community-led repair and renewal actions, the loss of local building skills, and of the ability of such groups to voluntarily support maintenance. No new public institution was immediately set up to take charge of these matters either. The Ancient Monuments Act of 1955 represented a belated attempt to rescue to the situation and the Department of Archaeology was created within the central government in order to implement it.

The *guthi* system received a severe legal setback when the Land Reform Act of 1961 was enforced in Nepal, which eroded the tillers' rights to land and nullified the resource base of the *guthi* system itself. In 1964, the Guthi Corporation Act came into force with the aim of correcting this situation and applying modern corporate management practices to running the *guthi.* However, narrow legal interpretations combined with inept and inefficient management of the Corporation itself led to further worsening of the state of the *guthi* and erosion of the community-led operation, care, and maintenance traditions of the temples. Declining faith and religious practice in the general population during modern times has further added to the laments of the tiered temples.

OBSERVATION AND RESPONSE TO THE GORKHA EARTHQUAKE

Despite the aforementioned seismically resistant provisions at conceptual and design levels, and despite the use of the best available materials and technology, the tiered temples have continued to suffer huge damage during major earthquakes in the recent past. The damage caused by the Gorkha earthquake was quite substantial and even greater than that suffered by the tiered temples in the 1934 earthquake. Because earthquake damage at a particular place depends on the magnitude of the earthquake, the epicentral distance and the subsoil conditions as well as the structure and condition of the building in question, we proceed to consider these factors in the following paragraphs.

History has witnessed the Kathmandu valley encountering major earthquake disasters at least once in each century. It is believed that at least four earthquakes of Richter magnitude 7 or higher occurred in or near Kathmandu between 1833 and 1869, with considerable damage caused by the 1833 event. The Great Bihar-Nepal earthquake of 1934 (magnitude M_L 8.4) destroyed large parts of the Kathmandu valley, even though its epicentre was located 240 km away near the Nepal-India border. The Gorkha earthquake of moment

magnitude M_w = 7.8 (25.4.2015), followed by a series of aftershocks including one with M_w = 7.3, is generally taken as an event belonging to this cycle. The epicentre of this earthquake was 81 km to the west of Kathmandu and its hypocenter at a depth of less than 15 km from the surface. Since the peak ground acceleration (PGA) value of this earthquake was low, at just 0.166 g, much smaller than 1.277 g computed for the 1934 earthquake and not large enough to affect low rise buildings, the extensive damage suffered by the tiered temples cannot be explained from PGA considerations alone. The low PGA value also means that the damage level had little to do with the short epicentral distance. Whereas in most past earthquakes maximum damage was centred around the town of Bhaktapur, located in the northeastern sector of the valley, this time around more extensive damage was suffered by monuments in the Durbar Squares of Kathmandu and Patan. Such differing damage patterns in the three palace squares also correlates well with the nature of the subsoils, as all the three monument zones have a rather similar subsoil formation.

Among the traditional stylistic groupings, more temples of the multi-tiered variety appear to have been affected, with the degree of damage varying from minor cracks to complete collapse. Of the 17 monuments that collapsed in the seven Monuments Zones of KVWHS, 10 were built in the tiered style and were also located outside of the BMZ. The fact that none of the more than six listed heritage buildings in the multi-tiered tradition in the BMZ of KVWHS, including the 55 Windows Palace, suffered collapse or heavy damage due to the 2015 earthquake points to the need to look for other explanations. One important fact that made the monuments within the BMZ distinct from the others was that they all had been subject to restoration and maintenance interventions over the past four decades.

No correlation is apparent between the ground floor plan configurations of the temples, the number of tiers, and the nature and extent of the damage they suffered due to the 2015 earthquake. While the two-tiered Charnarayan temple of Patan, which has both the sanctum core walls done in brick masonry, collapsed, the similarly-configured temple of Changunarayan suffered damage to its corner piers alone. While the three-tiered Harisankara temple, with multiple plinths and colonnaded timber post circumambulatory, collapsed in Patan, the five-tiered Nyatapola temple, built on multiple plinths and with a similar colonnaded circumambulatory, was only affected in a minor way. However, drawing on the conclusion of Sezen and Dogangun (2012) that historical structures with heavy and stiff walls are subjected to larger lateral earthquake forces due to their small periods of vibration, from the point of view of structural performance alone, the Harisankara temple — with an outer core support in framed timber — would have been expected to perform better than the Changunarayan and Charnarayan temples, both of which are heavier and stiffer, with both their sanctum core walls of brick masonry. Such structural behaviour would have also tallied with observations that temples with framing arrangements in sanctum floor show comparatively higher value of time period than temples without framing arrangements (Jaishi et al. 2003). It has been found from a modal analysis and seismic performance assessment of tiered temples with a sanctum plan made of two brick masonry core walls (upper variant, Fig. 9-3) that the periods are approximately in the range between 0.5 s and 0.6 s (Pejatovic et al. 2019). Even as all the three research findings support each other, the observed damage pattern remains unexplained from the consideration of time period or stiffness properties of the structures. Clearly the reasons for the patterns of damage seen in the Gorkha earthquake need to be sought elsewhere.

Similarly, no distinct correlation is seen between the type of plinths (whether single and shallow or multiple and high) and the nature and pattern of damage to the temples built over them. While temples with high, multiple plinths such as the Harisankara in Patan, and the Majudega, Trilokyamohan, and Jaisidewal in Kathmandu, all collapsed, others on multiple plinths like Vishownath in Patan and Nyatapola in Bhaktapur survived with little damage, just as temples on shallow, single plinths like Charnarayan also collapsed. However, on the basis of observations of behaviour from past earthquakes, as well as on theoretical grounds, some researchers associate the survival of multi-tiered temples with high plinths with better seismic performance due to the high shear wave velocity in the rigid structure of high plinths (Kawan et al. 2020).

INDIVIDUAL BUILDING RESEARCH AND RECONSTRUCTION RESPONSE

Post-earthquake studies of damage, archaeological research on site, as well as the efforts made towards the recovery, restitution, and reconstruction of individual buildings have proved very educative in evaluating the performance of the tiered temples. At the same time, they have also provided revealing explanations for the nature and scale of damage suffered by the tiered temples, which have in turn informed the approach and execution of the reconstruction work. The following case reports have been prepared primarily from the direct experiences of several authors of this chapter in connection with the reconstruction projects, but benefit also from numerous internal technical reports and other expert assessments.

MAJOR CASE: KASTHAMANDAP (2018–2021)

Built in the 7th century, the Kasthamandap is the oldest known structure in the Kathmandu Durbar Square monuments zone of the KVWHS. The three-tiered temple cum public rest house is largely a trabeate construction of timber posts (*tham*) and beams (*nina*), with only the quoin wall of the sanctum hall built from unreinforced brick masonry in mud mortar. The L-shaped brick quoins and the four large timber posts at the core of the temple constitute the main load bearing system. It has been verified through structural analysis that it is these L-shaped brick quoins that most effectively resist earthquake loads. Recent post-earthquake archaeological research indicates that the building underwent major reconstruction in the 9th and 11th centuries. Carpenter's identification marks found on the brackets (*metha*) of the main timber posts indicate that at least two more major renovation events were undertaken before the 18th century. Built on the original square plinth base with sides measuring 19.5 metres, it rises to height of 19.5 metres from its plinth level to the pinnacle. Its *busadhan* (birth anniversary) is celebrated on *maghesankranti* (which fell on the 14th of January in 2021) by the *sa guthi* community of Maharjan. While it had survived the great Nepal-Bihar Earthquake of 1934 with only minor damage, the Kasthamandap completely collapsed in the Gorkha Earthquake of 2015.

As the Kasthamandap started shaking that day, one member of the committee organising a blood donation camp there, Amit Awale, recalled to a local newspaper that: "For a second I had no idea what was going on. I didn't know whether to run or sit, everything and everyone seemed to be moving. Bricks and mud started falling down on us and nearby temples began going down one by one" (News Report, 6.5.2015). Apparently, it shook long enough for Amit to run back inside and rescue three others before it collapsed. But in the aftermath of ten deaths, few were inclined to notice this life saving resilient behaviour of the framed building, or to recall that it had stood up well against many and larger earthquakes in the long history of its existence. Similarly, few are even aware that the Nepalese builders of the past had made numerous technological innovations and developments that benefitted greatly from the creative tension inherent to such a disruptive seismic environment (Tiwari 2017b). However, being by far the most important and iconic example of traditional tiered architectural heritage, as well as the monument that gave its name to the place, the town and the valley, the need to rebuild the Kasthamandap was immediately felt and quickly committed to by the Government and local communities alike. Its ruins and foundations were also prioritised for post-disaster archaeological assessments and evaluations.

This post-earthquake archaeological research reset existing understandings of many aspects of the Kasthamandap and of the tiered temple form in general, including its history, foundation architecture, and the materials and technology employed in its construction. It was scientifically dated using C-14 and OSL measures that the Kasthamandap was constructed in the 7th century CE and that the ritual foundations of the sanctum floor were reconfigured two hundred years later (Coningham et al. 2017). It was found that a well-constructed and functional strip foundation of brick-in-mud-mortar had been provided for both the colonnaded perimeter enclosure and the sanctum square, while the four huge timber posts in the central square had pier foundations of similar brickwork. The sanctum square had been provided with a set of 1 brick thick and 35 courses deep cross-walls that ran in both directions making a *navakunda* configuration. These cross-walls and the infill materials belonged to the 9th cen-

tury reconstruction. The infill material had an organised mix that was thought to have given the foundations of the monument resilience and flexibility during seismic shock. It was observed that the foundations of the monument had by and large not been damaged by the 2015 earthquake or by prior seismic activity. The only evidence of earthquake action was confined to a few vertical cracks observed in two layers of brickwork just below two saddle stones of posts, located in the middle section of the west side sanctum square (Coningham et al. 2017).

These foundation infill soils characterised as PSD, clay fraction speciation and soil organisation (micromorphology) were assessed in laboratories using geo-archaeological methods for evidence of deliberate selection and organisation and compared against soil attributes considered to offer a level of earthquake resilience. It was found that the soil material used for infill was not collected from the local vicinity but were from multiple, non-local sources and were also culturally organised before deposition in the foundations (Simpson et al. 2019). The infills have low clay percentages in the less than 2 mm fraction and a greater proportion of coarser silts and sands. The speciation of clays in the organised soil used showed them having greater interlayer energy and non-plastic behaviour, giving the foundation materials flexibility and allowing them to sway with ground movements without structural failures. These very materials also allow for the drainage of water, making them less susceptible to liquefaction, which is a major cause of earthquake damage. The assessment concluded that the components of the foundation and the method of their construction apply core principles of earthquake resistant strategies and contribute to the resilience of the superstructure of the Kasthamandap adding that "the traditional method of foundation design highlights a cultural knowledge of earthquake damage mitigation transmitted in the form of ritual texts" (Simpson et al. 2019: 38). Further research done by the Kasthamandap Reconstruction Committee on the mud mortar used in the brick foundation walls has revealed that the mix ratio was uniform throughout and well within the present day recommendation of clay 18–22 %, silt 40–45 %, and sand 30–40 %.



Fig. 9-4 The first bricks go back on the mud mortar on the foundations of the Kasthamandap.
Source: Sudarshan Raj Tiwari (2018).

The archaeological investigations concluded that "a major contributing factor to the collapse of the Kasthamandap was the tiling over of the north east saddle stone during the monument's conservation" in 1966 (Coningham et al. 2017: 11). During this period of renovation, instead of reinstating the damp-damaged dowel of the timber post into the mortise of the saddle stone, brick in cement mortar was packed in-between, thereby causing loss of a critical connection and structural continuity between its superstructure and foundations.

After a long administrative debate involving the National Reconstruction Authority, the Kathmandu Municipality, and community groups over who should and how to reconstruct this key heritage building, the Kasthamandap Reconstruction Committee started work with the aim of: (i) wide public participation; (ii) authentic reconstruction of the national monument; and (iii) restoration of other tangible and intangible cultural assets associated with it. This process would follow the agreed principles of heritage conservation and authenticity, with maximised use of traditional architecture, construction materials, methods and processes, skills and knowledge, and the traditional construction procurement process of "force-account" building using the best of materials and the most skilled workers available.

With a target to lay the first bricks back to the foundations within six months and a com-

pletion period of two years, further archaeological, constructional, and structural investigation of the site, foundations and superstructure of the monument was immediately started. The first group of unskilled labour for site works was drawn from workers involved in archaeological work on the floors and foundations. In parallel, work on sorting and examining wooden elements and pieces rescued from the fallen monument was also started, aiming to ensure the maximum possible reuse of such rescued pieces, and to repair them if needed. In this process, architects and art historians were assisted by carpenters experienced in conservation and restoration work on comparable heritage buildings. Studies confirmed that most of the outer pillars on the ground floor had decayed bases and broken tenons at the top, while the base tenons of the pillars of the upper floors were in good condition. For all salvaged timber pieces selected to be put back in structural functions, strength and integrity tests using Resistograph were made. As the sorting and examination of rescued wooden elements was completed, a woodworking workshop was set up so that the lead carpenter and the carpentry team could start the repair works. The members of the carpentry team were recruited by the lead carpenter and a few were freshly recruited with a view to training them on site.

Analytical and structural investigations aimed to assess the adequacy of the existing foundation system and the original structural system and details to resist future earthquakes and to determine the type of modifications, if any, required to bring the structure in line with earthquake safety standards. As there was no evidence of differential settlement and distress in the foundation system, it concluded that "the existing foundation is robust and strong enough and no modification and repair is needed to be carried out" (Tamrakar and Gautam 2018: 4). Survey and laboratory tests of the ancient bricks and mud mortar used in foundations were made. These provided the size, shape, and strength specifications for the new, matching bricks to be manufactured, as well as fixing the mix ratio of sand, silt, and clay for the new mortar. The outcome was two sizes of traditional kiln-fired bricks (24.5 × 16.5 × 5 mm and 22 × 15 × 5 mm), manual levelling in mould, and a mix ratio of 3:2:1 to match the 48.9 % sand, 36.3 % silt, and 14.8 % clay mix observed in the existing mortar. The reconstruction of the foundations of the Kasthamandap was completed using a mixture of salvaged bricks and the matching new ones, using newly-made mud mortar as specified above. The senior masons were still skilled enough to lay the bricks in mud mortar so as to exactly match the extant foundation walls. As much of the old, organised infill as possible was also reused, with additional infill prepared with a similar mix ratio and also laid in thin layers.

The structural assessment also showed that the brick quoins making the corners of the sanctum room were subjected to high induced tensile stresses during earthquakes. It recommended embedding "a number of timber posts inside the wall at the critical locations" (ibid. 59). It also recommended increasing the size of tenons for the posts used to create three bayed openings between the brick quoins. As these posts concentrated compressive stresses

Fig. 9-5 Masons set the new timber uprights and ties in the quoin wall.
Source: Sudarshan Raj Tiwari (2019).
Fig. 9-6 Idem.
Source: Sudarshan Raj Tiwari (2019).







Fig. 9-7 Mortise and tenon joint between post, bracket, and beam.
Source: Sudarshan Raj Tiwari (2019).



Fig. 9-8 Idem.
Source: Sudarshan Raj Tiwari (2019).



Fig. 9-9 Timber joinery used against pull force.
Source: Sudarshan Raj Tiwari (2019).

onto the foundation walls, the size of the saddle stone (locally called *tepulohn*) provided at their base were increased for improved stress distribution.

Based on the results of Resistograph tests and other studies on the main central posts, dated to the 11th century CE, it was decided to reuse only one of them. Similarly, only four of the other old posts were accepted for reuse: one in the third layer on the ground floor and three on the first floor. The very idea and realisation of putting these posts back into the reconstructed structure along with the 5th century *metha* atop the north-west post (Fig. 9-2) and the 11th century post making the south-east member, both of the central sanctum set, has not only helped substantially regain material authenticity for the monument, but has also added much to the heritage storytelling vocabulary of the rebuilt Kasthamandap. Similar authenticity gains were also made through the restoration of the foundations, with its resilient, organised backfill material included exactly as per the original *navakunda* foundation system. Archaeological investigations made by the Kasthamandap reconstruction team revealed another kind of resilient infill, made of regularly packed brick laid in sandy dry mortar in compartmentalised spaces between the third and the fourth layer. This finding further enhances our understanding and recognition of the structure and construction of the traditional, earthquake resilient foundations of tiered temples. Archaeological observations from trenches cut into the plinths and foundations of other temples such as Jaisideval and Matsendranath in Bungamati, Bhaidega in Patan, and Krishna Mandir of Kathmandu Durbar Square had also shown similar types of infill being used outside the sanctums. These finds indicate that the ancient builders were continually working to improve the earthquake resilience of temple foundations.

The reconstruction proposals and drawings were prepared under the principle of truthful, authentic rebuilding of the originals, with minimum interventions and changes. They were based on archaeological findings and site measurements, as well as existing documentation such as drawings and photographs. Apart from the changes required for structural reasons, as indicated above, the Kasthamandap was reconstructed exactly as per the original architectural and constructional design and details, following the traditional construction processes and using traditional tools. From the use of traditional bamboo scaffolds with jute rope ties, manual hoisting and placing of all kinds of building materials such as bricks, tiles, mud and timber posts, beams, and rafters, and the mobilisation of community labour for salient and symbolic works, every effort was made to follow the traditional building reconstruction process and thereby to regain authenticity of a different kind. As well as reconstructing the tangible and intangible aspects of the built heritage itself, the objective of such conservation action aimed to prepare and enable future generations for authentic conservation actions, which will certainly be demanded in future. The reconstruction project was thus implemented as a series of learning and training episodes in conservation.

In addition to the reconstruction of the foundations and brick work in mud mortar, and the tensile reinforcements using timber uprights and ties, another major area of learning offered by the reconstruction project was in woodworking, joinery, and carving. One ingenuous adaptation of the simple mortise and tenon joint can be observed in the detail of joinery at the top of the post, where the brackets or *metha* are introduced between the post and the beam. Here a square tenon of sufficient length is formed on top of the post and threaded through the brackets to be housed into the mortise of the main beams above. This appears to have given the joint sufficient capacity to take the shear and tensile stresses that develop at this critical connection between post and beam. It may be noted in Fig. 9-7 that beams and brackets over the corner post are half-lapped and have projected ends, giving greater stability. In the picture (Fig. 9-8), we can also see the copper plate belt used on top of the post, which served as preservative for all the timber sections meeting there.

It can be seen in Fig. 9-9 that the joint used to connect two sections of wood together to make long beams are designed against the tensile and compressive stresses that develop on the bottom and top of beams through bending or deflection. The location of the joint is kept within the range of the brackets for greater safety. It is notable that the joint does not cut into the bottom section of the beam in tension.

Another interesting traditional joint that was relearned through this reconstruction process was the corner connection between wall plates and cornice plates and the corner timber uprights introduced in the corner of the quoin walls. This is shown in Fig. 9-1, Fig. 9-10, Fig. 9-11, and Fig. 9-12. The joint uses mortise and tenon joinery between the post and wall plate, and another set of mortise and tenon between the members at right angles, which are also

metred. It can be inferred that the upright tenon holds the wall plates and cornice in place, while the joint between wall plates at right angles are designed to resist opening, separation, and spreading. The stress resisting behaviour is similar to the joint between posts, brackets, and beams. Cornices are built in several layers in traditional wall construction and work as tension ties. The cornice illustrated here was built up in two layers.

The learning and training opportunities that emerged from this reconstruction project were useful not only for senior craftspeople seeking to train junior skilled workers, but also for senior and junior architects, engineers, and conservation professionals. It proved to be a very effective platform of interactive learning both within and across different specialisms and experience levels. Fig. 9-12 illustrates this graphically, showing the lead carpenter being assisted by two of his trainee carpenters to fit the joint together, while the team's junior field architect makes a close observation, taking obvious joy in this instance of shared learning.



Fig. 9-10 Stages in the making of a cornice joint.
Source: Sudarshan Raj Tiwari (2019).



Fig. 9-11 Idem.
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-12 Architects and craftspeople working together.
Source: Sudarshan Raj Tiwari (2019).



MINOR CASE: NYATAPOLA (2020–2021)

Built in 1702, this magnificent five-tiered temple was built as a five-bayed, colonnaded, and timber-framed construction measuring 9 m square in plan and enclosing a 6.75 m square sanctum core built with 1.45 m thick masonry wall of brick in mud mortar. With a clear sanctum space of 3.9 m square, the temple rises to a height of 32.45 m including its 8.45 m high plinth built in five stages. The *busadhan* (birth anniversary) of the Nyatapola temple is celebrated on *Asadh sukla* (which fell on 11.7.2021) by a *guthi* organised in the *Awah* community of Tuchimala.

While it was apparently unaffected by the earthquake of 1833, when it was 131 years old, its top tier was damaged and the pinnacle fell down during the earthquake of 1934. It is notable that the three-tiered rectangular temple of Bhairav, located adjacent to the Nyatapola, collapsed in that earthquake. The local people had even celebrated the strong performance of Nyatapola in that earthquake by composing a lyrical adage *Nyatapola chhata maru, Bhailahdyo patta maru*, meaning "five-tiered just lost one, but the Bhairav temple is lost without a trace". The Nyatapola's better seismic performance has been attributed to the rigidity of its massive multiple plinth brick base and its high shear wave velocity (Kawan et al. 2020).

The temple was restored in 1951 and its top tier was renovated again in 1998, when some damaged and decayed timber elements were replaced. It was partially damaged in the Gorkha earthquake of 2015, with the top tier suffering a permanent clockwise torsional drift of 3.25°. The value of such drifts in the case of lower roofs was much less: 0.85° for the fourth roof, 0.29° for the third roof, and 0.15° for the second. Severe cracks were caused in the fifth core walls, with some bricks falling out. Diagonal and corner cracks were also observed in the internal face of the core walls of ground floor sanctum.

Although the damage caused by the Gorkha earthquake was worse than that of the great Nepal-Bihar earthquake, its extent can still be taken as being consistent with the research observation that tiered temples with colonnaded timber-framed outer construction on the ground floor have comparatively higher value of time period than temples with both the sanctum core walls done in brick masonry (Jaishi et al. 2003). Since the higher period should have made it comparatively less susceptible to larger damage, the increased level of damage appears more related to the added age of one hundred years and the consequent deterioration of materials, as well as the questionable strengthening interventions made on its fifth floor core structure in 1998.

The carpenters working on the 1998 Nyatapola renovation had reported that the cross ties and joinery detail at the level of the third cornice, or middle of the third core wall, were different from what they knew from other temples. Such additional detailing may have contributed to the significant level of stiffness achieved by the building.

The complete loss of the fifth tier in 1934 earthquake and the level of damage and torsional drift it suffered in 2015 earthquake, while relating to their different intensities, could also be a result of the timber frame apparently introduced during the 1951 reconstruction.

While this may have kept the fifth tier from falling off, the asymmetrical anchoring could have contributed to the damage caused to the fourth core wall. The expert team appointed to assess the damage and recommend necessary repairs advised a complete dismantling and rebuilding of the fifth core wall and roof, along with repair of brick works damaged with wider cracks and grout sealing of the lesser cracks identified (Kawan et al. 2020). However, due to Covid-19 restrictions, only the dismantling and reconstruction of the fifth core walls and roof tier was actually carried out. In addition, the *jhingati* tiles were re-laid with fresh mud backing in all the four lower roofs, because many of them had become loose or dislodged. The relaying of tiles was achieved through the mobilisation of a large number of local women, who carried and hoisted-up the required mud, which significantly helped to recreate a sense of genuine community ownership. The use of traditional bamboo scaffolds also helped to renew confidence in traditional materials and building processes.

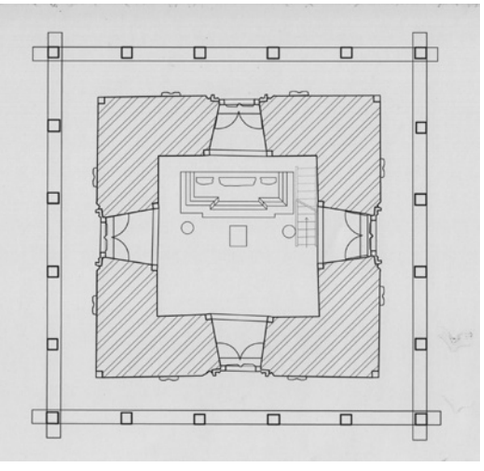


Fig. 9-13 Sanctum plan of the Nyatapola temple, showing its five-bayed, timber-framed colonnade.
Source: Bhaktapur Municipality (2020).

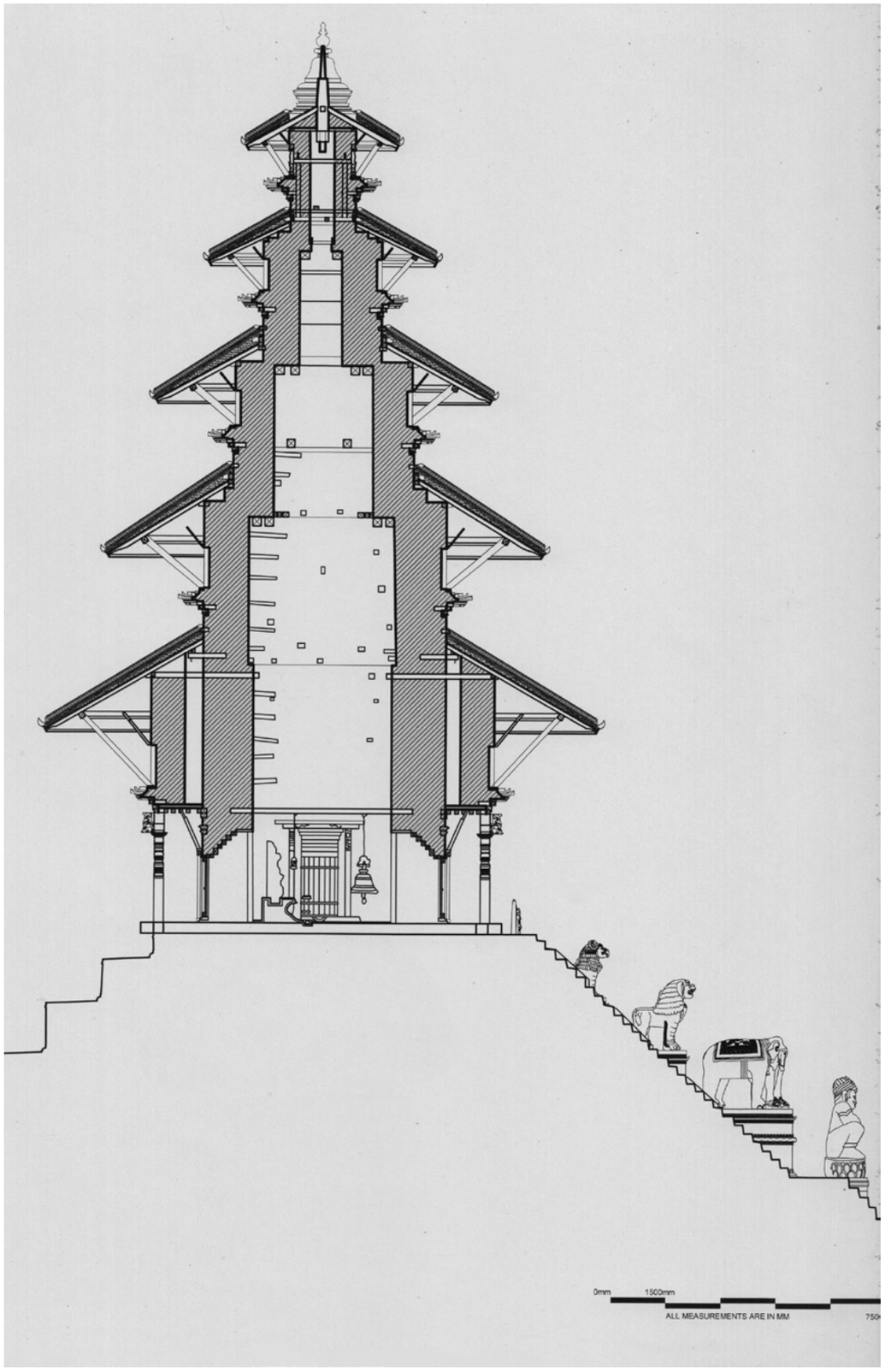


Fig. 9-14 North-South section of the Nyatapola.
Source: Bhaktapur Municipality (2020).

MINOR CASE: 55 WINDOWS PALACE (2003–2009)

Constructed as part of a concerted rebuilding campaign following the massive (Richter 7.7) earthquake of 1681 (Parajuli et al. 2012) and completed in 1708 CE after just three years of work, the 55 Windows Palace is believed to reflect the "state of the art" of earthquake resilient construction at that time. The architectural marvel of the *vimanjhya* (a projected balcony gallery window) with 55 panels that wraps round the second floor living room and gives this three-storied, U-shaped, half-court palace its name, could be one such element of resilience. The building survived the huge earthquakes of 1833 and 1834 without significant damage. The earthquake of 1934, however, caused the collapse of much of its second floor and the beautifully carved balconied window, but left undamaged the east wing and its gallery windows, the first floor main rooms with their excellent murals, and the ground floor. When it was restored in the aftermath of the 1934 earthquake, the projection of the balconied gallery was much curtailed, apparently compromising the balance of its main load-bearing wall and causing it to gradually lean outward. When the earthquake of 1987 rattled it again, the lean and bulge of the outer wall of the main facade was already critical at 16 cm and some of the *mikhafusi* bricks laid over the central *tiki* window in the first floor fell off. Given the high risk of damage or collapse of the building posed by the large lean and bulge of its main facade wall, as well as the ever-present threat of a large earthquake hitting the valley as part of its 100-years cycle, several proposals for structural consolidation were considered early on (1988–1995). These included the introduction of reinforced concrete slabs in all floors to tie the long walls, and steel truss framed brace supports between the floors. However, all of these modernist proposals were rejected, mainly for being incompatible with the traditional building systems. A comprehensive assessment of the structural condition of the building was made by national experts, aiming to arrive at a consensus on basic approaches to its conservation (Maskey 2002). Eventually, it was agreed to strengthen the palace through: (i) full use of traditional materials and building methods; (ii) strengthening of the walls by introducing vertical posts from plinth up, to tie the cornice beams and joists on the first floor and the frames of the gallery windows on the second floor; (iii) straightening the leaning south wall by cutting off the outer veneer and reinstating a plumb *Dachi-appa* brick finish, flush with the first offset of its foundation; (iv) reconstruction of the second floor window gallery to pre-1934 projection and artistry, with a *Jhingati* roof; and (v) preserving the first floor murals "untouched".

Actual conservation works were preceded by further structural, architectural, and archaeological investigations. Along with a 3D analysis of the structure as a whole, external consultants made a 2D assessment of stresses developed and structural stability of the south wall at critical sections, using the laboratory test data of the bricks and the brick wall in mud mortar. The structure was found to be safe on all counts, with just a few minor issues of surface stresses, all easily resolved by bonding the *Dachi-appa* veneer to the inner *Maa-appa*

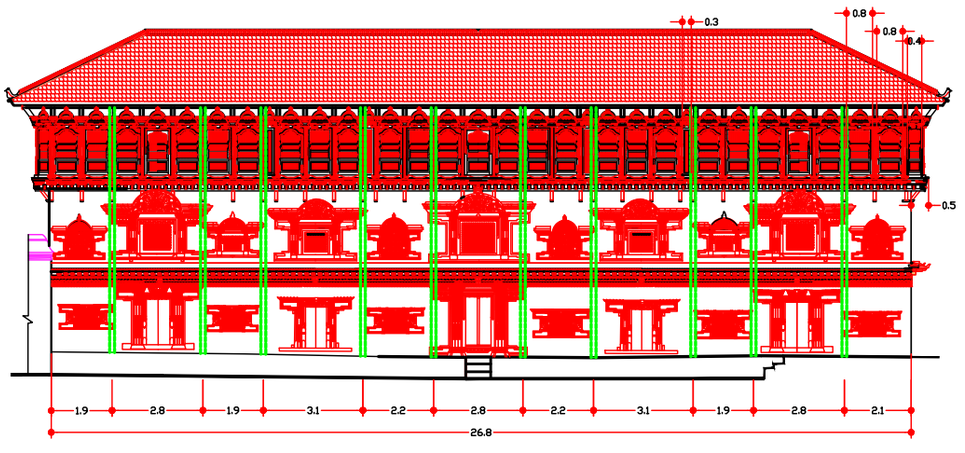


Fig. 9-15 The elevation of the palace, showing the inserted timber posts.
Source: Bhaktapur Municipality (2020).

body of brickwork. The 3D analysis showed "the southern wall safe for all cases of loads in both axial and bending stresses" (Welink Consultant 2002: 75).

As the south-eastern ground floor room was being dismantled, an interesting construction came to light. A number of timber posts were found encased inside the thick walls of this corner room, suggesting that timber post reinforcement for brick work was already in use in the 55 Windows Palace. As this discovery revealed existing features that were very similar to the proposed insertion of timber uprights into the south wall, it led to a big boost in confidence for the proposal.

The resulting conservation work was undertaken in three stages: (i) straightening and strengthening of the south wall was done first, followed by (ii) demolition and reconstruction of the west and east wings, and lastly (iii) the construction of the second floor gallery and roof. The 55 Windows Palace was renovated using only traditional materials and methods, including brickwork in mud mortar. Except for the insertion of timber uprights in the south brick wall, no significant structural changes were made. The building proved resilient enough to take the 2015 earthquake without any significant harm. It had passed a real life test of earthquake resistance with flying colours. Subsequent structural analysis found that the deformation of the main wall was attributable to the asymmetry of its load pattern, caused by changes in gallery projection, its roof, and storage in the half attic.

The photographs in Fig. 9-16 to Fig. 9-19 provide evidence that craftspeople were still able to execute all the processes and detailed work necessary to insert replacement floor joists and needles, repair and carve patterns, extend complex joist works for gallery windows, and replace the damaged bottoms of timber posts in the traditional manner (top to bottom). The most complex work component related to the reconstruction of the cornice, which is made of seven layers of horizontal members, with connection to the vertical posts introduced for strengthening purposes. The restoration project was also successful in training a new generation of workers in traditional skills under the guidance of master craftspeople, and many of those involved were able to lead the post-2015 earthquake restoration activities.

A comparative review of damage suffered by the palace building in 1934 and 1987, as well as its excellent performance in taking the earthquakes of 1833 and 2015, enable us to single out the lack of periodic maintenance, particularly of the roof, and the consequent ingress of moisture and deterioration of the joints of timber structural members, as the most likely cause of the 1934 failure. In more recent times, the lack of periodic maintenance remains a problem, while the incompatible interventions that introduced asymmetrical behaviour also contributed to the damage caused.



Fig. 9-16 Working on the 55 Windows Palace renovation.
Source: Sudarshan Raj Tiwari (2004).



Fig. 9-17 Idem.
Source: Sudarshan Raj Tiwari (2003).

Fig. 9-18 Working on the 55 Windows Palace renovation.
Source: Sudarshan Raj Tiwari (2002).



Fig. 9-19 Repair of post.
Source: Sudarshan Raj Tiwari (2004).



MINOR CASE: PANCHAMUKHI HANUMAN (2015–2018)

The temple of Panchamukhi Hanuman, completed in 1658 CE, was the first five-tiered temple of Nepal. It used circular roof tiers and was built on the terrace of the corner tower block of the four-storeyed Mohankali Chowk in the Hanumandhoka palace complex. Both the temple and its palace wing understructure were seriously affected by the 2011 earthquake. Damage was concentrated at the circular sanctum and the palace room immediately below it, with serious cracks appearing in walls, the opening of critical joints between structural timber members, floor joists, roof rafters, and supporting brick walls, and the cracking of bricks in the major load bearing wall of the palace at ground floor level. While it was being documented and researched in detail for restoration under the project "Conservation of Panchamukhi Hanuman temple and Malla Palace—2014" constituted by the Hanumandhoka Durbar Museum Development Committee, the weakened structure was shaken by the 2015 earthquake. Damage extended upwards, with cracks and plaster spillage in the second and third core walls as well as the roofs. The top roof and the core wall below it appeared slightly bent and twisted. Similarly, existing damage to the bearing wall on the ground floor of the south wing worsened, with wider cracks and increased crushing of bricks. The conservation works set the objective of restoring the temple to "its state as of 1934".

It was clear from detailed analysis that the damage wrought by the 2015 earthquake was concentrated in two areas: (i) in the plinth of the temple, the sanctum floor immediately above it, and the top floor of the south-east corner of the four-storied palace wing immediately below it; and (ii) the major load bearing brick wall at the ground floor south-west corner of the palace wing. Following in situ and laboratory tests on the state of the materials, it was inferred that the crushing of bricks and cracks were limited to the external veneer of brick work and plaster applied to it, while the original brick work on the inside remained intact. It was also noted that the timber tie runner placed at the bottom on the corridor side of the same wall was deteriorating and had disintegrated in several sections.

With the aim of formulating a strategy for the structural conservation of the temple, a detailed seismic vulnerability analysis was carried out, including identification of the properties of its structural components (Maskey 2018). Using the findings of these studies, a detailed structural analysis of the temple was carried out by numerically modelling the components of the structure as per the original design and construction. Based on the output of these





Fig. 9-20 Panchamukhi Hanuman Temple.
Left: Back view, after earthquake.
Source: Department of Archaeology (2015).

Fig. 9-21 Panchamukhi Hanuman Temple.
Right: Front view, during restoration.
Source: Sudarshan Raj Tiwari (2016).

analytical studies, it was deemed necessary to insert additional structural members in timber at strategic locations in order to enhance the strength and stiffness of the structure.

Apparently, the five-tiered temple was built atop the palace so that a high plinth could be achieved along with an innovative built up mass at the base. The efficacy of such a design in protecting against earthquakes had been observed over more than a century at the nearby Taleju temple. The nature of the damage as well as the analysis of the structural system revealed that the shallow timber box-like structural floor, built for transitioning and connecting the circular sanctum walls of the temple above to the square supporting room and the palace wing below, was working, although its timber elements showed material deterioration in some supporting sections. The more serious damage to the temple cores caused by the 2015 earthquake was linked to this load path mechanism, insufficient anchoring of the upper temple to the lower floors of the palace, and the changed contact conditions between the box structure and walls below. Thus, apart from general reconstruction of the upper temple and removal of wall sections thickened after 1934, the major interventions made to the structural strengthening of the building were: (i) reconstruction of the wall veneer with new bricks, incorporating timber horizontals and uprights and tied to uprights and runners on the other side of load bearing wall of the palace wing; (ii) introduction of eight-posts timber framed under support of four floors height, to provide an alternate load path for the circular body of the temple; (iii) restoration of the structural box floor; and (iv) the restoration of the square sloping roof provided over the square corner tower block, along with restoration of the struts and cornice elements beneath it.

The idea of strengthening through the addition of framed under support was borrowed from the arrangement of structural timber post and beam supports extant in the adjoining Agamchhe temple, built similarly on the terrace at another corner. The logic and effectiveness of these interventions were further confirmed through "math and path" analysis of load transfer drawn from modern engineering. However, even for carpenters and masons skilled in traditional construction methods and materials, it was a difficult task to introduce the octagonal timber frame with eight uprights from the ground floor up and to align it accurately with the extant uprights encased in the inner core wall of the sanctum on top, while ensuring also that the uprights were punctured through the floor with a minimum of cuts to the joists, and without requiring any changes to their layout. Tightening of horizontal tie beams to the under sides of the closely-spaced floor joists in order to ensure structural contact was a similarly challenging undertaking. The replacement of damaged lengths of wall plates and base runners was achieved using the traditional half-lapped-tongue joint known as *khicha gatha* (Fig. 9-23). The carved struts whose lengths had been cut off in earlier repairs were also restored using simple, traditional compression connections instead of the metal connectors used in some other recent repair works.



Fig. 9-22 Adding length to the strut.
Source: Sudarshan Raj Tiwari (2016).

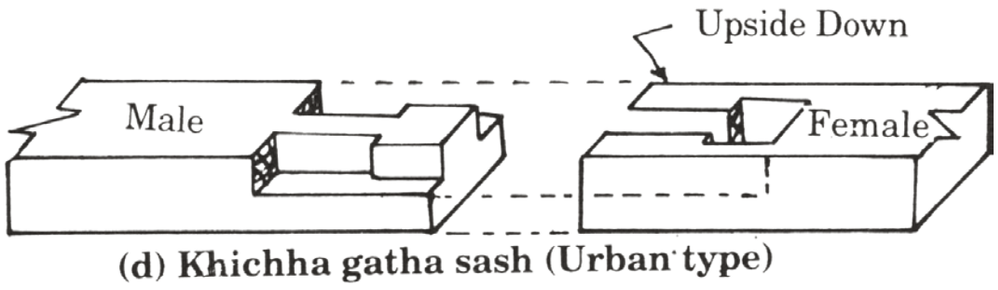


Fig. 9-23 Joinery in wall plates.
Source: M. M. Byanjankar (2005).



Fig. 9-24 Adding length to the strut.
Source: Sudarshan Raj Tiwari (2016).



Fig. 9-25 Idem.
Source: Sudarshan Raj Tiwari (2016).

CONCLUSION THROUGH CROSS-CASE COMPARISON

A comparative review of the recommendations and outcomes of earthquake vulnerability and structural performance analyses carried out for all the four cases reveals that the design and details inherent to the tiered building system have given it earthquake resistance and resilience capacities at a level quite close to the demands of contemporary standards and methods. Although the foundations were examined in detail only in the case of the Kasthamandap, researchers noted that earthquake resistant strategies were applied well both in its design and construction, as no part of the foundation and plinth system had suffered any damage or distress from previous earthquakes. No deterioration of building materials such as brick, mud mortar, and infill was observed below plinth level. That the ancients had kept the clay content in the mud mortar used in the Kasthamandap foundations well under 20 %, remarkably close to modern day recommendations, stands as a tribute to experiential learning, as well as to the flexibility and adaptability of Nepalese building craft traditions over time. The case of the Nyatapola temple also provides evidence that the Malla innovation of building on multiple stepped plinths added considerably to the earthquake resilience of tiered temples.

Structural assessments found that the brick quoins in the sanctum of the Kasthamandap were subjected to high induced tensile stresses during earthquakes, so timber ties and uprights were inserted into the brick wall at specific intervals to correct this. Clearly, this detail found in sanctum core brick walls of all later tiered temples was yet to be discovered in the 7th century CE. Similar insertion of timber ties and uprights in walls were also made to strengthen the walls in the south west corner of Mohankali chowk wing during the restoration of the temple of Panchamukhi Hanuman. Comparatively, structural assessment of the 55 Windows Palace also showed minor issues of surface stress concentration, particularly along the first floor cornice. This was dealt with by properly bonding the outer skin brick layer to the bricks in the main body of the wall and detailing connection of the timber upright and the cornice ties. It can be argued that the plan configuration of temples like the Nyatapola, which use colonnaded timber frame construction for the outer ring of the sanctum room, is actually a way to redress the earthquake vulnerability seen in the quoins of the Kasthamandap. Structural studies have shown that such changes have added stiffness to the temple.

Across the four cases examined, the only substantial structural intervention made was in the case of the Panchamukhi Hanuman temple, where a set of posts and lintels were introduced in the palace wing, providing a direct load path from the core of the temple to the ground as a way of enhancing the stiffness of the structure. This intervention was made to offset possible problems arising from the observed use of poorer-quality wood in the box structural floor, and as an alternate mechanism of load transfer. Reviewing historical developments of form, materials, and construction methods shows that the construction of tiered temples, royal palaces, and public buildings have traditionally used the very best materials available. While wood was obtained from trees identified as best for the specific purpose, whether carving, architectural or structural, the specification and production of bricks was continuously upgraded to achieve better performance in aesthetics, load bearing, weather resistance, and balancing moisture ingress. Likewise, the traditional craft of using timber for structural and architectural purposes, and the variety of joints developed in response to the patterns of stresses they face, show ample evidence of being both well thought out and highly effective, much as the artistry of local wood carving is widely known for its excellence. We can also see numerous examples of very purposeful and effective composite use of timber and brick masonry.

Following its 2008 restoration, the excellent performance of the 55 Windows Palace in the 2015 earthquake also clearly confirms that this traditional structural design and construction system remains capable of adequate earthquake response so long as skilled maintenance is performed cyclically and deteriorating materials are periodically renewed. Therefore, we can confidently conclude that the damage suffered by the tiered temples from recent earthquakes—the 2015 Gorkha earthquake in particular—cannot be attributed to any serious and intrinsic weaknesses in their configuration, design, or construction.

Considering peak ground acceleration (PGA) values, often taken as a key indicator of an earthquake's potential to cause damage to low rise (low period) buildings, we would expect the Gorkha earthquake of 2015 (with a PGA value of 0.166 g) to be least damaging and the great Bihar-Nepal earthquake of 1934

(PGA 1.277 g) the most damaging of the three big earthquakes faced by Kathmandu valley architecture over the last three centuries. The case of the Kasthamandap shows an exactly opposed situation. While it had escaped the 1833 and 1934 earthquakes undamaged, it collapsed during the lesser earthquake of 2015. This allows us to conclude that the extent of damage suffered by the tiered temples over recent centuries reflects neither inherent structural deficits in earthquake resistance capacity, nor the damage-causing power of the earthquake in question. It appears more reasonable to argue that the collapse suffered by the Kasthamandap is associated with the neglectful and inappropriate interventions of 1966, as well as the general deterioration of wooden components such as the dowels of the ground floor timber posts, which is also attributable to the lack of regular and careful maintenance.

A similar lack of maintenance can be blamed for the loss of most of the gallery floor of the 55 Windows palace in 1934, after it had escaped the 1833 earthquake without damage. This particularly concerns the poor condition that the roof was in and the consequent ingress of moisture, which caused deterioration of the joints of the timber structural members. It is also notable that the palace was already 226 years old by this time, so the aging of its materials would have significantly contributed to its vulnerability. The unnecessary addition of timber uprights anchored to the fourth tier of the Nyatapola during the 1951 repairs, which resulted in over-rigidity and asymmetry, may explain the damage to its fourth and fifth core walls during the most recent earthquake.

It is important to note here that the corrective actions and strengthening elements recently introduced in the various case studies were all already in the repertoire of the post-earthquake recovery and restoration actions of the traditional builders. These include reinforcing brick work with timber ties and uprights (Kasthamandap and Panchamukhi Hanuman temple), providing a direct load path through the addition of timber posts (Panchamukhi Hanuman temple), and embedding timber posts into walls for added stiffness (55 Windows Palace). That the traditional path of iterative, experiential learning and knowledge building was capable of such retrofitting and strengthening innovations is a clear tribute to the builders and craft traditions of the Kathmandu valley from the medieval period onwards.

The key conclusion that we can draw from all this is that the main cause of severe damage to the tiered temples during the Gorkha earthquake was the general aging of the buildings and their state of disrepair and dysfunction, which resulted in deterioration of material timber, timber joinery, and the timber elements' critical interconnections with the rest of the building. Secondary causes include inappropriate and incompatible earlier interventions, which introduced asymmetrical behaviour or excess rigidity in critical sections of the structures, or isolated structural changes. It was the breakdown of the practice of regular maintenance, cyclical repairs, and materials renewal in the recent past that precipitated such a disastrous condition. The progressively increasing damage suffered by the tiered temples and other heritage monuments through the earthquakes of 1833, 1934, and 2015 indicate not only the cumulative effect of aging on these buildings, but also the impact of less frequent and less effective maintenance, repair, and renewal actions, which, in turn, can be directly connected to the decline of the *guthi* system.

We have shown how the breakdown of the *guthi* culture of community led, managed, and financed systems of inspection, repair, and monitoring of the tiered temples started with the economic and sociocultural crisis precipitated by the political changes of the 18th century. This situation got progressively worse with the new building practices of the early 19th century, which overlooked many traditional skills and saw the conversion of large amounts of agricultural land into sites of palace building and other urban uses. The land reforms and Guthi Corporation acts of the 20th century further depleted the agricultural land that formerly provided the resource base for the *guthi.* These factors combined with the declining religiosity of today's modernising society to severely reduce the importance of the *guthi* both as an institutional form and as a practical service provider.

In all four cases studied, the *busadhan* practice was found surviving only as a ritual of placing new festoons and flying flags over the top of the building, an offer of ritual worship to the finial, and in the cases of the Kasthamandap and Nyatapola only, a small festive feast. Both the concerned *guthi* have lost their land grants, but the associated castes (the *Maharjan* masons at the Kasthamandap and the *Awal* roof layers at Nyatapola) appear to still remember their repair and maintenance agendas and skills. The near complete breakdown of social and

community engagement in the institution of the *guthi* charged with the inspection, repair, and renewal of these buildings was thus another important factor contributing to their performance in the 2015 earthquake. Clearly, the maintenance and repair activities set up through modern public institutions such as the Department of Archaeology and Municipalities remain deficient, even in the case of the KVWHS. The collapse of the Kasthamandap further shows how disastrously flawed and careless interventions can be made by even the highest authorised public agencies.

RECOMMENDATIONS — TOWARDS AN INDIGENOUS STRATEGY

The architecture of the tiered temples, as well as other brick and wood built heritage in the Kathmandu valley, owes its uniqueness to its conceptual base, its vernacular development using natural building materials and traditional construction methods, a particular set of climatic and geotectonic conditions, and its community-based craft traditions of building, maintenance, and renewal. Although the post-earthquake reconstruction projects have been largely successful in themselves, threats to these values, knowledge forms, and practices remain considerable. The reliance on perishable materials, the challenging environmental and geotectonic conditions, and shifting socioeconomic and cultural contexts are problems that will remain for as long as the temples exist. Indeed, if the tiered temples are to survive as unique symbols of human effort and achievement, cultural continuity and civic strength, a concerted strategy to reduce future earthquake disaster insecurity is urgently needed, both on paper and in practice.

As we have seen above, the damage that has recently affected the tiered temples was largely the consequence of a failure to maintain, repair, and renew the buildings and their constituent materials, abetted by the breakdown of the community and *guthi* based traditions of celebration, maintenance, and craft. Bringing back community involvement and strengthening abilities and capacities to a sufficient level are key first steps towards establishing a locally embedded conservation strategy, built on traditional knowledge and skills. This strategy depends foremost on nurturing the skills of the craftspeople, on improved community relations and ownership, and on expanded opportunities for learning through practical experience.

The reconstruction projects have shown that the revitalisation of traditional skills and knowledge concerning materials and construction methods was still possible from the available (albeit aging) community of masons and carpenters in the region. They have been able to train and produce a new generation of workers with traditional skills, who could be instrumental in improving community capacity for future works of maintenance, repair, and renewal. Strategically, the institutions responsible for the management of built heritage need to provide continuing qualified employment, engaging master craftspeople and their trainees in heritage restoration so that the traditional skills remain both conserved and practiced (see also Weise and Joshi, this volume). To ensure sustainable livelihood conditions for craft communities is clearly a precondition for sustaining living built heritage. After all, conservation itself lives in the hands and minds of the skilled, more than in the rebuilt heritage building per se or the local conservation professionals.

All the case studies highlight the importance of keeping heritage buildings well maintained and in a state of good repair, in order to protect them from the serious damage that can result from earthquakes such as those faced over the last few centuries. Given the very limited level of community participation achieved in the reconstruction projects and the general infeasibility of reinstating the traditional *guthi* system with its high level of community participation in managing a regular system of maintenance and renewal, the need to develop such capacities within public institutions at various levels of government is paramount. In order to establish a new culture of maintenance, it is recommended that along with developing community and professional capacity, a system of regular monitoring of the structural health of prominent heritage buildings should be set up. A maintenance management plan for each building could be kept updated through regular observations and analysis. It is also recommended that the *busadhan* festivals be celebrated as a way to reintroduce annual community

inspection of critical components of the buildings, including information sharing sessions between the skilled craftspeople, user communities, and technical teams involved in maintenance and monitoring of structural health.

The post-earthquake reconstruction projects have also highlighted the importance of making rehabilitation and reconstruction decisions based on careful and extensive archaeological research, assessment of material conditions, vulnerability assessments, and structural analysis of building superstructure and foundations. In order to avoid bringing incompatibilities, asymmetries, and over-rigidity into traditionally balanced building systems, it is recommended that the introduction of any new materials or technology is first subjected to wide user community, craft community, and professional scrutiny. It is quite clear that the current post-earthquake conservation approach focuses too tightly on the objective of reconstruction or restoration of monuments, seeking only perfunctory community participation. We argue that this approach cannot bring about a true and lasting conservation of the tiered temple heritage. To do so, we must bring the protection and restoration of the formerly central elements of community ownership and stewardship firmly into the ambit of the conservation strategy. This means including also the settlement envelope that forms the background in the buffer area, as well as the associated intangible heritage that connects the buildings to the community and to the owners and beneficiaries of the heritage.

Building on these strategic needs and possibilities, mainly concerning local forms of knowledge and skills but differentiated in terms of ownership, responsibility, governance, and community involvement, we propose three principal component approaches for the comprehensive conservation of the tiered temples:

i. a locally-focused and community embedded approach for the conservation and maintenance of tiered temples as "living heritage" within a "living city" (Bjønness 1994), with the main emphasis on indigenous knowledge and building skills within the contextual envelope of the historic settlements of the Kathmandu valley

ii. a nationally governed conservation and maintenance system for the tiered temples, other listed monuments, and urban heritage landscape of the seven Monument Zones of Kathmandu Valley World Heritage Site

iii. an applied, research-based approach which emphasises training, skills development, and sustainable livelihoods, linked to traditional knowledge and appropriate technological solutions.

The three approaches, as a matter of principle, all seek to link the responsibilities and authorities granted to craftspeople, communities, citizens, and the government. The implementation of the third component can be integrated into the first two approaches, as the best learning, training, and skill development is achieved through practice and on-site cooperation, while also involving university partners to provide relevant research components.

In order to take the proposed indigenous strategy beyond expert-defined, value-based conservation and into the ambit of conservation of the tiered temples as living heritage, it needs to identify and prioritise the main stakeholders as the powerful managing authorities in the conservation process (Paulios 2014). This means entrusting to these stakeholders real decision-making power as to the values assigned to cultural heritage, as well as over the measures taken to achieve effective and sustainable conservation. In such a process of decision-making, the stakeholders will naturally be informed by their indigenous knowledge, crafts, and the context of local settlements, thereby legitimising and reinforcing the relevance of the traditional knowledge and crafts in the process of conservation. It will be for the second component of nationally governed conservation and maintenance management to strategically manage the authenticity concerns, driven by international norms on one hand and traditional practice on the other. In the following paragraphs, we detail these aspects of the indigenous strategy further.

We have seen from the case studies that the community of the immediate neighbourhood, the traditional users of monuments as public buildings, the trade-based communities of builders, masons, carpenters, and other craftspeople, and the traditional keepers of the monuments, should be understood as key stakeholders in the operation, maintenance, and rebuilding of built heritage. Accordingly, the caste group communities responsible for maintenance and ritual annual celebration of *busadhan* have been identified as follows: the *sa-guthi* of Manandhar, the Maharjan community for the Kasthamandap, and the *awa-guthi* of Prajapati of Tucimala for the Nyatapola. For the Kasthamandap we should also include user communities such as the Tamrakars of the

tarahcata-guthi, the Kapalis and the other followers of Gorakhnath cult as associate stakeholders.

Despite far-reaching socioeconomic change over recent decades, there remains a significant undercurrent of living culture still pertaining in the present day society of Nepal. Local people's enthusiasm and involvement in reconstructing their damaged temples and being a part of the ordained celebration of festivals and other intangible expressions associated with them, particularly in the difficult period immediately following the earthquake, demonstrates how the many castes, social groups, and *guthi* associated with these highly inclusive cultural activities must be considered as the real "owners" of this heritage (Tiwari et al. 2018). Similarly, the stewardship of caretaker communities, traditionally assigned by the *guthi* and set up by richer social groups, also remains important. We note that no such arrangements exist for monuments and temples within the palace, so these need to be formally placed under the care of government institutions, as per the second component of the proposed strategy.

It is also important to recognise that the inclusion of community stakeholders in the decision-making processes of conservation has been seriously impeded by the "expert knows best" syndrome suffered by many conservation professionals. Close scrutiny of past conservation projects in Nepal will reveal a need for much greater self-awareness and auto-critique, especially on behalf of those with foreign backgrounds (Easterly 2013). It is thus imperative for experts and professionals to make sure that development of local competence and community involvement in heritage conservation is not adversely affected by their own knowledge systems, norms, values, and attitudes (Bjønness 2020). To bring local stakeholders truly into the centre of the conservation process, trans-disciplinary dialogue between professionals, master craftspeople, citizens, and government officials should be started, focusing on the key problems and opportunities outlined in this chapter.

The paramount need of the moment is to recognise indigenous knowledge systems, the local environmental and geotectonical context of the tiered temples, and the Kathmandu valley's tradition of conservation practice, so that the authenticity demanded by the tiered temple heritage is properly understood and built into conservation actions (Tiwari 2017a). The case studies show that indigenous knowledge and skills are still in a recoverable state and also that there is increasing openness towards them. Nevertheless, the threat related to aggressive promotion of modern building materials should not be underestimated. This further underscores the pressing need for research, publication, discussion, dissemination, and valorisation of traditional building crafts and materials knowledge in both the professional community and the society at large.

In short, for the proposed indigenous strategy to take root and be effective in the longer term, steps need to be taken to bring forward the skills, practices, and experiences of local building craftspeople, while sustaining their working environment and ensuring their economic security (see also Weise and Joshi, this volume). The overall conservation strategy should also seek to make the continuing use of local materials, technologies, and building skills a dependable source of livelihood by guaranteeing adequate wages. An inductive approach to this would be to systematically link practice-based training opportunities to necessary building maintenance and renewal agendas, thereby making heritage conservation a sustainable undertaking. On the other hand, a deductive approach would be based on a top-down project planning framework. Seismic safety would rather start with national strategic measures, normative frameworks, and an appropriate resource base (Haavaldsen et al. 2014). However, this takes decision-making into the political domain, keeping local and community level stakeholders out of planning decisions. It would require conscious and sustained efforts in order to ensure local participation in planning, detailing, and implementation processes. Such a deductive approach also requires the empowerment of citizens and beneficiaries so that they may take a more active part in decision-making processes.

The involvement and collaboration of primary stakeholders—the craftspeople and the local communities—would not only reinforce ownership relations and the potential for on-site application of solutions, but would also result in improved opportunities for conservation practice and the mitigation of vulnerabilities. In the same spirit of community participation and local control over local affairs, conservation professionals and both local and central government bodies should act mainly in an advisory capacity, with the latter taking on added responsibilities for resource mobilisation.

From our experiences of settlement-level conservation works in the larger region, and particularly in Gyantse, Tibet Autonomous

Region of China (Bjønness 2008), we must note the urgent need to take the current monument-focused conservation practices relating to the tiered temple heritage of the Kathmandu Valley to the next level by including conservation of its wider urban and village contexts. The strategic need to expand conservation actions into the context of inhabited historic towns should include the residential buildings envelope of the buffer area, the crossroads complexes of temples and rest houses dispersed all over the traditional core of the town, and other still surviving neighbourhood ensembles of tiered temples, residential courtyards, Buddhist monasteries, and other public buildings. It should be noted here that earthquake damage to the historic urban landscape of the Kathmandu valley was exacerbated by the government promulgating additional offset requirements for street-side buildings in order to allow for wider roads. These actions led to the widespread loss of the traditional street fabric and living cultural heritage, with considerable (yet under-recognised) local and neighbourhood level significance.

Our proposed indigenous strategy for ensuring the continuity of the living heritage of the tiered temples essentially revolves around raising the profile of these buildings and their conservation practices in contemporary Nepalese society and at the government level, at the same time as supporting the adaptation of traditional technologies and skills to ensure regular employment, respectable livelihoods, and ongoing developmental opportunities for these craftspeople. The fact that the planning, implementation, and governance of the massive undertaking of the Kasthamandap's reconstruction was conducted entirely by Nepalese institutions and individuals offers encouraging signs of growing competence and self-reliance in such conservation and development efforts. The successful restoration of the Kasthamandap and the 55 Window Palace should create a precedence for greater levels of trust and independence in the future. Nepalese peoples' faith in their country's cultural strength, human and material resources, and traditional knowledge is fundamental to building sustainable post-earthquake resilience, recovery, and societal relevance for its immensely rich and still living cultural heritage.

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X

Building Craft Traditions in the Kathmandu Valley: Challenges, Transformation, and Continuity

Kai Weise and Anie Joshi

Name: Kai Weise
Designation: Doctoral Researcher
Affiliation (Institute): Durham University, UK
E-mail address for correspondence: kai.weise@yahoo.com

Name: Anie Joshi
Designation: Secretary
Affiliation (Institute): ICOMOS Nepal
E-mail address for correspondence: zoseanie@hotmail.com

Biography

Kai Weise

Kai Weise completed his Masters in Architecture from the Swiss Federal Institute of Technology, Zurich in 1992 and is presently a Doctoral Researcher at Durham University, UK. He facilitated the establishment of management systems for World Heritage properties in Nepal, Uzbekistan, Myanmar, and India. After the 2015 Gorkha Earthquake in Nepal and the 2016 Chauk Earthquake in Myanmar, Kai Weise was UNESCO consultant responsible for response and rehabilitation planning. He was a member of the expert team advising on the reconstruction of the Kasthamandap from 2018–2022 and co-edited the publication *Kasthamandap* (Kasthamandap Reconstruction Committee and Nepal Heritage Research Centre, 2022).

Anie Joshi

Anie Joshi is a practicing conservation architect from Nepal with a post-master's degree DSA "Architecture et Patrimoine", a specialisation degree in Heritage and Conservation from ENSA-Paris Belleville. She is currently the secretary of ICOMOS Nepal. She has been working in the cultural heritage sector, including research, documentation and restoration of monuments and sites in Nepal and the Himalayan region. She was a member of the technical team responsible for research and documenting the reconstruction of the Kasthamandap from 2018–2022 and co-edited the publication *Kasthamandap* (Kasthamandap Reconstruction Committee and Nepal Heritage Research Centre, 2022).

INTRODUCTION

> The cultural traditions of the multi-ethnic people who settled in this remote Himalayan valley over the past two millennia, referred to as the Newars, is manifested in the unique urban society which boasts of one of the most highly developed craftsmanship of brick, stone, timber and bronze in the world. (Government of Nepal 2007)

This statement highlights the outstanding quality of the building crafts of the Kathmandu Valley and was part of the justification for the inscription of seven "monument zones" in the valley onto the UNESCO List of World Heritage. The buildings within the World Heritage property were traditionally built mainly of timber, with brick masonry in mud mortar and tile or copper roofs. The elegant forms of these buildings, particularly the tiered temples and the unique *mahachaitya* or *stupa*, are in themselves unique to the Kathmandu Valley, while the highly evolved craftwork involved in producing ornate elements in wood, terracotta, copper, bronze, and stone is truly exceptional.

The 7.8 magnitude Gorkha Earthquake that struck central Nepal on 25.4.2015 caused a huge amount of damage, particularly to these historical monuments and traditional settlements, severely testing the resilience of the local community. Questions arose over the stability of these structures and how to "build back better", which became the motto of the international agencies providing support to the beleaguered country. However, in areas such as Bhaktapur and Kathmandu, local people also rose up in response to the earthquake, showing that resilience is based on the means and will of the community themselves to restore their architectural heritage. This was possible because there are still craftspeople who have retained the knowledge and skills needed to restore and rebuild these traditional structures. Building craftspeople have, however, been facing major economic and social challenges for several decades, as support and acknowledgement for their work has declined and the Government of Nepal increasingly relies on private contracting firms to carry out conservation work.

Many questions were raised following the 2015 Gorkha Earthquake, some of which will be investigated in this paper. How did the extensive damage to historical monuments during the 2015 earthquake both reveal the need for traditional craftspeople[1] and highlight the challenges they are facing? How did the standard reconstruction procedures of the government authorities side-line traditional building craftspeople, leading to inappropriate reconstruction of the historical monuments? How do the traditional building craftspeople see their situation and what do they think needs to be done to ensure the survival of their trades and communities?



Fig. 10-1 A collapsed monument after the 2015 Gorkha Earthquake within the Hanuman Dhoka Durbar Square, part of the Kathmandu Valley World Heritage property.
Source: Kai Weise (2015).



Fig. 10-2 The remains of the Maju Dega Temple at Hanuman Dhoka, Kathmandu, after it collapsed during the 2015 Gorkha Earthquake.
Source: Kai Weise (2015).



Fig. 10-3 The remains of the Dasavatar (left) and Maju Dega (right) temples at Hanuman Dhoka Durbar Square in Kathmandu that collapsed during the 2015 Gorkha Earthquake.
Source: Kai Weise (2015).

1 A basic distinction can be drawn between craftspeople who work according to traditional work patterns, those who work in modern contexts outside of traditional frameworks, and those who operate in both worlds. This paper mainly concerns craftspeople working in the building and construction sector who largely follow traditional working patterns, but are currently negotiating their encounter with modernity. Our use of the term "craftspeople" thus implies those who associate themselves primarily with traditional building crafts.

This paper argues that the continued, successful, and appropriate conservation of Nepal's architectural heritage depends on the survival and revitalisation of its building craft traditions. It is further argued that the standard procedures of the government are undermining these craftspeople, which has led to inappropriate and ineffective reconstruction projects. There are, however, several examples of reconstruction projects where the building craftspeople have ensured successful restorations, which this paper shows could offer a solid framework around which future activities could build. The craftspeople have started organising themselves more effectively, more so due to the problems that arose during the post-earthquake reconstruction. In discussions with the craftspeople, their concerns were noted and a list of requirements was prepared that have strong potential to ensure the continuation of their community and their trade, which is explained in section 4 (see also Tiwari et al., this volume).

Since the 2015 earthquake, various interaction programmes have been conducted to discuss the involvement of traditional building craftspeople in the restoration and reconstruction of historical monuments. This paper picks up on the outcomes of three seminal events. On 16.2.2016, the issue of craftspeople and reconstruction was addressed as part of "a week-long discussion on the philosophy and approaches to appropriate reconstruction of cultural heritage destroyed by the 2015 Gorkha Earthquake in Nepal", which was organised by the Earthquake Response Coordination Office ERCO and ICOMOS Nepal, supported by the ICOMOS Scientific Committee for Risk Preparedness, or ICORP (ICOMOS Nepal 2016: 89f.). On 18.4.2018, to celebrate the International Day for Monuments and Sites, or World Heritage Day, ICOMOS Nepal chose the topic of "Traditional Craftspeople in Safeguarding Heritage", in the Sisha Baitak, Hanumandhoka Palace Museum, where a discussion was held with building craftspeople working in the Kathmandu Durbar Square (Weise 2018a). This was followed by an event organised by the Shilpakar Samaj (the Carpenters Society of the Shilpakars) in Bhaktapur on 4.5.2018, with the participation of the *shilpakar* carpenters and the *shilakar* stone masons of all ages, included the retired ones who still retain a lot of undocumented knowledge (Weise 2018b). Furthermore, discussions have been held over the years after the earthquake with building craftspeople from Bhaktapur, who have been working on various projects in the Kathman-



Fig. 10-4 Laxmi Bhakta Rajchal, the head carpenter, working on linking the old bracket to the new post during the reconstruction of the Kasthamandap.
Source: Kai Weise (2019).

du Durbar Square, particularly those involved in the reconstruction of the Kasthamandap, an ancient and very famous timber pavilion that gave Kathmandu its name. The master-carpenter Laxmi Bhakta Rajchal led the reconstruction of the Kasthamandap, with Tulsi Ram Makhasya as head mason. Laxmi Bhakta Rajchal had many years of experience, also having worked on the restoration of the 55 Windows Palace in Bhaktapur in the 1990s, and the Nepali Temple on the ghats of Benares in 1999. Laxmi Bhakta Rajchal is also the chair of the Shikarmi Samaj, the association of all the carpenters who are not from the Shilpakar caste in Bhaktapur. Tulsi Ram Makhasya is from the farming community and had worked on smaller traditional buildings before getting involved with the Kasthamandap, where he was responsible mainly for the brick masonry in mud mortar and the traditional roof laying, but also dealt with various general activities on site. Gopal Krishna Shilpakar worked as a carpenter on the Kasthamandap project, particularly on the intricate carvings. Krishna Prasad Shilpakar also helped out at the Kasthamandap, and worked on the restoration of the Jaganath Temple in Hanumandhoka. Discussions were also held with Ram Gopal Shilpakar, an executive member of the Shilpakar Samaj who worked on the restoration project of the Nine-storey Palace at Hanumandhoka, which was supported by the Chinese Government.

THE EARTHQUAKE EMPHASISES THE NEED FOR TRADITIONAL BUILDING CRAFTSPEOPLE

This section addresses the way that the extensive damage to historical monuments during the 2015 earthquake revealed the importance of traditional building craftspeople, as well as highlighting the difficulties they are facing in the present day. The argument is raised that the continued conservation of architectural heritage is largely dependent on the survival and wellbeing of these building craftspeople.

When the Gorkha Earthquake struck on 25.4.2015 at 11:56 am, instantly the whole of central Nepal turned into a massive disaster site. It had a particularly devastating effect on vernacular architecture and historic monuments. A total of 920 historical monuments were affected in 31 districts. This does not include approximately 845 Buddhist monasteries that come under the Monastery Management Committee, which was directly supported by the National Reconstruction Authority. Within the seven monument zones of Kathmandu Valley World Heritage property, 33 historical monuments collapsed and 137 were partially damaged (Department of Archaeology 2020).

The impact of the earthquake on the tangible heritage was directly visible. However, indirectly, it had far-reaching effects on the community. There was trauma caused by shock and much grief over the loss of lives and property. There was also an impact on intangible cultural heritage, particularly in terms of festivals and rituals. Many streets were blocked by collapsed structures or by the props that were now holding up damaged buildings. Where the temples collapsed, rituals continued either on the remaining plinth or in a new location where the deities were temporarily installed. The earthquake also tested relationships between communities, the government, and the international organisations and agencies involved.

A report prepared in June 2020 provides only a summary of the progress made after five years (Department of Archaeology 2020). More detailed information is, however, available on the 33 collapsed and 137 partially damaged monuments within the seven monument zones of the Kathmandu Valley. These projects can be viewed in detail from the State of Conservation Reports that the State Party submitted to the World Heritage Centre in Paris, along with the assessment reports prepared by the Reactive Monitoring Missions (jointly conducted by ICOMOS, ICCROM and UNESCO).[2]

Considering the extent of the damage described above, the overall reconstruction efforts became a huge task. The government, guided by the National Reconstruction Authority, took on the lead role in all reconstruction works, either by implementing projects directly or by providing grants to homeowners. All funding was linked to compliance to the standards of safety defined in the Nepal Building Code 203: "Guidelines for earthquake resistant building construction: low strength masonry" (Government of Nepal

2 Online: https://whc.unesco.org/en/documents/187827/ (accessed: 28.9.2021).

1995), which was updated in 2015 and again in 2020. To facilitate the building of houses as per the construction guidelines, the Department of Urban Design and Building Construction (DUDBC), with the support of the Japan International Cooperation Agency (JICA), prepared a "Design Catalogue for Reconstruction of Earthquake Resistant Houses".[3] However, these did not take into consideration traditional building designs, materials or technology. In fact, the policies, building codes, and proposed standard designs completely overlooked the rich and diverse architectural heritage of the region. Furthermore, these documents undermined the role of the craftspeople in the reconstruction process and in the maintenance works that would subsequently be required.

There were, however, some efforts made to highlight the need to involve building craftspeople in the reconstruction process in the culture sector. The initial National Reconstruction Policy was poorly formulated, particularly for the culture sector. The Earthquake Response Coordination Office of the Department of Archaeology (DOA) and International Council on Monuments and Sites (ICOMOS) Nepal provided the National Reconstruction Authority with proposed amendments, but these were simply disregarded. These recommendations included the need to "give high priority to ensuring availability of essential materials and the training of required craftspeople" and "the master craftspeople with the knowledge of required traditional technology shall be given high recognition and high priority will also be given to the training of new craftspeople" (ICOMOS Nepal 2016: 12).

Particularly essential was the need to ensure appropriate responses for the historical monuments and settlement areas within designated heritage sites. A document prepared for UNESCO in 2015 proposed a strategy to prepare for the post-earthquake rehabilitation of the heritage sites and historic settlements, monuments and cultural objects. The first point under "Implementation Requirements" is "Craftspeople Identification, Promotion and Training" (Weise 2015: 16). Furthermore, the "Basic Guidelines for the Conservation and Reconstruction of Earthquake-Damaged Heritage 2072" prepared by the Earthquakes Response Coordination Office (ERCO) at the Department of Archaeology, with technical support from ICOMOS Nepal, also underlined the need to address the availability and training of craftspeople:

> 22. Crafts-persons availability and training
>
> a. High priority shall be paid for giving high recognition to the master crafts-persons with the required traditional crafts and to the training of new crafts-persons.
>
> b. It shall be ensured that work is carried out by skilled, qualified and experienced crafts-persons or under the guidance of such crafts-persons. (Government of Nepal 2016a)

These points were further underlined in the draft procedures for post-earthquake rehabilitation, which were also not adopted. The implementation process outlined here gave first priority to "community-based reconstruction", followed by "labour contracts", both ensuring the possibility of employing traditional building craftspeople. Only if both these options were not possible would tendering be carried out, but with a prequalification round to ensure that all bidding contractors were qualified for the job (ICOMOS Nepal 2016: 27f.).

The Post Disaster Recovery Framework (PDRF), published by the National Reconstruction Authority a year after the Gorkha earthquake clearly states the need to identify and support local craftspeople, and to ensure their employment in the reconstruction process of architectural heritage:

> The rehabilitation of the heritage sites, historic settlements, monuments and traditional houses must ensure cultural continuity by maintaining the original design, materials, building technology and traditional craftsmanship. In most cases, the process involves re-assembling traditional structures. Due to a limited number of craftspeople, specialised skilled labourers and quality materials, the work must be done phase-wise. Capacity building is a critical part of this process. (Government of Nepal 2016b: 3f.)

It was also stated that the reconstruction of historical monuments was different from standard construction and therefore that the standard tendering system would be inappropriate. Specialised craftspeople, materials, and procedures were required, which would need to be examined through a prequalification round for contractors. This would need to be linked to acknowledging the craftspeople:

> Specialised master craftspeople must be provided special recognition by the state as carriers of the skills and knowledge required for the rehabilita-

3 Online: http://www.dudbc.gov.np/uploads/default/files/0ef9f3598df115407ae9ed4e7bfab24a.pdf (accessed: 28.9.2021).

> tion of cultural heritage. The master crafts-persons and craftspeople need to be reimbursed for their skills accordingly. The inclusion of craftspeople must be ensured. This requires specific arrangements for the identification, promotion and training of craftspeople. In some countries there is a required minimum percentage of construction budgets reserved for craftspeople. (Government of Nepal 2016b: 8)

The need for building craftspeople to restore and rebuild the historical buildings was therefore clearly identified and published by the authorities early on in the process. However, during actual implementation, these considerations were quickly and completely disregarded. Projects were tendered out to lowest-bidding contractors as per the standard Public Procurement Act, without any assurance for the involvement of traditional building craftspeople. This led to protests by community members, and in certain cases like at the Kasthamandap, the reconstruction was led by a Community Users Group and implemented by groups of traditional building craftspeople.

TRADITIONAL BUILDING CRAFTSPEOPLE AND THEIR ROLE IN ENSURING THE CONTINUITY OF TANGIBLE AND INTANGIBLE HERITAGE

This section addresses the standard reconstruction procedures adopted by the government of Nepal. It raises the argument that these standard procedures are undermining the building craftspeople, which in turn has led to inappropriate reconstruction projects. It also offers examples of reconstruction projects where the traditional building craftspeople have contributed to successful restoration.

Craftspeople are essential to ensuring both the appropriate reconstruction of the historical monuments and the continuity of the traditional techniques themselves. The rehabilitation process must encompass the artisans' skills and knowledge, along with the beliefs and rituals that are integral to their traditions. For example, craftspeople show great reverence towards their tools, bowing to them before starting work and then again before stopping. Various rituals are carried out during the different stages of construction, to purify the site and protect the workers. As Tulsi Ram Makhasya explained during one such ritual at the Kasthamandap, because construction materials are brought from various places, they might be polluted or carry inauspicious spirits, which therefore need to be purified through rituals (Joshi et al. 2022: 293–299). Standard rituals also take place at the beginning of the project: at foundation level, when erecting the main door, when putting up the beams, and finally when the pinnacle, or *gajur*, is installed on the topmost roof.

Fulfilling these roles requires a rich variety of skills and knowledge to be passed on from generation to generation, especially considering that large earthquakes take place roughly every 80–100 years, which means every third or fourth generation. Maintaining transmission involves the communities engaged in the traditional building crafts passing on the required knowledge in respect to the techniques, the tools and procedures, as well as the associated beliefs and rituals. Although the Government of Nepal has made statements on the importance of craftspeople, such recognition



Fig. 10-5 Head Carpenter Laxmi Bhakta Rajchal (centre) and head mason Tulsu Ram Makhasya (right) with provincial MP Rajesh Shakya (left) during the *Lukha Puja* (door ritual) at the Kasthamandap.
Source: Kai Weise (2022).

has not been reflected in their actual policies to date. Attempts must therefore be made to change the policies and define new work practices that clarify how the craftspeople will be integrated into the formal process of reconstruction. To ensure that there is no scarcity of craftspeople, which would then become a bottleneck in the reconstruction process, a roster of craftspeople for all required skills is required, along with continued training. This means that the inclusion of craftspeople must be formalised (Joshi 2016: 89), financially supported, and implemented in practice, rather than remaining as an unrealised intention.

DAMAGED MONUMENTS CAUSED BY INAPPROPRIATE PAST INTERVENTIONS AND LACK OF MAINTENANCE

Through investigation of the historical monuments after the Gorkha earthquake, the reasons for the widespread damage and destruction were brought to light. Although no extensive studies were carried out, the following selected examples of the assessments done on the causes of damage to monuments provides a general overview of the circumstances.

When the central timber mast, or *yoshi,* of the Bauddhanath stupa was found to be damaged, some suggested that it may have been due to the base of the spire, or *harmika,* being cast in concrete during earlier renovation work. Similarly, many people speculated that the brick masonry in mud mortar at the plinth level of the Pratappur temple was crushed as a result of the recent reconstruction of the superstructure in more rigid lime-*surkhi* mortar. Similar observations can also be made in respect to the nine-storey palace at Hanumandhoka, which possibly collapsed due to the failure of a reinforced concrete tie beam introduced during the 1970s restoration. Indeed, several of the tiered temples that collapsed included concrete tie beams that were introduced during earlier phases of restoration. Even the collapse of Kasthamandap raises questions concerning the relative impact of earlier interventions compared to design faults, according to the archaeological investigation.

These examples suggest that the main reasons behind the damage to, or collapse of, these historical monuments were lack of maintenance and inappropriate interventions in the past (see Tiwari et al., this volume). The concerned authorities carried out earlier intervention work without prioritising traditional knowledge and materials, and without fully understanding the implications of their interventions. The main lesson that can be learned from this is that, where possible, the introduction of foreign materials and technology should be minimised. This also suggests greater involvement of traditional building craftspeople, with their highly specific knowledge and advanced skills.

The lack of understanding of the traditional structures is alarming. It is important to appreciate that the restoration project of Kasthamandap in the 1980s covered up the fact that one of the main four central posts was not locked onto a saddle stone. At the base of many of the posts, the tenons had deteriorated and the some of the holes in the saddle stone were filled with cement mortar. The structure probably collapsed because it was not locked to the plinth and was standing on only three out of four main posts (Coningham 2017: 4). We also know that the structure did not collapse immediately as there were people who went in and out immediately after the earthquake (see Tiwari et al., this volume) and many more would have survived if they had moved away more quickly. Further research and documentation are therefore required in order to fully understand what happened and to prevent similar mistakes being made in the future.

A good example of a historical monument where appropriate interventions were introduced with involvement of the traditional building craftspeople was explained by Sudarshan Raj Tiwari (2009: 44–46) for the 55 Windows Palace in Bhaktapur. After many years of discussions with international experts, who wanted to introduce modern engineering interventions to the 55 Windows Palace, these proposals were rejected and it was decided that the restoration would be done solely using local expertise and materials. Tiwari also explained that, traditionally, the head carpenter was the overall responsible person on the construction site, so retaining and respecting this authority is essential if restoration work using traditional craftspeople, methods, and materials is to be successful. It is notable that the 55 Windows Palace was not seriously damaged by the 2015 Gorkha earthquake (see Tiwari et al., this volume).

Skilled workers should also be understood as "carriers of knowledge", because they have intimate knowledge of traditional building standards and can apply all the required methods, materials, and techniques themselves. The



Fig. 10-6 Tulsi Ram Makhasya laying bricks in mud mortar during the reconstruction of the Kasthamandap.
Source: Kai Weise (2022).

early foreign-led restoration projects in the Kathmandu Valley also sought assistance from local craftspeople in order to help the non-local experts understand how the traditional construction methods and materials functioned. This information was documented by the technical experts and later used to guide restoration work (Sandey 1974: 7).

The craftspeople are the bearers of vast amounts of traditional knowledge, but it is mainly through practical work that their knowledge and skill find expression. Each craft was specialised within certain communities in the past, retained within family lineages and passed on to the next generation through apprenticeships. This meant that there was barely any need for them to document their knowledge in written form, as it was transferred entirely in fields of practice. Such craft traditions concern not only the skills needed to perform specific tasks, but also deeper understandings of the social, religious, ritual, and symbolic meanings behind the work they produce. Family apprenticeships enable the younger generation to directly gain these deeper levels of understanding, which are vast and beyond the scope of this paper. Whenever discussions with craftspeople take place, they tend to explain their limited verbal expressions by saying things like: "If you want to know what we do and how we do it, come and watch us do the work!" This can lead to awkward situations between craftspeople and modern day "experts", who tend to ask for verbal solutions to specific problems, or for oral accounts of practical knowledge.

It is worth noting that the aforementioned projects were organised not through tendering but by labour contracts, which allow for the hiring of individual craftspeople. The craftspeople were also represented in the executive committees of the projects, giving them a real sense of ownership as well as a forum for resolving both structural issues and questions concerning iconography (Tiwari 2016: 49).

QUESTIONING THE STANDARD GOVERNMENT RECONSTRUCTION PROCEDURES

Master carpenter Laxmi Bhakta Rajchal remarked that, after the 2015 earthquake, he was not called to work on any projects until he got involved in the reconstruction of the Kasthamandap, which did not start until 2018. He explained that although he possessed advanced technical skills, had gained extensive experience by working on numerous projects with national and local authorities, and had access to enough human resources to carry out any restoration project, he was not approached to work as a master carpenter for three years after the earthquake as this was not the standard government procedure. Most of the monuments were restored through tendering processes in which it was almost impossible for him and his team to compete. However, he remembered that whenever particularly complex projects arise that are difficult to implement, the Department of Archaeology approaches him personally, because no contractor engaged through a tendering process would be able to complete such works. He explained how he had felt honoured when the Department of Archaeology asked him to carry out the restoration of the Nepali Temple in Benares in 1999. He completed it successfully after many had failed due to the complexity of the task. Yet after the 2015 earthquake, he felt hopeless because the rehabilitation and reconstruction projects were almost entirely arranged through tendering and, as traditional craftspeople, he and his team did not fulfil the tender requirements. This shows how the Government of Nepal's current procedures for commissioning and managing the reconstruction and restoration of heritage buildings exclude the very people with the knowledge,



Fig. 10-7 Wood carvers replicating the timber brackets of the main posts for the reconstruction the Kasthamandap.
Source: Kai Weise (2022).

skills, and proven experience necessary to achieve the required quality of work.

In an attempt to work around these problems, Laxmi Bhakta Rajchal's son, Laxmi Prasad Rajchal, registered a company together with his brother-in-law, Krishna Prasad Shilpakar. He also helped out with certain tasks for the reconstruction of the Kasthamandap, such as leading the team that erected the main central post. During our discussions with him, he explained how difficult it was to work as a traditional craftsperson within the prevailing system. To be competitive, the registered company always has to show its experience through a list of completed projects, with the scale represented by the project cost. It was therefore unprofitable to work on projects carried out through community users' groups, since these did not count as valid forms of "experience". The dilemma is that the system only acknowledges contractors and tendered projects, not experience gained through traditional modes of project implementation. Thus, even attempts by craftspeople to find ways to work around the new system, such as registering as a formal company, face numerous problems.

Furthermore, there is an expectation that work will be done fast, which does not allow for traditional techniques to be properly applied. A lack of adequate supervision means that compromises are even being made in terms of construction materials, such as hardwoods from Malaysia being used instead of local hardwood. The traditional carpenters lament that the high quality of the five-tiered Nyatapola Temple, built in Bhaktapur in 1702 using local resources, is very difficult to achieve today. Laxmi Bhakta Rajchal explained that when building the Nyatapola Temple, the head carpenter died before the final tier was completed, leaving it to his successor to complete. It is because of this that during past earthquakes, only the topmost tier was damaged, possibly due to some missing details. Despite its size and the greater vulnerability of the area around Bhaktapur due to liquefaction of the soil, the Nyatapola Temple has never collapsed.

There clearly has been mixed success with the process of tendering carried out by the Department of Archaeology (DoA) and Kathmandu Metropolitan City (KMC). One project that has caused major controversy concerns the Dasavatar Temple near the Kumarighar in Hanumandhoka Durbar Square, a World Heritage property. The DoA project bid was won by a joint-venture team that was working at the Jaisideval Temple further to the south of the city, as well as on projects in Bhaktapur. Clearly, the main contractor had no idea how to restore and rebuild such monuments and received little support from the collaborating partner, who specialises in conservation. After numerous delays and several community protests, the plinth of the Dasavatar Temple was finally rebuilt, but with inappropriate materials and poor quality workmanship. However, without any audit of the quality of previous work, the same contractor was then awarded the KMC contract for the Majudega temple, which is located nearby, on the basis that he had already worked on several high-value projects. This raises serious questions over the structure, organisation, and implementation of current governmental bidding procedures.

The work of conserving and rehabilitating monuments requires an entirely different approach, process, and understanding to the construction of a new building. The government hides the failures of its commissioning system behind the excuse that it is following the Public Procurement Act in order to simplify and expedite project implementation, yet the system clearly sacrifices quality and transparency as well as the accumulated skill and experience of traditional building craftspeople. Projects were tendered out and work was often given to contractors with little or no experience in conservation work, while highly experienced craftspeople were left idle and without any income. The aforementioned projects were also carried out based on the Post Disaster Needs Assessment (Government of Nepal 2015), a very rough study conducted six weeks after the earthquake, with inadequate preparation, documentation, or instructions. The standard system did not make funds available for adequate research, documentation and design, and therefore the projects were often not clearly defined. Furthermore, arrangements and funding for proper supervision of the projects was lacking. The motto of "build back better" was further misinterpreted to the point of becoming unintentionally ironic. For example, it appears to be founded on the general belief that traditional technologies cannot compete with modern construction materials and methods. The trend of demolishing slightly damaged monuments so that they could be rebuilt from the foundations up has had disastrous effects on cultural heritage.

Some projects were so obviously flawed, misconceived, and mismanaged that concerned local communities took to the streets to protest. One example was the collapsed

Machhendranath Temple at Bungamati, for which the government of Sri Lanka provided financial support. The project was tendered out and the contractors began their work, while the local building craftspeople from Bungamati watched on helplessly.

Even at the stage when the rubble stone foundations were being laid, the locals got together at the weekends to improve the work of the contractors. It soon became clear that the contractors were not going to get the monument rebuilt, but it was only after several months of stagnation and the mysterious death of one of the partners of the contracting firm that the project was finally handed over to the local craftspeople to complete.

The nine-storey palace, along with other structures around Lohan Chowk of the Hanumandhoka Palace, was restored with technical and financial support of the Government of China through a Lhasa-based government contractor. However, a team of building craftspeople from Bhaktapur carried out the actual project implementation. With little experience of the traditional construction methods of the valley, the technical team from China and the contractor required immense support from the local craftspeople at every stage, from dismantling to reconstruction. As explained by Ram Gopal Shilpakar, who worked on this project, some work such as the dismantling of the windows was done without numbering the constituent parts, which made the subsequent reassembly process very difficult. The metal craftsman Hem Krishna Tamrakar was called upon to dismantle the *gajur* (pinnacle) of one of the towers, as the unskilled labourers were unable to do it. Only highly experienced craftspeople understand the overall system behind these structures and thus are able to take apart such complex components and then put them back together again. As explained by the head carpenter Laxmi Bhakta Rajchal at the Kasthamandap, when such structures are being built, there is a particular logic in the manner the pieces fall into place. The structure "tells you what needs to be done next", but only if you already have a deep understanding of the structure can this voice be heard.



Fig. 10-8 Left: The local community of Bungamati redoing the work of the contractors on the foundations of the Machhendranath Temple.
Source: Kai Weise (2017).



Fig. 10-9 Right: A wood carver using his skills to carve a deity in clay for the replication of a terracotta element for the Machhendranath Temple in Bungamati.
Source: Kai Weise (2022).

THE CHALLENGES FACED BY BUILDING CRAFTSPEOPLE

This section addresses the question of how the building craftspeople see their situation and how they believe it might be possible to ensure the survival of their trade and community given the many challenges they are facing. It compiles the outcomes of discussions carried out with the craftspeople over the past five years. The argument is raised that these craftspeople understand what needs to be done to ensure the continuation of their community and their trade, and that they are getting better organised amongst themselves in order to affect the necessary changes.

There were 16 points that came out of a discussion organised by the Shilpakar Samaj (the Carpenters Society) in Bhaktapur on 4.5.2018. These have been reorganised into six main themes: safeguarding the culture; protecting livelihoods; the need for acknowledgment; the transfer of knowledge; research and documentation; and getting organised to address these concerns. Each of these themes are further examined below, based on the various formal and informal discussions held with the concerned craftspeople.



Fig. 10-10 The use of steel nails and wooden pegs as *chukul* used to hold the timber rafter in a post- earthquake reconstruction.
Source: Anie Joshi (2017).

SAFEGUARDING THE CULTURE

The architectural heritage of the Kathmandu Valley has survived because the building craftspeople have ensured the continuity of their trade. In many cultures around the world, due to the loss of the craftspeople, the only means of saving their heritage is by preserving the material remains. A key characteristic of a living cultural heritage is thus the continued existence of skilled craftspeople and their traditions. Up to now, craftspeople in various settlements of the Kathmandu Valley have remained strong and have managed to ensure continuity of their community, their culture and rituals. Building craftspeople within the Kathmandu Valley are found mainly in Bhaktapur, Kirtipur, and Bungamati for carpentry, masonry and roof-laying work, while stone and metal crafts are mainly concentrated in Patan.

During the discussions held in 2018, the older generation of craftspeople in Bhaktapur raised some major concerns. Since many of them had now retired and the younger generation were better educated and were looking into other ways of making a living, they worried that much of their accumulated knowledge would soon be lost through lack of practise. Particularly important are the different types of timber joints, the assembly of windows with hundreds of pieces, as well as the correct use of the specialised tools required for such work.

One major difference between the traditional carpenter and many of the newly trained carpenters is their understanding of the role of each of the elements used for the safety of the structure. One such example is the use of *chukul* (wooden pegs) by the traditional carpenter instead of *kila* (metal nails) preferred by newly trained carpenters. Traditional work us-

ing *chukul* is much more appropriate in terms of earthquake resilience. The *chukul* hold the timber beams and rafters in place, but still allow movement, which dampens the seismic forces. The lack of such specialist knowledge contributed to the increasing use of nails in the restoration of monuments, which can be a serious threat during seismic events.

The Shilpakar Samaj, representing the Shilpakar community of carpenters in Bhaktapur, has 15 *agamghar,* or houses for their clan deity Vishwakarma. This is where they keep their old manuscripts and tools, and where numerous festivals and rituals take place. As Ram Gopal Shilpakar explained, the government does not provide any support to this traditional organisation and it has even become difficult to conserve its 920-year-old *agamghar.* The Shilpakar Samaj is getting organised to carry out such projects, but the municipality does not control developments taking place around the site and does not provide any resources to assist with such work. On the other hand, Laxmi Bhakta Rajchal explained that those traditional carpenters who do not belong to the Shilpakar community do not partake in the activities at the *agamghar* and have their small shrines at home.

Amrit Shakya, a retired engineer who worked for many years with the Department of Archaeology, noted that these days traditional carpenters can only be found in Bhaktapur and Bungamati, whereas formerly such craftspeople were strategically distributed throughout the valley. He explained that in places like Kathmandu, craftspeople have largely turned to easier and more lucrative businesses. With barely any craftspeople left in Kathmandu, skilled workers must be brought in from other settlements whenever they are needed. This shift was already underway by the 1960s, since the craftspeople working on the restoration of the Kasthamandap in 1966 hailed from various settlements outside Kathmandu city. In comparison with Bhaktapur and Patan, people from Kathmandu were more involved in trade from an earlier period, for example setting up trading posts in Lhasa and elsewhere. It must therefore be noted that changes in the popularity and distribution of craft traditions are shaped by socioeconomic factors. Unless the livelihood conditions and incomes of building craftspeople are improved, the young generation are unlikely to continue playing an important role in the maintenance and restoration of architectural heritage.

Professor Sudarshan Raj Tiwari has explained how during the Rana period (1846 to 1951), the rulers preferred to copy European buildings styles, which were mainly based on load-bearing brick masonry (Tiwari 2009; Tiwari et al., this volume). This led to the position of head craftsperson shifting from the carpenter to the brick mason. Brick masons working with mud mortar were often from the farming community, the Jhyapus, based around Kirtipur. These groups were in a better position to register themselves as contractors than the carpenters who preceded them in head craftsperson roles. Furthermore, when land prices within the Kathmandu Valley rose exponentially, the farming community, which held a lower position in the social hierarchy, suddenly became rich by selling off or leasing their land, which improved their social standing. For example, Maila Maharjan from Kir-



Fig. 10-11 The craftspeople of the Kasthamandap reconstruction project having a traditional *bhoj* (feast) in Bhaktapur.
Source: Kai Weise (2022).



Fig. 10-12 Retired craftspeople are interviewed at a meeting of the Shilpakar Samaj in Bhaktapur.
Source: Kai Weise (2018).



Fig. 10-13 A gathering of the Shilpakar Samaj in Bhaktapur.
Source: Kai Weise (2018).

tipur is a partner in a registered construction company and has secured government contracts for work around the Hanumandhoka Durbar Square area in Kathmandu for over three decades. He explained that his company hires traditionally trained carpenters only when absolutely required, since they are more expensive than other workers.

ENSURING LIVELIHOOD AND REQUIRED PROCEDURES

Over the centuries, carpenters have been crucial to ensuring the continuity of much of the traditional knowledge and skill required for constructing, maintaining, and reconstructing the world-famous architectural heritage of the Kathmandu Valley. The question that arises now is whether it is economically viable and socially agreeable to continue with the existing system of tenders and contracts, or whether this needs to be adapted to the changing context. This was a major concern raised by carpenters during the World Heritage Day event organised by ICOMOS Nepal. As described in the previous section, the system of only allowing registered contractors to work, particularly on government-funded projects, has caused serious damage to the position of traditional building craftspeople, as well as to the quality of the restoration work undertaken. It is important to understand how this system could be adapted in order to allow the building craftspeople to retain their livelihoods.

One central question discussed between the craftspeople at the World Heritage Day event was how to identify the motivations behind their work. Issues of pride and a sense of duty were prominent, as discussed in the next section, but the participants noted that these alone would not be sufficient to motivate revitalisation. Higher incomes would be necessary to ensure a decent livelihood and better job security. Discussions with UNESCO and the Department of Archaeology suggested that a roster of all craftspeople must be prepared and maintained, identifying the skills and experience of each individual. This led, in turn, to questions being raised over how to categorise the craftspeople, which would provide the basis for establishing a pay scale.

The going rate for a master craftsperson is around NPR 2,500–3,000 per day (EUR 19.45–23.34). The standardised government rates are much lower, which is one reason for the craftspeople not being hired in recent restoration projects. The members of the Shilpakar Samaj in Bhaktapur explained that quality work takes time and must be reimbursed sufficiently, which means that payment would be better made on a daily wage basis rather than being based on a proportion of the value of an entire contract. Meaningful standards for daily wage rates thus need to be set, but setting pay scales is difficult since the quality of the work depends on the levels of training, experience, and talent of each individual. How can such aspects be measured and a reimbursement standard established? Standardisation would need to be carefully worked out, based on the various categories of artisans and the difficulty of the work to be carried out.

An initial proposal for standardising such categories was discussed, although further work on this is required to agree upon and finalise the selection. This discussion was considered essential for establishing an appropriate remuneration system for building craftspeople. Such decisions can only be made within the community of craftspeople, as they know the capabilities, skills, knowledge, and experience of each of their members. However, the format in which the categorisation was presented would need to be understandable and acceptable to external actors and authorities.

To calculate wages, it would be necessary to categorise both the craftsperson and the specific work to be carried out. A solution was proposed in simple terms, with craftspeople being categorised at "Master" or "Junior" levels, while the work could be categorised under *sajilokora* (simple rough), *garokora* (coarse), or *buta* (ornamentation). Further issues were also raised for consideration. Particularly important is the head carpenter, who coordinates the entire team of craftspeople and takes all the critical decisions, and who thus needs to be reimbursed at a higher level due to the greater responsibility and managerial role involved. Special skills are also required for *dristi kholni* or "opening of the eyes" of statues of deities, often found on temple struts, which is linked to special rituals. Krishna Prasad Shilpakar explained that once these rituals are complete and the statues are consecrated, they need to be shown the necessary respect. Such ritual work also requires special consideration. Similar categorisation processes are also be needed for brick workers and stonemasons, taking into account their own specialisations, levels of skill, and responsibilities.

Another important issue discussed at the Shilpakar Samaj meeting in Bhaktapur in May

2018 was the limited amount of restoration work available for skilled craftspeople and the problem of discontinuous employment. A sustainable system is required for craftspeople that includes work and sources of income throughout the year. For example, it was suggested that the government should retain a pool of skilled craftspeople who can manage regular maintenance of the monuments throughout the year. There are periods when more craftspeople are required for reconstruction, while at other times alternative income sources are needed. In the past, many had access to land and could rely on farming to provide security. However, today the craftspeople own less land and therefore need alternative means of income. The possibility of using their skills, particularly in respect to decorative elements, to produce souvenirs for the tourism industry was considered a promising option. The market for traditional elements, such as carved doors, windows and furniture, often demands cheaper materials and work of lesser quality. Gopal Krishna Shilpakar explained that the production of such work for new buildings has allowed the traditional carpenters to earn their livelihood, as people like to have carved doors and decorative elements in their new houses. Even if the workmanship is not as intricate and lacks the correct iconography required for restoration projects, the income can be good enough to sustain craftspeople in between larger, heritage-focused projects.

ACKNOWLEDGEMENT OF THE CRAFTSPEOPLE AND TRADITIONAL KNOWLEDGE

As mentioned in the previous section, the motivation to continue working as a traditional building craftsperson is based on livelihood and security, as well as a sense of pride and duty. This is closely linked to the wish for greater acknowledgement of the skills and knowledge of the craftspeople, as well as of the traditional technologies with which they work.

During the discussions with the Shilpakar Samaj in Bhaktapur, it became clear that there needs to be a better way to show respect to the senior craftspeople, as they are expert knowledge holders as well as potentially important transmitters of specialist skills to the next generation. The carpenters explained that during the Rana Period (1846 to 1951), the *naike* (head carpenter) in charge of the restoration of the Bhairav Temple was given a pot of silver coins, bracelets, and gold earrings after completing the work, and was taken home in a procession with a marching band. Nothing even close to such acknowledgement is provided any more, showing a significant loss of social status and respect. There is another story told by Krishna Prasad Shilpakar of an artisan who built his own temple and inscribed his name in stone on it, which further confirms the formerly high status of craftspeople and highlights the extent to which it has declined in the modern era.

The successful reconstruction or restoration of monuments cannot take place without skilled craftspeople who have expert knowl-



Fig. 10-14 Laxmi Bhakta Rajchal proudly displays a photo in his workshop in Bhaktapur of him getting a medal from the President of Nepal. Source: Kai Weise (2019).

edge of traditional construction methods and materials, as well of the relevant iconography and rituals. It is abundantly clear that the importance of such skilled craftspeople must be more clearly acknowledged within the entire system of heritage conservation. The lack of acknowledgement shows that contemporary Nepali society has little understanding of the value of these craftspeople, possibly because they do not have professional certification, university degrees or any of the other modern markers of legitimacy and authority. The Shilpakar Samaj has proposed that the government establish a system by which the most accomplished craftspeople can be acknowledged through a certain title, such as in Japan, where they have been given high standing in society and are referred to as "Living National Treasures". This idea was integrated into the UNESCO initiative on "Living Human Treasures" (UNESCO 1993) and now forms part of the 2003 Convention for the Safeguarding of Intangible Cultural Heritage (UNESCO 2003). In Nepal, the title of "Living Heritage" was bestowed on cultural expert Satya Mohan Joshi on his 99th birthday on 13.5.2019. Such respect and increased social status could motivate the younger generation to take up the profession of their forefathers. An initial step was taken when Master Carpenter Laxmi Bhakta Rajchal was bestowed the Prabal Janasewa Shree award by President Bidya Devi Bhandari on 14.4.2019, for his contribution to preserving traditional timber craftsmanship and leading the reconstruction of the Kasthamandap. (Fig. 10-14)

We propose that it is not only the craftspeople who need to be better understood and acknowledged, but also the traditional construction methods. As examined above, many interventions have been carried out over recent decades in which inappropriate new technology was incorporated into a traditional structure, sometimes with disastrous consequences. This demonstrates declining knowledge of these buildings as well as the lack of any detailed understanding of how modern construction materials and techniques may affect their structural integrity and stability. Furthermore, the National Building Code does not have any provisions for traditional construction technology, which adds further to the challenge of ensuring appropriate techniques, materials and craft knowledge are utilised in the maintenance and restoration of historic buildings.

In addition to a lack of knowledge and respect for craftspeople and traditional technologies among government staff, bureaucrats and construction firms, a lack of awareness is also notable among the general public. There is considerable potential for raising such awareness through sensitive and focused media coverage, highlighting the craftspeople and those restoration projects that respect traditional techniques, skills and materials. If people were provided with information on traditional building techniques in a way that showed that they are understood by engineers and acknowledged by the government, it would likely be more readily accepted across the social spectrum. Because verbal communication and explanation do not come easily to craftspeople used to expressing themselves primarily through practice, they can be seen to lack knowledge, or even to show subservience, in the context of a rapidly modernising Nepal. Thus, it is important to find modes of communication through which craftspeople can have a voice with which to explain their knowledge, skills, and value to a contemporary audience.



Fig. 10-15 Three generations of carpenters: master carpenter Laxmi Bhakta Rajchal (right), his son Krishna Prasad Rajchal (centre), and grandson Krijesh Rajchal (left).
Source: Anie Joshi (2020).

TRANSFER OF KNOWLEDGE AND CERTIFICATION

Knowledge transfer in traditional building crafts formerly took place through an apprenticeship system, with the young generation within a family being taught by their elders. The caste of a person generally defined their trade, which meant in a certain sense that it was predetermined. Gellner explains the Newar castes and hierarchies, based on his research in Lalitpur, with the Hindu and Buddhist priests at the top, followed by the higher castes of traders, and then the farmers and craftspeople, and then the lower caste trades, ending with the "water unacceptable castes and the untouchables" (Gellner 1992: 44). One of the early studies by Gutschow and Kölver (1975: 55–58) includes in an appendix a "List of Bhaktapur Castes". This documented the various castes at that time and established a certain hierarchy, defined by with whom one can share boiled rice (equal), from whom one can accept beaten rice and water (i.e. from lower castes), and from whom one cannot accept even water. There were 157 households of Shilpakars listed, who were categorised in the mid-level of the hierarchy, together with the Lohamkarmi (stone masons), and a group of Jhyapus (farmers) including the Rajchals, who also had duties in the Taleju shrine inside the palace.

Ram Gopal Shilpakar explained that a traditional carpentry apprenticeship of young family members started even before they turned ten years old. It began with the drawing of grids, then they were taught details of joinery and the simple patterns for carving. This was to ensure that their hands became stable, *hat basni,* before they began actually working on wood. Today, young apprentices learn during their free time and in the school holidays. The last and most complicated part of the training in wood carving is learning how to carve statues, particularly the faces and expressions of the gods. Only those with the highest skill levels are able to do this. It is, however, only after many years of working together with senior carpenters that one may be given title of head carpenter, with responsibility for deciding the techniques to be employed and the designs of the structural elements. The most complex connections that a head carpenter must manage are between the roof struts, the support beam and the rafters that fan out towards the roof corner.

Craftspeople need to understand not only the complex structural aspects of a building, but also the iconography of the details. They then need the skills to carry out the actual work. Ram Gopal Shilpakar explained that this link between knowledge of structure and iconography, as well as the required skill to implement the work, puts very high requirements on the craftspeople, especially those deemed "masters". They must be architects, engineers, and foremen, as well as skilled workers, all in one. The separation of expertise in the contemporary system has compartmentalised our understanding of craft knowledge as well as of the structures themselves, with each expert seen to focus only on one certain aspect. A major challenge today is to find ways to make broad-based and embodied forms of knowledge, skill, and practice accessible to, and compatible with, modern teams comprised of specialised experts.

As Dharma Raj Shakya from the Federation of Handicraft Associations of Nepal explained during the ICOMOS workshop in 2016, Nepali craftspeople developed their skills from the Licchavi Period right through to the end of the Malla period in the 18th century. It was only when the Shah Dynasty conquered Nepal, from the late 18th century onwards, that strong support and patronage for the arts and crafts subsided. This became obvious under Bhimsen Thapa, who introduced Moghul designs, and even more under the Rana Prime Ministers, who promoted western neo-classical styles and imported objects from Europe. Dharma Raj Shakya explained that while there is still some teaching of traditional crafts taking place in the Buddhist Viharas at Patan, most of the apprenticeship traditions have sadly died out. With the more recent restoration works and the growing handicraft market for export and sale to tourists, there are signs of a revival of such knowledge transmission traditions, but these remain precarious and insufficient to guarantee their future.

From discussions with the Shilpakar Samaj and individual building craftspeople, it has become clear that there is a lack of public and official acknowledgement and that today's society has little understanding of the requirements or value of these craftspeople, which largely springs from their lack of formal qualifications, low visibility, and declining social status. Many voices among such knowledge-holders point out that the system of knowledge and skill transmission is in dire need of reassessment and revitalisation. Where the apprenticeship system still functions, it needs financial support and social encouragement. Faced with the real possibility of both

Fig. 10-16 A woman carving decorative patterns on a timber post.
Source: Kai Weise (2019).





Fig. 10-17 Dovetail joints are used to join smaller wooden sections together.
Source: Anie Joshi (2019).

general and specialised forms of knowledge and skill dying out, new methods and approaches to training urgently need to be introduced. Ideally, these should be linked to formal modes of certification that are recognised as equivalent to those obtained at academic institutions.

Considering the changing social circumstances, there is also an evident need to train people outside the family or clan. Training has also included women that are interested, however the *Sanga* needs to further support such initiatives, as gender roles remain relatively rigid in this field and are likely to change only slowly. Traditionally, women were not trained to be carpenters, although this has changed in recent years. In the workshop set up for the reconstruction of the Nine-storey Palace of Hanumandhoka, Ram Gopal Shilpakar hired and trained several women. Some training has also been provided to interested individuals outside the traditional carpenter community, as well as to women, through organisations such as the Shilpakar Samaj. However, Ram Gopal Shilpakar lamented that only half the trained persons remain in the profession. He explained that this is most probably because the work is very difficult and without a secure means of earning a livelihood, people tend to find other work. It is only those who believe they are bound by community obligations and hereditary lineages that are prepared to struggle hard to retain these professions.

As mentioned above, a major problem is that traditionally trained craftspeople do not have any documents that demonstrate their skills, training, and experience. This makes discussions over training processes and certification increasingly important. These days, certification is required to find many forms of work, yet craftspeople have few possibilities to learn the required skills and no paperwork to show in order to secure work. The pressing question is how to upgrade the knowledge and skills of craftspeople, improve their work to achieve the required quality, and ensure that they gain socially recognised forms of qualification and certification. Such a direction has already been followed for some decades in neighbouring Bhutan (see Dujardin, and Yeshey et al., this volume) and there exists potential for similar developments in Nepal, for example through the Centre for Technical Education and Vocational Training (CTEVT), but the extent to which this potential is realised remains to be seen.



Fig. 10-18 Scarf joints are used to join the pieces of beams and also rafters.
Source: Anie Joshi (2020).

Fig. 10-19 Goose-neck lap joints are used to join two pieces of timber beam together.
Source: Anie Joshi (2019).



RESEARCH AND DOCUMENTATION

The loss of traditional knowledge over recent generations is increasingly apparent in Nepal. There are fewer types of timber joints being used, for example. During the discussions with the Shilpakar Samaj in Bhaktapur, Ram Gopal Shilpakar admitted that in the past, senior master carpenters used to know over a hundred different types of joints, but nowadays they know of only around 35 types and generally use less than 20. (Fig. 10-17 to Fig. 10-19) It is a similar situation with the quality of carvings. The criteria for defining the quality of statues are the depth of carving and the fineness of the facial expressions. Such advanced forms of knowledge and skill can only be learned through long periods of practical apprenticeship, which would formerly have been started in childhood, through study and observation with a father or other relative. The entire culture surrounding the artisan castes contributes to ensuring quality, giving support and training to one another while safeguarding the knowledge.

All Newar communities have their own *agamghar*, where they keep their clan deity. The *agamghar* is where the clan carry out their rituals, which are kept secret among their own clan. This is also linked to tantric traditions, where the deity is not represented in an anthropomorphic form, and objects such as the tools of the carpenters become the ritual objects. A newer practice during Vishwakarma Puja is to carry the tools around the city in a palanquin. Ram Gopal Shilpakar explains that they also have books about their trade, but these are not shown to anyone outside the clan. He admits that these books need to be documented, possibly even reproduced. This, however, would need to be carefully discussed with the community, to see how best to safeguard the books and the knowledge retained within them.

In addition to safeguarding the old books, certain important texts might need to be republished and made widely available. The writing of new books which both draw upon and update the classical texts also needs to be encouraged. Furthermore, reference examples of timber joints and carvings need to be used to set standards, to make sure the new generations learn according to ideal models and best practices. Laxmi Bhakta Rajchal agreed that examples of high-quality work that set benchmark standards need to be protected and made accessible for current and future trainees to learn from.

The fact that many prominent monuments survived in 2015 suggests that the traditional building methods and construction systems are well adapted to local circumstances and can even withstand strong earthquakes. Perhaps the most impressive example is the five-tiered Nyatapola temple in Bhaktapur, which withstood both the 1934 and the 2015 earthquakes with only minor damage to the top tier. When maintained properly, with the use of traditional details and the supervision of skilled craftspeople, even complex, multi-tiered buildings made with traditional materials can clearly perform well during earthquakes (see Tiwari at al., this volume). The various chariots built in the Kathmandu Valley and pulled around the city undergo high stress levels. For example, the chariot used for the Bisket Jatra in Bhaktapur is pulled from both sides in a tug-of-war between the communities of the upper and lower cities. During this event the chariot is put under great stress, often smashing against the corners of buildings, but it always survives the ordeal. The tall Seto Machhendranath chariot in Kathmandu and the even taller Rato Machhendranath chariot in Patan are pulled roughly around the streets each year during festivals, yet always maintain their equilibrium. The traditional construction of buildings, even when they are deformed, sometimes by as much as 45 degrees, can still hold up under ordinary stresses and seismic shocks, allowing both architectural heritage and local people to survive.

One of the main problems in ensuring appropriate maintenance and restoration activities concerns questions of quality, which are linked not only to workmanship but also to the materials and technologies being used. For example, the *chukul* pegs that hold the various parts of the building together must be made of the best and strongest wood, which should ideally be sourced from the base of the trunk of a Sal tree (*Shorea robusta*). When such wood is used correctly with due consideration to its grain, the joints tighten and become stronger in response to earthquake activity. In contrast, when metal elements are used for timber joinery, as many conventional engineers and construction workers do today, construction processes are much faster and easier to complete, but not as stable or resilient. The metal components get severely damaged by water and degrade over time. During an earthquake, the connection between the timber element and the metal element also loosens, damaging both

elements and reducing structural integrity. This is but one example of the advantages afforded by traditional designs, techniques, and materials over their supposedly superior and officially acknowledged modern counterparts.

The building craft community of the Kathmandu Valley recognises that if extensive documentation is not carried out within the next 15–20 years, there is a real risk that much of the skill and knowledge accumulated in building craft traditions could be lost. This knowledge must therefore be safeguarded through documentation, which allows for quality standards to be set and subsequently presented to apprentices. Detailed technical drawings need to be prepared of the various parts, components, and details, even though other important forms of knowledge cannot be documented properly due to their tacit, hands-on, and embodied nature. This would require more innovative means of documentation such as videos with ongoing commentaries by the craftspeople. The recommendations of the concerned craftspeople at the meeting in Bhaktapur were to document traditional skills, crafts, and knowledge through oral and written means, while also making use of photography and video. They realise that it is critical to interview senior craftspeople and as far as possible document their knowledge and experience before they pass away. The idea of establishing craft museums was also discussed, where quality work, both old and new, could be attractively presented for viewing by trainees as well as the general public. Further research is urgently required on historical monuments, materials, and technology, as well as to find better means of communication with modern engineers and the general public.

Fig. 10-20 Interview with master carpenter Laxmi Bhakta Rajchal.
Source: Kai Weise (2022).



GETTING ORGANISED

Another concern voiced by the older generation of building craftspeople was how knowledge and cultural heritage can be conserved if young people cease to show any interest in continuing these craft traditions. Even under the most difficult circumstances, the craftspeople up to now have managed to ensure continuity. One positive recent development in this regard was that it was the initiative of the younger generation that led to the establishment of the Shilpakar Samaj association. One of the main aims in so doing was to make sure that strong lines of communication are maintained between the younger and older generations. This was clearly observed at the meeting in Bhaktapur, where all the retired traditional carpenters and stonemasons were invited to provide their opinions on how the younger generation should move forward in promoting their trade. This group recognised that some critical measures need to be taken to ensure continuation of the craft community and their trades. Among the many key points that were raised, finding means to support and improve the situation for the craftspeople emerged as particularly crucial. The existing Shilpakar Samaj was seen as a good basis to begin with, and it was recognised that they needed to closely collaborate with the Shikarmi Samaj. During discussions with the carpenters at Hanumandhoka, it was recommended that a proposal be prepared and presented to various levels of the government, and that a series of workshops should be organised to disseminate information and raise awareness, as well as to present and discuss practical issues relating to craftwork. The need for better coordination between the various traditional building trades at local and national level was also raised. This would provide stronger links between craftspeople working with wood (carpenters and wood carvers) and those working with other materials (brick masons, stonemasons, metalworkers, etc.). The craftspeople who had gathered for the meeting in Bhaktapur agreed that most maintenance and restoration projects require a set of craftspeople who are together able to deal with all the different materials and sections of the monuments. Stronger links between trades would facilitate the formation of such diverse teams, thus raising both quality and efficiency.

Already well-established national level organisations, including the Shilpakar Samaj and the Sikarmi Samaj, also need to find better ways to assist individual craftspeople. In addition to training, there is a clear need to provide the necessary tools for individuals to carry out their work effectively. In many cases, individual craftspeople do not have the chance to get started or to build a strong enough reputation to secure more work, so establishing workshops may be a good way to provide further support. Organisations also need to provide further security to the craftspeople, including alternative livelihood opportunities as well as insurance, which would help them get through difficult times without the need to quit the field altogether and take up other activities full-time.

CONCLUSION

The 2015 Gorkha earthquake severely tested the stability of the many historical monuments and buildings of the Kathmandu valley, as well as the resilience of the communities responsible for maintaining, restoring, and rebuilding them. This chapter has investigated the role that building craftspeople play in ensuring the conservation of the architectural heritage of the region. These craftspeople were clearly identified in various documents as playing an important role by all the relevant authorities, including the Department of Archaeology, the National Reconstruction Authority, and UNESCO Kathmandu.

However, despite general agreement on the continuing need for building craftspeople, the standard government procedures and reconstruction programmes did nothing to accommodate them, and in fact served to further marginalise and undermine them. As we have seen, there are many examples of monuments that were restored before the Gorkha earthquake with inappropriate modern interventions, techniques, and materials, and which were seriously damaged or completely destroyed when the earthquake hit. These are contrasted with several examples of restorations made using only traditional materials and craftspeople, such as the 55 Windows Palace in Bhaktapur, which proved to be much more resilient (see Tiwari et al., this volume).

Numerous meetings and discussions have provided us with an overview of the main issues facing building craftspeople in contemporary Nepal, as well as ideas for how these challenges might be tackled. The main themes raised in these discussions were: safeguarding the culture; securing livelihoods; gaining greater official and public acknowledgment; ensuring the transfer of knowledge; improving research and documentation; and getting better organised in order to effectively address all of these concerns. Building craftspeople have indeed started to organise themselves more effectively as a community, as stakeholders, and as skilled workers. However, they urgently need to guarantee sustainable livelihoods and to maintain their dignity in order to continue their traditions under rapidly changing circumstances. As long as they can maintain their livelihoods, pride, and sense of duty while gaining the trust and respect of both official figures and the general public, the architectural heritage of the Kathmandu Valley will remain protected for many generations to come.

For the time being, however, the survival of Nepal's building craft traditions remains under considerable threat. As we have seen, the current government system of tendering out projects to contractors offers very little indeed for these craftspeople.

The Public Procurement Act of 2007 urgently needs to be amended to include strict prequalification procedures for any work linked to historic monuments and traditional structures, which would ensure a major role of craftspeople in future. This has been discussed numerous times at the Department of Archaeology, but there remains a lack of political will within the government to carry out such changes. Furthermore, the National Building Code needs to be augmented with a section dealing particularly with traditional structures and materials.

An example of such a provision can be found in the Myanmar National Building Code 2016 section 2.10, Regulations for Historical Buildings, which provides a template that could be adapted for use in Nepal. Discussions on developing a proposal for the amendment of the Nepal National Building Code along these lines have been initiated and interest has been shown by various experts, but final decisions have yet to be taken.

The most critical factor for the survival of Nepal's traditional building craftspeople will be whether the next generation continues to find interest in the trade. A similar story in the context of Japan was documented in the book *The building of Horyu-ji* by Nishioka and Kohara (2016), where Tsunekazu Nishioka, the *miyadaiku*, or master carpenter, explains his predicament.

> As time passed and my sons grew up, they decided they did not want to follow in their father's footsteps to become *miyadaiku*; they wanted to become white-collar workers. I thought this was only natural, and I didn't try to stop them. [...] somehow I found myself being haunted by the thought that I had become the last of the *Horyu-ji miyadaiku*. Then, in the spring of 1966, just when I found myself sunk in despair, something happened. One day out of the blue, a high school student visiting the temple on a school excursion from Tochigi prefecture came up to me and said, "I want to become a *miyadaiku* and learn how to build a five-story pagoda like the one here." (Nishioka and Kohara 2016: 5f.)

After completing school this student, Mitsuo Ogawa, trained with Nishioka and went on to become a *miyadaiku*. As Nishioka explained, training that would normally have taken 20 years was completed in ten due to Ogawa's passion, perseverance, and relentless effort. For the building craft traditions of the Kathmandu Valley to survive, it is essential that young Nepalis are able to develop a level of interest comparable to that of Mitsuo Ogawa. They must subsequently be supported and respected if they choose to follow such a path, which also requires at least the possibility of a secure and sustainable livelihood. As this chapter has shown, there are still a lot of things that need to be improved in order to ensure the survival of traditional building crafts within the Kathmandu Valley, but there are also reasons for hope.



Fig. 10-21 Gopal Krishna Shilpakar carving the decorative friezes for the corner pavilions of the Kasthamandap.
Source: Kai Weise (2021).

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XI

Arga Stone Roofs and Floors in Tibet and Beyond: A Material Trans-cultural Approach

Hubert Feiglstorfer and Martin Michette

Name: Hubert Feiglstorfer
Designation: Senior Researcher
Affiliation (Institute): Austrian Academy of Sciences (Institute for Social Anthropology)

Name: Martin Michette
Designation: Director of Studies, Departmental Lecturer, Researcher
Affiliation: University of Oxford (Department for Continuing Education), Oxford Resilient Buildings and Landscapes Lab at the School of Geography and the Environment

Biography

Hubert Feiglstorfer

holds a Diplom Ingenieur in Architecture from the Vienna University of Technology (TU Wien), and two PhDs in Architectural History and Clay Mineralogy from the TU Wien and the University of Natural Resources and Life Sciences in Vienna (BOKU), where he also teaches in the fields of vernacular architecture and earthen architecture. In 2019, he concluded his habilitation at the TU Wien in the field of vernacular architecture. Targeting an interdisciplinary approach in applying technical, material and ethnographic research methods, he is working at the interface of construction technology, architectural history, architectural anthropology and material culture. As project investigator he is currently leading research projects in the fields of sacred space and ritual topography, and climate and transformations of vernacular architecture. Recent journal and book publications focus in sacred and ritual space in the Western Himalayas and building craft traditions in Tibet and the Himalayas.

Martin Michette

studied Architecture (BSc) at the University of Bath and Building Conservation (MEng) at the University of Applied Sciences Potsdam, before gaining his doctorate in Science and Engineering in Arts, Heritage and Archaeology at the University of Oxford. He has also spent several years working in architectural practice and continues to work as a historic building surveyor in a freelance capacity. His research interests are natural building materials, historic architecture, and resource management in the historic built environment. The focus of his research lies in reducing the environmental impact of historic buildings and enhancing the historic environment, by identifying and promoting synergies between low energy technologies, cultural heritage dynamics, and natural systems. A significant aspect of his work lies in outreach and engagement, and he has worked closely with leading UK and international heritage institutions and at several UNESCO World Heritage Sites. He also teaches courses on the history of architectural conservation and traditional building materials.

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INTRODUCTION

The Tibetan term *arga* describes stone with certain properties, which allows its use as a building material, especially for making floors and flat roofs. It is known in many parts of the Tibetan cultural area and is still used for this purpose in some of these regions today. *Arga* stone is one of the building materials that has influenced building culture over many centuries across the Tibetan cultural area, from Ladakh to Eastern Tibet. In Tibet in particular, the production of floors and roofs from *arga* stone is still a living craft today. As a craft form primarily intended for the buildings of the wealthy, the sourcing and delivery of the *arga*, the preparatory work, and the processing itself are associated with high material and labour costs. The selection of certain *arga* qualities, arduous processing and continuous maintenance measures are required to achieve the desired reflective surfaces and to ensure longevity. *Arga* floors are characterised by a variety of colours, which originate from the selected raw material source.

In this context, religious symbolism, for example, is particularly connected with the colour red, which may be supported by the brilliance and reflectivity of the surface. A range of specific craft skills are required to make and maintain *arga* floors and roofs and these are examined at length in this chapter.

The processing of *arga* and the technical functioning of *arga* roofs are subject to certain physical and chemical principles. The use of *arga* thus depends on the one hand upon the availability of the required raw material and on the other hand, upon certain regionally varied cultural-technical developments. The use of a building material for elite structures and its processing by the common people underlies a stereotyped classification of a craft or its outcome as either "elite" or "vernacular". This interplay of different characteristics of craft underlies the materiality of *arga*, and in this contribution the question of cultural-technical parallels between Tibet and other regions in the world is raised. For this reason, this chapter also looks beyond Tibet to other regions of Asia, to Europe, and to Africa in search of cultural-technical phenomena with possible parallels to *arga* use within Tibet.

The use of geomaterials such as earth and crushed stone in the construction of floors and roofs is by no means restricted to the Tibetan cultural area. There are several other regions that have persisting or extinct craft forms that display not only physical and technical similarities to *arga*, but also material cultural commonalities. Based on an investigation of these, the authors argue that building craft forms cannot be understood as one inseparable process, but rather need to be addressed as an agglomeration of various technical and cultural aspects, which shape crafts in localised contexts. Focusing not only on the material aspects of *arga* and looking at crafts from a socially situated and comparative perspective brings new insights into materiality as a dialectic between people and objects. Proceeding from an understanding of the concept of materiality "typically used to refer to the fleshy, corporeal and physical" as "heterogeneous and ambiguous" (Tilley et al. 2013: 3), the authors explore *arga*-related materials from a trans-cultural perspective. This trans-cultural approach seeks to find patterns within individual material cultures that are repeated on a super-regional scale.

Based on these conceptual starting points, the authors address how a trans-cultural approach can inform the study of building craft traditions in relation to: 1. How language and material characterisation influence each other; 2. the relationship between vernacular and standardised approaches to construction across geographic and cultural boundaries, and how they influence the emergence of representative aesthetics; and 3. the evolution of practice and labour community, and how their preservation can aid conservation and maintenance.

The first part of the chapter considers various aspects of *arga* as a building material, its social aspects and the methods involved in its processing. Opening onto wider discussions, it thus examines *arga* from both cultural and technical perspectives. Thereafter, based on selected examples, discussion moves on to consider similarities and differences in the provenance, preparation, and properties of various materials and techniques in comparison to *arga*. From a material-technical point of view, the authors focus on the unifying material characteristics, such as calcite/lime content and the regional variations of different additives that aid workability, longevity, etc. The latter facets are then related to vernacular crafts and building traditions, producing a geographically linked index not only of materiality, but also of associated cultural aspects, for which the earlier discussion of *arga* sets a precedent. The discussion also touches upon the complex topic of terminological charac-

teristics, in particular how the terms used for materials and techniques such as *arga*, *huwwar* or terrazzo can denote different things in different academic disciplines, and how this presents risks for identification, conservation, and propagation. The prevailing view of *arga* that emerges from this discourse — specifically the way the term unites materials, techniques, and crafts — is then proposed as a paradigm that could be applied to other material-cultural assemblages.

As noted by Tilley et al. (2013), accepting the heterogeneity and ambiguity of materiality is essential to understanding the nature of crafts. Different material and culture-dependent parameters flow into one another and make crafts recognisable as the practically applied side of materiality. Considering historical factors, the current activities pertaining to a material's use, and the precarity of particular crafts in specific contexts enables broad insights to be gained that encompass both chronological and user-oriented reference points. Social and technical relations connect immaterial and material aspects of *arga*, while popular and academic uses of *arga*-related terms reveal the interconnectivity between the material, its users, and its uses.

HISTORICAL BACKGROUND AND PREVALENCE OF *ARGA*

The origins of the structural use of *arga* in the Tibetan cultural area remain unclear, but certain markers point to a history of more than 1,000 years, referring back to Tibet's imperial period. The discovery of *arga* in a grave from this era at Lebri (Slebs ri)[1] gives an early indication of the application of this material in Central Tibet (Feiglstorfer 2018: 121). Also, at Khrom Chen in Lhatse district, findings indicate the use of *arga* in the largest burial mounds (Tsewang 2011: 149). This archaeological find indicates the refinement of the floor in the area of the burial chamber by the use of this material.

Arga was used in different regions shaped by Tibetan Buddhist culture, from Ladakh, Zangskar, and Spiti in India, Humla and Mustang in Nepal to Ngari, Purang, Ü-Tsang, Amdo, and Kham in Tibet, and Derge in Sichuan (Könchog Tenzin et al. 2010: 94). The use of *arga* is particularly common in Tibetan Buddhist monasteries and a long list of exam-

1 A floor covered with a 10 cm thick layer of *arga* was found in mounds M-121 and M-130 (Huo Wei 2010: 53).

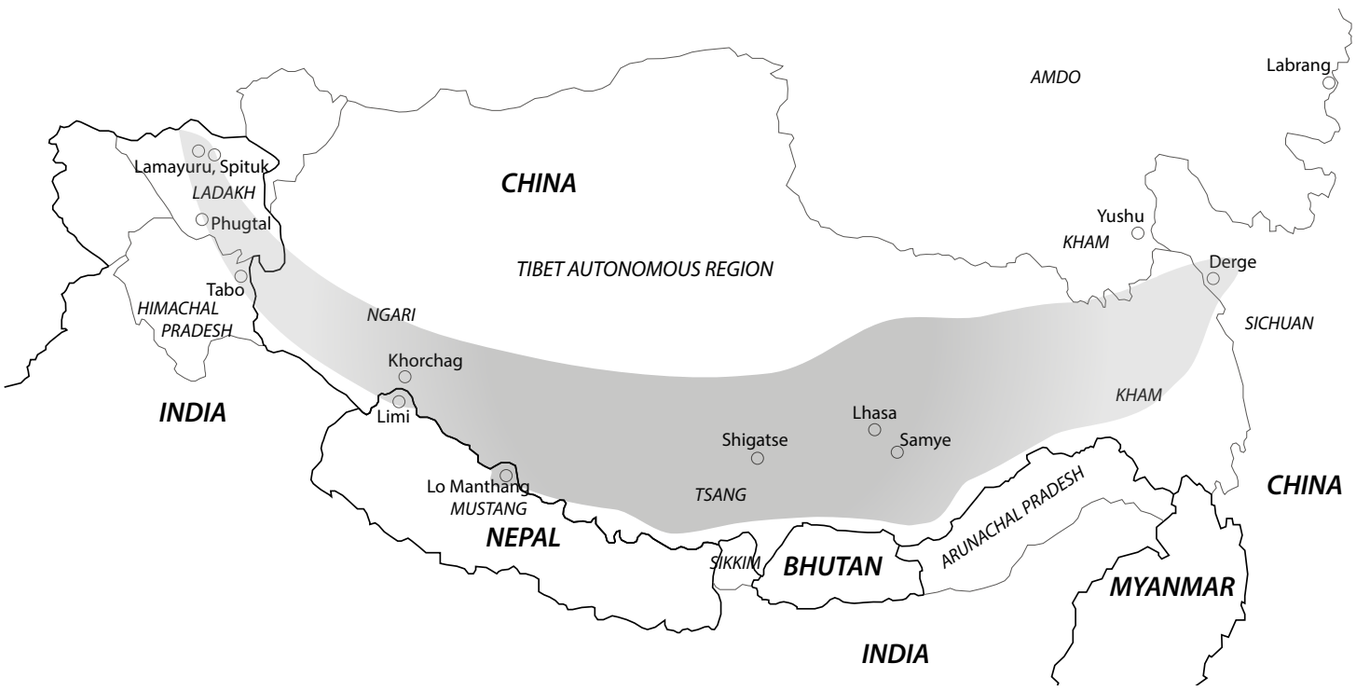


Fig. 11-1 Map of the Himalayan region marking regions of contemporary and historical use of *arga*.
Light gray areas have little or no *arga* usage, while the dark gray areas still use *arga* today.
Source: Hubert Feiglstorfer (2021).

ples could be given from across the entire Tibetan cultural area. For example, in the western regions of Ladakh and Zangskar, the monasteries of Lamayuru, Basgo, Thikse, Mangyu, and Phugtal; in Central Tibet the Jokhang and the Gyüme Dratsang monastery at Lhasa; and at the printing workshop in Derge, Eastern Tibet (Feiglstorfer 2016b, 2019).

The processing of *arga* for roofs, floors, and stabilising wall plaster can still be seen in many parts of Tibet. In India, however, Feiglstorfer obtained information about the processing and deposits of *arga* only from elderly people in Lamayuru, Alchi, Leh, and Phugtal, which came from their youthful experiences or from those who had formerly lived in Tibet (Feiglstorfer 2019: 179). Alexander (2014: 356) argues that *arga* use is rare in Ladakh, in part due to the preference for earthen roofs, while Tara Sharma,[2] a member of ICOMOS India, confirmed that she was not aware of any current activities involving *arga* in Ladakh. *Arga* is known in some Tibetan-influenced areas of Nepal such as Mustang, where its use is ongoing, and in Limi in Humla, where according to the current state of research, it is no longer used these days. This contrasts to the monastery of Khorchag, which is in a similarly dry high-altitude region located near to Humla but on the Chinese side of the border, where *arga* was processed during Feiglstorfer's field research in 2010 (Feiglstorfer 2019: 176f.). A Tibetan community has also settled in the area of Simikot, which is further east of Limi, located in a more humid area, but no *arga* tradition could be traced in this area.

Based on the available information, several regions do not appear to have established *arga* traditions such as Sikkim, Bhutan, Tawang and Bombilla in Arunachal Pradesh, Labrang in Amdo, and Minyag in the south-east region of Kham, towards Yunnan. Fig. 11-1 gives an overview of the places that do have an *arga* history according to the current state of research. Among these, the region with the most prominent and extensive use of *arga* is Central Tibet.

While the processing of *arga* forms part of the broad family of Tibetan craft traditions, there are significant differences in its positioning and status between Tibet itself and the Tibetan-influenced areas of India. While in Central and Eastern Tibet, the knowledge of *arga* use is still vibrant and practically implemented, the craft is no longer practiced in Northern India and only a few elderly people remain alive who know about its sourcing, preparation, and use. As a result, *arga* floors and roofs are no longer made in Ladakh and Zangskar. Existing *arga* roofs are weathering and will soon be irretrievably lost, as shown by the roof of the Serzang Lhakhang in Basgo (Feiglstorfer 2019: 176), for example. (Fig. 11-2) In the outside area, weathering could be determined by cracking and peeling of the surface. The weathering progresses slower in the indoor areas, where frost burst and frost-thaw cycles do not affect the surfaces as deeply as they do outdoors. In the interiors, weathering is primarily noticeable through cracking, as well as a growing dullness and unevenness of the surface. In the *zimchung* (*gzim chung*) of Lamayuru Monastery (Feiglstorfer 2019: 142), on the other hand, the *arga* floor is still in very good condition due to the room only being opened to high-ranking religious guests and to the addition of a PVC covering, which protects the surface while being invisible to visitors.

2 Email correspondence between Tara Sharma and Hubert Feiglstorfer, November and December 2021.

Fig. 11-2 Weathered *arga* roof of the Serkhang, which is a *lhakhang* in Basgo, Ladakh (India).
Source: Hubert Feiglstorfer (2010).



CURRENT ACTIVITIES IN *ARGA* USE

We locate two main modes of activity related to *arga* use in the present day: one that follows regional traditional patterns, and another that forms part of conservation measures, mainly implemented by NGOs. The use of *arga* within regional building traditions is responsive to patterns of demand and supply. The demand comes primarily from the social elite, mainly monasteries and wealthy people. Today, most of the roofs and floors that are made using *arga* are located in monasteries, temples, and museums (Interview with Rinzin Gyalpo, a master mason working in Drag Yerpa).

The economic reason behind this is grounded in the high production costs associated with *arga*, as dozens of people must work for between several days and a few weeks to complete a single job. Services that were in Tibet previously, at the time of Ganden Phodang (dGa' ldan pho brang), which covers the time from the 5th Dalai Lama onwards, provided by the local population in the course of compulsory service or benevolent support of monasteries are now paid out as daily wages. *Arga* must be rammed over a long period of time in order to gain the desired properties, and the duration of ramming corresponds to the area of the roof or floor. The area of a one-pillar room is roughly 16 m² and ramming it would require around 20 workers for at least 20 days (Interview Lama Norbu 2021). The duration of polishing is estimated at one day per person for a three-metre strip, or one metre per person per day if the quality is intended to be very high (Interview Lama Norbu 2021). Besides the estimation of the duration by the roof area, other estimations are given in general for making an *arga* roof. The duration of the construction of an *arga* roof is described by Thubten Yarphel (2013: 920) with seven days, and according to Charigpa Lobzang Namgyal (2007: 32) ramming takes three to five days.

Master mason Rinzin Gyalpo, who works in Drag Yerpa, provided detailed economic data concerning the making of an *arga* roof. One person needs seven days to finish 1 m² of *arga* roof, while 16 people are needed to process an *arga* area for one room approximately 16 m² in size. For this work, each person earns CNY 200 (EUR 26) per day. In total, the production of the *arga* area for a standard room could cost CNY 20,000–30,000 (EUR 3,330).

Founded in 1996, the Tibet Heritage Fund (THF) is an NGO that, inter alia, organises training programs relating to heritage conservation in Ladakh, Sikkim, Mongolia, and Tibet. In 1998, the Lhasa city government approved a list of 76 houses for protection (Alexander and de Azevedo 1999: 32). Several of them were restored by THF and *arga* roofs were installed, for example at Trapchishar and Choetrikhang during the year 2000.[3] In the Eastern Tibet regions of Sichuan and Qinghai, the THF has introduced an *arga* roofing program,[4] while the Trace Foundation (founded in 1993)—another NGO working with Tibetan culture—also supports the preservation of Tibetan architecture, including *arga* techniques.[5]

RISKS TO THE *ARGA* TECHNIQUE

Beyond its great strength and water repellency, there are several negative factors surrounding the use of *arga* as a roofing material. In addition to the high workload involved, problems can arise if insufficient care is taken when dealing with conservation measures, and there are also socioeconomic and climatic issues to consider.

NEGLECT OF CARE AND DESTRUCTION

Despite its stability, an *arga* roof is susceptible to water, salt, and fat (Thubten Yarphel 2013: 921). It is waterproof, but only if it is properly maintained through regular cleaning, oiling, and coating with resin. Leaving snow on *arga* surfaces for too long can also have unfavourable results, so it should be removed as soon as possible (ibid.). Water must be removed or drained from the roof as soon as possible after rain, before anyone can step back on the surface. Standing water can cause pockmarked breaking (*'bar tshag*) on the roof

3 Online: http://www.tibetheritagefund.org/old_web_2002/3_works/3_02/3_02_07trapchishar/3_02_07_01_en.html (accessed: 19.12.2021).

4 Online: https://www.tibetheritagefund.org/page/?r=93 (accessed: 19.12.2021).

5 Online: https://www.trace.org/field/preserving-tibetan-architecture (accessed: 19.12.2021).

(Charigpa Lobzang Namgyal 2007: 32). The *arga* floor needs to be cleaned daily, for example with a cloth. Polishing with a candle along with the red fruits of a particular plant (known as *tug dowa*) hardens the *arga* surface (Charigpa Lobzang Namgyal 2007: 32). Also, no heavy objects should fall on the *arga* floor, and oil should be applied to roofs from time to time, but not to floors (Interview Lama Norbu 2021). If such maintenance activities are not carried out properly, cracks emerge, moisture penetrates, and the uppermost *arga* layer peels off as a result of frost cracking.

Besides neglect, destruction plays a crucial role in the vanishing of historic buildings connected to *arga*. Alexander and de Azevedo (1999: 25) report that an average 35 historic buildings were destroyed yearly in the Old City of Lhasa since 1993, until they started a conservation project there in the late 1990s.

SOCIO-ECONOMIC REASONS FOR DECLINING *ARGA* USE

As with many other craft techniques, the tradition of making *arga* roofs is linked to specific social conditions and associated economic factors. Today, it is primarily monasteries and government clients that have to pay the costs for making *arga* roofs. Workers are no longer bound by tradition to corvée labour or regular community-level voluntary activities, so must be paid in cash. The creation of *arga* roofs thus remains a matter for the religious elite and the wealthier strata of the bourgeoisie. When looking across the Himalayas, such socioeconomic factors may partially explain the declining use of *arga* in certain areas, the drying up of traditional knowledge relating to it, and the decaying state of many existing *arga* roofs, as is the case in Northern India.

CLIMATIC CHANGE

Over recent years, the effects of climate change have become more evident throughout the Himalayas, which also has implications for the condition of existing *arga* roofs. Prolonged and more intensive rainfall can significantly damage roofs that are not optimally maintained, leading to accelerated degradation. A generally drier climate paired with occasional very strong rainfall makes the weather unpredictable, giving rise to both droughts and floods but without any regular pattern.

SPECIFIC MATERIAL PROPERTIES OF *ARGA*

Arga is a hypernym, which connects particular material properties and usages. In Tibetan dictionaries, the term *ar ga* (also written as *ar ka*), is variously translated as: clay (THL[6]: Ives Waldo, Jim Valby); marble (THL: Ives Waldo, Rangjung Yeshe); plaster floor (THL: Ives Waldo, Rangjung Yeshe); plaster floor made of pulverised marble and oil (THL: Jim Valby); or hard earth from which faces can be made (THL: Ives Waldo). The translations of *arga* as "plaster floor" (THL: Ives Waldo, Rangjung Yeshe) or as "plaster floor made of pulverised marble and oil" (THL: Jim Valby), are somewhat problematic, as this material is not only used for floors but also for roofs. One could argue that a flat roof is a kind of floor, because it is an accessible surface that bears weight and may be used for certain household activities. From a technical point of view, however, simply referring to all *arga* surfaces as "floors" overlooks one important distinguishing aspect: the waterproofing. Contrary to common earthen flat roofs, *arga* roofs are known for being waterproof and permeable to water vapour when treated correctly by applying particular fluid substances like resins and oils on its surface. The translation "hard earth from which faces can be made" (THL: Ives Waldo) points more to the hard consistency, as mentioned with *sa khreg po* (*sa* meaning "earth", *khreg po* meaning "hard"), as well as stressing the qualities that enable it to become a workable surface.

Considering its main constituents and properties, Alexander (2011: fn. 135) suggests that *arga* is a kind of micrite. *Arga* samples, which Feiglstorfer collected between Zangskar and Lhasa were examined by him at the University of Natural Resources and Life Sciences, Vienna. Results of these tests show *arga* to contain a high amount of carbonate and clay (Feiglstorfer 2019). Samples from Northern India and Central Tibet, for example, turned out to be mainly limestone-marl with a content of calcite ranging between 46% and 80% (Feiglstorfer 2019: 194).

6 "The Tibetan and Himalayan Library (THL) is a publisher of websites, information services, and networking facilities relating to the Tibetan plateau and southern Himalayan regions." The website includes a Tibetan-English translation tool which provides various translations according to different experts. Online: https://www.thlib.org (accessed: 19.12.2021).

For some of them, it is not possible to easily break these samples by hand and their fracture patterns are more similar to those of stone than clay. As noted by Feiglstorfer, there is a large fluctuation in the ratio of clay and lime, which means that *arga* can have very different strengths and can be broken with different amounts of force. When mining *arga*, the softer type can easily be broken into small pieces. The harder kind is either crushed immediately at the quarry site, as was the case for the *arga* brought to the Gyüme Dratsang monastery, or is brought to the construction site in big blocks by truck where it is broken into smaller pieces, as at the monastery in Khorchag.





Fig. 11-3 Two examples of a variety of different *arga* floors at Samye monastery.
Source: Hubert Feiglstorfer (2019).

Fig. 11-4 Idem.
Source: Hubert Feiglstorfer (2019).

According to our research results, it is the binding effect of the clay and the *arga* which renders an *arga* roof waterproof. These are placed above each other in layers during the ramming and watering stage of installation, so they are crushed and at the same time homogenously mixed with one another to achieve the binding and waterproofing properties (see the system graphics of this mixing process in Feiglstorfer 2019: 192).

In fact, most of the *arga* used for floors and roofs is not actually pulverised, but is simply crushed into smaller pieces. The process of producing dust we also find in the term *rdo thal*, which can be translated as "stone dust" or *Steinmehl* (German).

A Tibetan work song neatly describes the hybrid constitution and appearance of *arga* in a simplified manner: *"Arga* is not earth, *arga* is not stone, but if you use it, it becomes very beautiful" (Thubten Yarphel 2013: 916). Besides its use as building material, other uses as well as particular beliefs and rituals are connected to *arga.* It is thought to belong to the realm of the *nāga* (*klu*) (mythical beings, half human and half serpent) and before being quarried, a specific ritual and fire ceremony should ideally be held during which the *nāga* are asked for permission to remove the material (Thubten Yarphel 2013: 917). However, according to our interviews in various parts of Central Tibet, the ritual described here is little known and rarely practiced today. At Trapchishar, which is one of the old buildings along the Lhasa Barkhor, a different ritual is held before work with *arga* begins, asking for "successful completion and to please the protector spirit that is said to live in one of the corners of the roof"[7].

The colour of finished *arga* surfaces varies considerably. When finished, *arga* is categorised according to its three main colours: white, red, and black (Fig. 11-3, Fig. 11-4). The most favored colours are white and red, but this is purely an aesthetic and symbolic matter, as the colour makes no difference to the quality of the finished material (Interview Lama Norbu 2021). In its natural state, the colour of *arga* ranges between light grey and medium grey, but according to the mineral content, we may find hues of light red and light yellow (Könchog Tenzin et al. 2010: 94). According to the material examinations conducted by Feiglstorfer (2019), which covers *arga* samples collected over a wide area from Zangskar to Central Tibet, the colours of *arga* vary widely both for the raw material and the processed product. Colour is also a feature

7 Online: http://www.tibetheritagefund.org/old_web_2002/3_works/3_02/3_02_07trapchishar/3_02_07_01_en.html (accessed: 19.12.2021).

that may allow for the detection of *arga* deposits from a distance. For example, in Phugtal (Zangskar) Feiglstorfer found *arga* deposits situated at the foot of a rock face and known to the local monks from hundreds of metres away, because its intense yellowish-brown colour contrasted strongly with the surrounding landscape (Feiglstorfer 2019: 179). (Fig. 11-5) Similarly, in Basgo in Ladakh and near the Phugtal Monastery in Zangskar, the *arga* deposits had a distinct brownish-yellow colour. In contrast, at Mangyu in Ladakh, at Khorchag in Purang, and at the Gyümed Dratsang, the *arga* was much closer to grey in colour (Feiglstorfer 2019: 174–178). The *arga* in Mangyu and Khorchag was similar to a breccia,[8] while the sample from Drag Yerpa had a more homogeneous structure and was easier to crush than the other two samples (ibid.). *Arga* powder, which Feiglstorfer detected in various admixtures of clay plaster at the monasteries of Tagphu Gön, Dorje Drag, and Kündeling, was consistently grey and served only to make wall surfaces harder and more stable for subsequent polishing.

Beyond its stabilising properties, the addition of *arga* to floors and roofs has an important aesthetic value. Unlike the raw material, which has a dull surface, the final impregnation and burnishing of finished *arga* surfaces with oils, resins or waxes brings all the colours of the accompanying minerals to light (Feiglstorfer 2019: 165). Similar to a terrazzo surface (discussed below), in which the colours of the constituent minerals also determine the character of the surface, it is the play of colours on the joint-free surface of a finished *arga* floor that is so sought after across the Tibetan cultural area. The renowned Tibetan king, Songtsen Gampo, was famously enchanted by these very properties, commenting that a high quality *arga* floor should have a mirror-like appearance (Fig. 11-6). The situation is completely different with *arga* surfaces that are weathered and are not regularly wiped or impregnated, as these tend towards a dull and lifeless appearance.

In order to achieve an attractive colour distribution on the rammed surface, the *arga* pieces broken after the first ramming are evenly distributed depending on the desired colour, in a work step known as *tra* (*khra*) (Interview Lama Norbu 2021). To achieve further decorative effects, particularly colourful stones are placed on the already finished surface and are beaten into the *arga* to create a decorative stone inlay (Fig. 11-7). This work step is known as *len tha* (*lan khra*) and is often accompanied by specific work songs (Lobsang Dorje 1997: 14).

8 Breccia is a sedimentary rock comprised of broken fragments of various kinds of rock and minerals, "cemented" together by a fine-grained matrix.

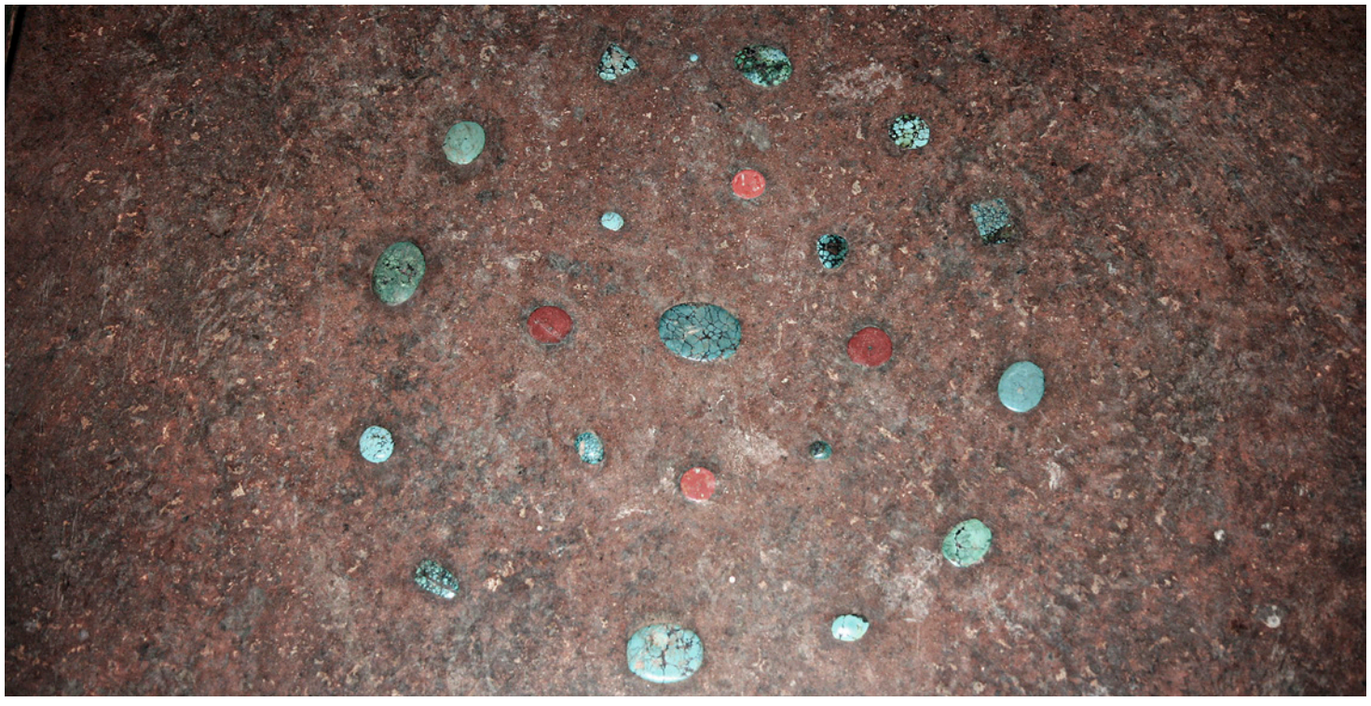


Fig. 11-5 Yellowish-brown *arga* deposits below the access path to the Phugtal Monastery, see red frame.
Source: Hubert Feiglstorfer (2005).



Fig. 11-6 A mirror-like appearance of an *arga* floor in Gongkar Monastery.
Source: Lama Norbu (2021).

Fig. 11-7 *Arga* floor in the *dukhang* at the Khorchag Jokhang.
In a final work, stone inlays were pressed into the *arga* surface.
Source: Hubert Feiglstorfer (2010).



SOCIAL CONTEXT, CULTURAL IDIOSYNCRASIES AND A REFLECTION ON CRAFT MODES

The shiny, colourful, and representative characteristics of *arga* floors, as famously admired by King Songtsen Gampo, are key reasons for their extensive use in monasteries and temple areas. When selecting *arga* for quarrying, workers must pay attention to select particular stone colours in order to achieve a specific colour brilliance. However, the value of *arga* surfaces is not only reflected in the fine sorting of its colours—the extensive processing required, the need to transport it over long distances, and its quarrying confirm *arga* as the most exquisite building material available in this region. The colour red, which appears again and again in religious contexts, combines with the reflective surface qualities to give *arga* floors special symbolic power.

For roofs, water resistance and general resilience are the most important criteria behind this manufacturing technique. Once *arga* roofs have been properly impregnated, as described above, they are considered waterproof and are said not to collapse even if an underlying support buckles. Preliminary studies suggest that the mineral structure is vapour diffusion-open, and capillary conductive, leading us to assume that arga roofs are both more efficient in terms of building physics and more ecologically sustainable than concrete roofs in the context of Tibet (Feiglstorfer 2016).

Certain building craft activities follow a fixed hierarchy and order according to Tibetan tradition. Historical records from the time of the construction of the Potala at Lhasa offer insights into such social hierarchies (Thubten Yarphel 2013: 908), which are also relevant to the processing of *arga*. There was the *udze* (*dbu mdzad,* meaning the master) for plaster, who guided the workers and was responsible for the final layer of plastering as well as the production of plasters for the noblest areas such as the *lhakhang* and the *zimchung*. Next in the hierarchy were nine *jingde* (*bying gras*), who supported the *udze* and were responsible for the second layer of plaster. They, in turn, were followed by 12 *gyüma* (*dkyus ma*), or "normal" plasterers, who supported the *udze* and the *jingde* as well as being responsible for the first layer of plaster and for turning the plaster, known as *damchu* (*'dam chu*).

The socially embedded context of *arga* craftwork is expressed through the large number of work songs, known as *arshe*, that accompany the ramming of *arga* (Grothmann 2011). These set certain rhythms for the required forward and backward movements involved, with various speeds suitable for each respective manufacturing phase. The *telshe* (*tel zhe*), for example, is a song type that sets the rhythm for the slower pounding movements during the early phase of ramming *chob* (*hrob*), which refers to the larger pieces of *arga* (Charigpa Lobzang Namgyal 2007: 33; Lobsang Dorje 1997: 10). The *gyugshe* (*gyug she*), on the other hand, provides a faster rhythm for running movements with hard beating (Charigpa Lobzang Namgyal 2007: 33). Lobsang Dorje (1997: 10) also mentions the *delwa* (*drel wa*) and the *pekor* (*pe skor*), which accompanies the circular movements (Charigpa Lobzang Namgyal 2007: 33) used to round off the corners (Lobsang Dorje 1997: 12). When moving along the *pekor*, all the workers must move in a line and not side-by-side, which Lobsang Dorje (ibid.) refers to as *thakor* (*mtha skor*).

A variety of song forms accompany the rammers as they work, including satirical songs, love songs, songs about the mountains, and hymns of praise (Charigpa Lobzang Namgyal 2007: 33). These generally use a 2/4 beat (Grothmann 2011: 41). *Shags rgyag pa* refers to a competitive style of singing between two groups of workers. The groups mutually respond to each other and develop a kind of vocal game, in which those who can no longer keep up with the song lose the contest (Charigpa Lobzang Namgyal 2007: 35). Charigpa Lobzang Namgyal (2007: 33) also gives a few examples of the content of such *arshe* songs. One is about reducing worries and tells of a lamb that is not allowed to stay at home but has to go out to pasture. Its mother shouldn't be sad, the song concludes, because the absence is not permanent and the lamb will return back to her after grazing. Another song tells of a boy and a girl who spend their youth together and grow up experiencing close friendship. The end of the *arga* ramming process is accompanied by specific songs, used as a common concluding act. These auspicious songs are known as *tashichöpa* (*bkra shis gcod pa*) and are the only type appropriate for this final phase (Lobsang Dorje 1997: 15).

The processing of *arga* has been described in detail elsewhere (Feiglstorfer 2019). In the following section the whole process is outlined, but includes certain aspects that have been observed since that previous research was conducted. It thus provides insight into the preparation process as well as additional



Fig. 11-8 Top: White *arga* used at Gongkar Monastery, quarried at Gyangtse.
Source: Lama Norbu (2021).

Fig. 11-9 Bottom left: Red *arga* used at the Potala, quarried in Yangpachan, about 90 km away from Lhasa.
Source: Lama Norbu (2021).

Fig. 11-10 Bottom right: Sieved white *arga*, or *arshib*, used at Gongkar Monastery.
Source: Lama Norbu (2021).

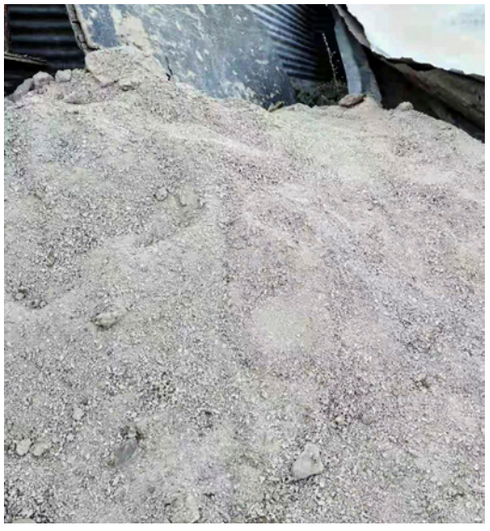


information that was not available to the authors earlier.

DIGGING AND DETERMINING THE QUALITY OF *ARGA*

Certain places are referred to as being sources of "the best *arga*", but the extent to which this is connected to the mythical status of the site or really refers to its high material quality remains an open question. It is widely said that the best *arga* quality comes from Drag Yerpa (Brag yer pa), a place widely known among Tibetans as particularly holy and the site of a seventh century cave monastery, among other religious structures. Although Drag Yerpa still has *arga* deposits, little material is sourced from there nowadays. Most of the *arga* used in Central Tibet today comes from Samye and Drachi (Gra phyi), as well as increasingly from Lhoka, Phenpo, and Shigatse. *Arga* from Phenpo is considered particularly good (Interview Lama Norbu 2021). In addition to Phenpo, Gyadrong (Brgya grong) is also known for its good quality *arga*. Further *arga* deposits are known to exist in Gyantse and Sakya, but these are said to be of lower quality. In Chushul Serme, close to Lhasa, according to Lama Norbu, the best *arga* quality can be found. Further *arga* sites in Central Tibet are mentioned in a film on *arga* by Feiglstorfer (2016).

In the past, most of *arga* workers came from the regions of Lhoka, Samye, and Dhanang near Samye, while today most of the *arga* workers come from Phenpo, Shigatse, Yardrog, and Lhokha as well (Interview Rinzin Gyalpo). For ramming the roofs of big monasteries, a large group of workers may be needed for several weeks, which is a major factor making *arga* use so costly. Additionally, the *arga* stone is in most cases transported over long distances. In former days this was done with animals, in particular the *khelyak* (*skyel g.yag* or transport yak), but today it is done by truck. The size of rocks varies, in Khorchag, for example the blocks were up to ¼ m³ with an estimated weight of 500 kg. These must first be broken down to the size of a fist before being further processed on the floor. The chunks are crushed into pieces of walnut size, as described by locals, before they are carried in wooden carrying frames on the back, mainly by women, onto the roof where they are unloaded ready for use.



PREPARING THE *ARGA* BEFORE RAMMING

Before processing, *arga* is cleaned, for example all traces of earth must be removed, because "dirty" *arga* is always considered poor quality (Thubten Yarphel 2013: 917) (Fig. 11-8). The required size of *arga* to be used is determined when the Shogdung (*hrob rdung*) denotes the first spot at the beginning of the ramming. As mentioned above, different colours of *arga* are available, with the main colours referred to as white and red (Fig. 11-9). Before application, the total area to be covered with *arga* must be determined (Thubten Yarphel 2013: 918). For very large areas, the *arga* is broken into pieces of roughly apple size before being applied to the roof, while for the standard area of a four-pillar building they should be walnut sized. In smaller areas, *arga* pieces should be roughly the size of a dried apricot or somewhere between an apricot and a walnut, which is called *archob* (*bar hrob*) (Thubten Yarphel 2013: 918). Pounding leaves very small *arga* pieces, which are then sifted to a flour-like fineness which is known as *arshib* (*ar zhib*) (Fig. 11-10). Grain-sized *arga* parts remaining in the sieve are called *nedrama* (*nas 'dra ma*), and slightly larger ones *nechob* (*nas hrob*), which are similar in size and shape to broad beans (Thubten Yarphel 2013: 918). In summary, the *arga* sizes are graded as follows: apple–walnut–*archob*–apricot–*nechob*–*nedrama*–*arshib*. Charigpa Lobzang Namgyal (2007: 31) describes the gradation with just four sizes, large (*hrob*), middle size (*bar hrob*), and like grain (*nas 'dra*).

THE CLAY BELOW THE *ARGA*

The load bearing substructure of a roof has a significant impact on the technical performance of a finished *arga* roof. For this reason, the layers below the *arga* are described in detail in the following paragraphs. The following layers are added on top of the main *kawa* (*ka ba*; pillar):

- *dungma* (*gdung ma;* first beam)
- *cham* (*lcam*; secondary beam);
- *delma* (*dal ma*; wood, branches and bushes on top of the *cham*, also known as *telbang* (*bral bang*));
- *deldo* (*bral rdo*; stone, which is a few centimeters tall on top of the *delma*);
- *dambag* (*'dam bag*; clay on top of *deldo*).

If the *dambag* represents the top layer of the roof, such as in a farmhouse, this is also known as *tongdag*. If the *dambag* is too wet, then a little *saböl* (clay mortar, described below) is added. After pouring the *dambag* on top of the roof, it is kicked together, not rammed. To ensure good quality clay, one leaves the *dambag* to stand overnight and only then continues working on it. If one omits *saböl* mortar when the clay is too damp, the *dambag* will stick to ones' shoes.

A glossary at the end of our contribution lists a variety of clays mainly in relation to roof construction.[9] Some of these terms suggest certain material qualities, physical behaviour of the clay, or methods of processing. The term *dambag* (*'dam bag*); suggests a relation to humid natural ground; the term *dagchen* (*'dag chen*) suggests a *dambag* with a higher content of water; and the term *chamdag* (*lcam 'dag*) indicates the use of clay on top of a wooden sub-construction. The *thogdag* (*thog 'dag*) refers to an upper layer of clay in the roof construction, which is covered by loosely spread earth on top, which is known as *saru gampo* (*sa ru skam po*). Besides the use for roof construction, other terms suggest a clay's use as filling material for solid walls, like *migdag* (*mig 'dag*) or the *singsa* (*sing sa*), a term commonly describing earth. For house construction this term also suggests a particular use in wall construction, or the *saböl* (*sa 'bol*), which is used for stone walls and roofs as well.

On top of the upper clay layer, a layer of poorly sorted out *arga* is applied, which can also naturally be blended with *bakar* or *arshib*. This layer is called *arden* (*ar gdan*).[10] Thereafter, well-sorted *arga* is spread onto the *arden*. *Bakar* is a white mineral sediment which can be found together with *arga* and is used, for example, as aggregate mixed with sand and/or clay to produce wall plaster.

Before *arga* is applied to the roof, another layer of clay is applied to the supporting structure. On that clay base, layers of *arga* will be pounded and rammed. The clay layer below mixes with the crushed *arga* above to form a homogeneous mass.[11] Clay thus becomes an essential part of the *arga*. Research on the systematic classification of clay types shows how Tibetans categorise clay according to its different uses, such as that which is suited for roofs or walls. Chö Phuntsog (2013: 98) mentions various types and uses of clays, and these are given in the "Glossary on a variety of clays and their use in Tibet" below.

RAMMING

The ramming starts on top of a stabile sub-construction, resistant to the strong vibrations caused by the ramming. This sub-construction has the ceiling below, mainly made of wooden sticks or planks, and on top of that an organic layer which supports the waterproofing of the roof. In some cases, an extra layer of stone is added to increase the loadbearing efficiency and further reduce vibration. On top of this stabile layer, several plastic (in the sense of flexible) layers are applied. First a layer of clay is distributed over the whole floor and levelled to keep a similar thickness. On top of this earthen layer, the actual *arga* processing takes place. The construction of an *arga* floor is thus a complex composition in which all of the single layers are statically and physically well-adjusted to each other.

The *arga* is rammed till the pieces are crushed the size of grain or smaller, including dust. As described by Könchog Tenzin (2010: 95) the smaller and larger pieces stick together. The ramming of *arga* is usually called *drung*, or in the region of Lhasa *arga chag*. During ramming, the surface is continuously watered, so the clay is pressed upwards and the *arga* pieces downwards. Our technical studies show that it is the conglomeration of the fine clay below and the crushed *arga* pieces and dust which is transformed into a homogenous and elastic mass, which is said to be stable enough to withstand even the cracking of a supporting pillar (Feiglstorfer 2019).

9 A first overview of different types of clays used in Tibetan and Himalayan architecture is given in Feiglstorfer (2019: 23).

10 The word *ar* here is a short form of *arga*, while *gdan* means "mat", thus likening this layer to a covering under the feet.

11 For a drawing of the process of *arga* compression, see Feiglstorfer (2019: 192).

The ramming of the *arga* is hugely labour intensive and is thus always a team undertaking (Fig. 11-11). Wooden sticks with a stone plate attached to one end, known as *bogdo* (Tib.: *'bog rdo*), are used for ramming and are always kept in an upright position. In a grid pattern, the workers move forwards and backwards several times, before they turn 90° and again move forwards and backwards. This choreographed action is accompanied by working songs (*arche*) under the direction of a master singer, known as *zhépön* (*gzhas dpon*).

Shogdung (*hrob rdung*) denotes the first spot at the beginning of the ramming, where a slightly larger and heavier *bogdo* is used. Charigpa Lobzang Namgyal (2007: 31) describes the processing of *arga* in the following way: First, large pieces of *arga* (known as *hrob*) are spread on the floor, the thicker the better. In three to four rows, the workers beat this layer with the addition of water, not too strongly. Then middle size *arga* (known as *bar hrob*) is applied, beaten softly again as before. Next, small, grain-size *arga* (known as *nas dra*) is applied and beaten without adding water, then water is applied everywhere and beaten firmly. This stage lasts three to four hours or until all the water has dried up. Once the *arga* has dried, the surface is polished with round stones (known as *chu rdo* or *dbur rdo*).

Thubten Yarphel (2013: 918f.) describes the ramming process slightly differently: First, a large amount of *archob* is distributed over the entire floor area. Then slowly and not too strongly it is beaten with a *bogdo* weighing roughly 500 g. After the addition of some water by the *zhépön*, the *archob* is beaten for approximately 24 hours.



Fig. 11-11 Ramming the *arga* with *bogdo* on the roof of the Gyüme Dratsang in Lhasa.
Source: Hubert Feiglstorfer (2015).



Fig. 11-12 Rounded parapets after having been beaten with a *bärdo*, at Gongkar Monastery.
Source: Lama Norbu (2019).



Fig. 11-13 Repairing a crack in the *arga* roof by using a *bogdo*.
Source: Hubert Feiglstorfer (2019).

To achieve a very high quality, this may be extended up to 36 hours, with no extra water added. Then the *zhépön* spreads *nechob* (broad bean sized *arga* pieces) over the entire surface and this is beaten a little harder for about 16 hours with a *bogdo* weighing at least 1 kg. Next, *nedrama* (grain sized *arga* pieces) and water are applied over a large area and beaten for eight hours with a 750 g *bogdo*. On this day a lot of food, tea, and beer is given to the workers. Then the corners are knocked out, left to dry out, and this process is repeated. The following morning, water is added by the *sheybön* and *archob* is sprinkled over it in order to make the surfaces homogeneous. This layer is beaten for eight hours with the addition of water and finally without the addition of water for another two to eight hours. The ramming process is completed as soon as the water no longer dries up in the ground and the water level comes to stand above the rammed surface. Then the workers polish it with stones, each in his or her own work area (Thubten Yarphel 2013: 920).

Lama Norbu mentioned that in earlier days, the *arga* layer on the roof was not very thick, but the quality of the *arga* was high. Also, more time was spent on ramming, up to four weeks for a whole roof. This has changed so that the *arga* layers are now thicker and are made with less carefully selected *arga*, including parts of *bakar*.

Mostly *arga* is processed in spring, summer, and autumn. *Arga* can also be used indoors in winter, but must not freeze. Should an *arga* layer break, the top layer is opened for repair. Often there is the entry of water or salts, which are removed and then this piece of *arga* is repaired again with a *bagdo* (*sbar rdo*; *sbar* = palm, *rdo* = stone). If this piece is not exchanged accordingly, cracks will appear around the exchanged piece of *arga*.

REPAIRING CRACKS AND MATERIAL DEFECTS

In 2015, Feiglstorfer accompanied repair work on the roof of the Lhasa Jokhang. Here one of the technically and ecologically sustainable qualities of *arga* was revealed, namely the renewability of damaged areas without the need to dispose of the entire roof structure. During this process, the roof structure was removed up to the supporting substructure, along the cracks, and the resulting imperfections were filled with supplementary material and tamped with sufficient water (Fig. 11-12). Although these repaired areas are visible as stripes along the previous crack lines after the surface has dried out, the roof is waterproof again with relatively little effort (see the book cover of Feiglstorfer 2019). There were five workers engaged in the repair of a 6 m long crack, in this case all female workers. The preferred working tool was not the *bogdo* but rather a wooden beater known as a *bärdo* (*ber rdo*). This tool enabled the work to be done while sitting. In contrast to ramming with the *bogdo*, this work was not accompanied by work songs.

In 2019 Feiglstorfer visited the Dorje Drag monastery located on the way from Lhasa to Samye, where plaster was also applied in the traditional manner. In this case, something went wrong during processing or the processed material must not have been of the required quality, as the newly processed plaster was indeed mirror-like after drying out, but had large cracks or chipped areas (Fig. 11-13). It was not possible to determine whether this was due to processing with too little water, too short a compression time, or a lack of binding aggregates.

Lama Norbu explained in a later interview that to repair joints, cracks or unevenness, the residual material that is still moist or freshly mixed with water is used. He also mentioned two different stones used for polishing, one of which is very fine, known as *jamdo* (*'jam rdo*), the other coarser, known as *tsubdo* (*rtsub rdo*).

BURNISHING

In 2019, Feiglstorfer accompanied the production and application of wall plaster in the Kündeling (Kun bde gling) monastery. Parts of the monastery, including the outer walls, were completely rebuilt. A new wall plaster was applied in the sculpture anteroom and *arga* was also used here to stabilise the clay. After polishing, the surface was smoothed, burnished, and ready to be painted.

In 2015, Feiglstorfer visited the monastery in Uru Katsel (Dbu ru Ka rtsal) Temple (Feiglstorfer 2019: 163), where a new interior plaster was being burnished (Feiglstorfer 2019: 44, Fig. 7.2). This work was carried out exclusively by women. After a short drying time, they burnished the "leather-hard"[12] plaster surfaces with rounded river stones to give them a smooth, mirror-like finish (see the book cover of Feiglstorfer 2022). As is so often the case when Tibetans work together, the work was accompanied by a pleasant atmosphere of

12 Here "leatherhard" describes a state of the material when drying out but still in a plastic state.

conversation and laughter. *Arga* does not require any special quality for this kind of application. In Lhasa, *arga* from the surrounding regions is collected and sold for such uses at various construction sites.

SEALING THE SURFACE

When polishing the *arga* surface, its quality is assessed by the way in which *arga* adheres to the polishing stone (*dbur rdo*), this material is referred to as *argyag* (*ar skyag*) (Thubten Yarphel 2013: 920). If there is a content of earth in the *argyag*, then this is a sign of inferior quality (Thubten Yarphel 2013: 920). Round shaped pieces like parapets are treated with hand tapping (Fig. 11-14).

Sealing the surface after burnishing is usually achieved using white stones (Thubten Yarphel 2013: 907). Könchog Tenzin (2010: 95) describes the use of beeswax and then animal or vegetable oil, after which the *arga* surface becomes bright and clean by polishing. Thubten Yarphel (2013: 920) describes the use of a special extract to seal the roof, which is obtained after beating and boiling the bark of a specific tree (*yom 'bog*) in water. According to Charigpa Lobzang Namgyal (2007: 32), the bark is brushed one to three times over the roof. For the best quality, hot oil with incense (*spos dkar*) is also applied as the last layer, which makes the roof fully waterproof (Charigpa Lobzang Namgyal 2007: 32; Thubten Yarphel 2013: 920).

After polishing, liquid remains of the bark of the *yombok* (*yom 'bog*) tree after having it soaked in water, must be applied to the roof on the same day that polishing takes place (Feiglstorfer 2019: 165). This is not so urgent for interior floors and the *yombok* liquid can be applied there after a day or so. It should not be too thick, otherwise the *arga* will turn black. *Yombok* liquid that is too thin is also unsuitable as it does not adequately protect the roof against moisture. After the layer of *yombok* liquid, a small amount of oil is applied, which also protects the *arga* against the ingress of water. Another processing description speaks of applying the *yombok* liquid three times, then drying it and coating it with oil three to four times.

MAINTENANCE

In 2019, Feiglstorfer visited the monastery in Samye, where the *arga* floors are in good condition. For continuous care, sheepskins filled with barley are pulled across the floor for polishing and cleaning. The barley adapts to the unevenness of the surface and only puts so much weight on the floor that it is not damaged by impressions (Feiglstorfer 2019: 142). In heavily frequented monastery rooms, taking off ones' shoes and walking with stockings or felt slippers also has a cleansing effect. Tsering Drongshar who acted as monk in Tibetan monasteries also observed the *arga* floor in the Sera monastery being cleaned with a cloth.

Fig. 11-14 Repair of a material defect in a wall plaster at the Dorje Drag monastery.
Source: Hubert Feiglstorfer (2019).



FURTHER DISCUSSION

As with other Tibetan material names, for example the *markalag* clay (Feiglstorfer 2019) whose fine consistency and resulting properties are expressed through comparison with butter (*mar*), the name *arga* does not follow any terminological system according to the Western scientific approach. As a hypernym (a superordinate grouping word), *arga* describes not only the material but also its uses. Grothmann (2011: 4f.) suggests that the word *ar ka* (an alternate spelling of *ar ga*) does not have Tibetan origin, but could be a loan word integrated into the Tibetan language with the introduction of certain building materials and associated techniques.

On the one hand, this approach to naming makes it difficult to classify *arga* based on quantitatively determinable material properties, or to describe it using internationally valid technical language or precise geological nomenclature. On the other hand, this type of material designation makes specific reference to sensually perceptible properties and to the behaviour of the material during processing. This sensual and process-oriented terminological approach facilitates the understanding of the respective material as part of an application-oriented material culture. From this perspective, the term *arga* appears to emerge from its relevance to a broad range of users, in particular the ordinary unskilled workers, which contrasts with other nomenclatures that relate specifically to skilled craftspeople. While keeping this in mind, it is nevertheless interesting to study the raw material *arga* through geological investigations in the laboratory, for example to establish its overall mineralogy. A classification as "marl" might work at a very general level, but it can be made more precise by also specifying relative levels of carbonate content.

SPREAD OF KNOWLEDGE ON *ARGA*

From a socioeconomic point of view, the spread of knowledge concerning the use of *arga* across a large part of the Tibetan cultural area is related to the existence of an elite social strata, given the high costs associated with sourcing and, in particular, processing these materials. Most early evidence of the use of *arga* already shows its use for exquisite purposes in the chambers of burial mounds from the Tibetan imperial period. Its religiously symbolic character, as we know it today, when manufactured to the highest possible technical standard, can be retraced to the very early use of *arga* in the Lhasa Jokhang, which was erected in 639 CE (Martin 2013). Until today, collectively anchored associations are maintained, for example via its texture and colour, or its waterproofness after being processed.

The techniques for processing *arga* are basically the same across a wide region, from Zangskar and Ladakh in the far west of the Tibetan cultural area to far Eastern Tibet. It is striking that the spread of *arga* for the production of roofs is limited to regions with correspondingly low precipitation. Accordingly, the spread of *arga* can be seen as dependent on the climate, on the availability of the raw material, and on socioeconomic factors, notably the presence of an elite. At the southern edges of Central Tibet, for example, where the monsoon leads to heavier rainfalls, there is a kind of a climatic frontier to the spread of *arga*. Climatic changes with increasing and/or heavier rainfall events may have a corresponding negative impact on the tradition's continuity in rain-affected areas in future.

It would be an exaggeration to speak of *arga* use as a standardised technical practice, as the processing of *arga* and the making of whole roofs, with their attendant sub-constructions, as well as the finishing of the surface, varies regionally. One reason for the local variations of processing standards is the regional diversity of different qualities of *arga*. However, we may confidently propose that there has been standardisation at the social level, regarding the connection of *arga* to social hierarchy and forms of religious symbolism. The maintenance of a building craft tradition since at least the mid 7th century shows the interrelationships between craft traditions and Tibetan culture. Even the politically-led breaking of elite Tibetan culture during the 1950s and 1960s, when the monarchic guild system was replaced by governmental structures, did not erase the knowledge and practice of *arga* processing. Over recent decades, NGO support has continued to raise awareness of Tibetan craft heritage, riposting a local tendency towards neglect. In recent times, several Tibetan speaking authors have kept the traditional knowledge of *arga* vibrant through their books and articles, such as by comparing the size of *arga* pieces with different fruits and grains, as opposed to using body-based measurement as is commonly seen in other building craft traditions.

SUMMARY OF *ARGA* MATERIAL CULTURE

A wide range of working steps are needed to complete *arga*-based construction works, from the initial quarrying of the raw material right through to the final finishing of a roof. In addition to the *arga* itself, it is its physical interactions with other ingredients like clay, resins, or oils that give this material its renowned properties. Methods of processing *arga* require deep technical understanding, for which a master is needed to coordinate the working processes. The materiality of the craft of processing *arga* is strongly connected to a community of workers, at this point referring to the communities of practice theory by Wenger (2006), while from a material culture perspective, *arga* is deeply embedded in various localised customs, rituals, and social relations. The nomenclature, work songs, construction logics, and maintenance practices all express the values, material varieties, and usage demands associated with this remarkable material. The multivalent use of the term *arga* as a hypernym also connects particular material properties and usage methods within an identifiable building craft tradition.

In contrast to vernacular building techniques in rural areas, where materials form the local area are mostly used for construction (see Thakkar and Shah, Tiwari et al., and Wozniak, this volume), *arga* is often transported over long distances from it place of collection. Differing meanings of "vernacular" and "elite" also raises semantic problems which challenge the limits of both terms. If we define vernacular buildings as those based on local knowledge, skills, and resources, then we may well call *arga*-based working processes as "vernacular", since the knowledge is carried on by the common people. However, because *arga* use is primarily restricted to buildings of the social and religious elite, the buildings themselves do not fit well with the mainstream conceptualisation of the vernacular. Following this polysemic discourse on *arga*, we may understand the vernacular and the elite as complementary and interrelated, not simply as dichotomous faces of the "*arga*-craft".

LOOKING BEYOND TIBET: CRAFTS SHOWING PARALLELS TO TIBETAN *ARGA* STONE FLOORS AND ROOFS

The use of geomaterials such as earth and crushed stone in the construction of floors and roofs is by no means restricted to the Tibetan cultural area. Similar techniques can be found across the world. Often, these are examples of a traditional building craft under existential threat due to societal or climate change, such as the *banco* architecture of West Africa. Others may be defunct construction techniques with relevance to either archaeology or architectural conservation, for example the flat earth roofs of the Eastern Mediterranean. As such, the commonalities with *arga* are not restricted to material or constructural similarities. There might be cultural idiosyncrasies or semantic reasons, like terminological inconsistencies which reflect similar factors related to *arga*. There may also be shared or similar risks and hazards, or a potential for common strategies to mitigate these. Investigating these common techniques within a single framework can reveal opportunities for synergistic research and knowledge exchange. The material cultural approach, used in the previous section to understand and describe *arga* in terms of a pertinence to Tibetan culture more broadly, has a global applicability.

Beyond academic discourse, this holistic understanding can contribute to improved awareness of conservation risks and practical approaches, as has been the case with *arga* in the Tibetan region (Feiglstorfer 2019). In the British Isles for example, floors made of geo-materials, whether forms of lime or gypsum-plaster, or raw, hard-beaten materials such as earth or chalk, were a common traditional construction form which lasted into the early 20th century (Watt and Colston 2002). The vernacular craft was intrinsically linked to the availability of raw materials, some of which might no longer be available or suitable for use within local construction industries. Contemporary reference material dates back to the 18th century or later, and no longer describes local vernacular variations but rather standardised approaches (Henry et al. 2011). Where specifications survive, they indicate that floors were laid by treading and beating with wooden rammers, with a final layer sometimes smoothed out using a trowel. Any

greater variation in guidance is generally related to different additives. Several references exist of clay being mixed with oxblood to increase its hardness. Others mention lime-ash, horse dung, egg white, or milk. Many such floors still survive and present complex conservation challenges. While technical guidance produced by the Society for the Protection of Ancient Buildings and English Heritage is available (Wright 2016; Goode 2018), there has only been limited study of the materials, maintenance, and any associated vernacular cultures. Conservation best practice is therefore limited to generalised guidance and many floors continue to decay rapidly. Although valued in those buildings in which they have survived, and protected as tangible heritage assets, there is no surviving practice or intangible heritage associated with the craft. Perhaps a more interdisciplinary approach could help elevate such techniques to a similar standing that *arga* has recovered in parts of the Himalayan region, where it now functions as a culturally valuable, low embodied energy alternative to modern construction techniques.

RESEARCH CRITERIA

Techniques with a notable commonality to *arga* could be said to include (1) layers of clay and/or crushed stone, which are (2) assembled and maintained to provide a socially highly representative and to some degree water resistant floor or roof, with (3) an element of intangible heritage.[13] The following sections will outline three such building crafts in terms of their relevance to *arga*: (1) *Opus signinum* and terrazzo in the ancient Roman territories; (2) flat-earth roofs in the Eastern Mediterranean; and (3) adobe buildings in West Africa. Each of these describes a technique or a range of techniques used to fabricate architectural surfaces, which bear some commonality to *arga*. The purpose is to outline and discuss similarities and differences in the provenance, preparation, and properties of the materials, but also in terms of the relevance of a material trans-cultural approach to understand and describe their significance, and finally to return by looking at idiosyncratic aspects of the nature from a more general cultural approach.

Each of the three cases is presented as a short vignette, which does scant justice to the depth and richness of previous and ongoing work, but rather serves to contextualise them within a framework of material cultural research. Supplementing an overview of key historical developments to the individual case, each vignette focuses on a set of attributes discussed in the previous section on *arga*. Material properties, social context, cultural idiosyncrasies, craft modes, academic/terminological inconsistencies, risks to the technique, and conservation approaches are discussed as relevant to the individual comparison between the specific technique and the *arga*-based techniques covered in the previous section. The overall aim is to promote the benefits of adopting a framework of material trans-cultural research, in terms of the broad cultural and historic perspective to ongoing study and the associated benefit to conservation science and archaeological science this can provide.

OPUS SIGNINUM AND TERRAZZO

This section explores the evolution of two techniques which have some commonality with *arga*. Terrazzo can bear a strong visual resemblance, and is produced in a similar fashion (crushed, pounded, polished). *Opus signinum* was used to finish multi-layered, water-resistant surfaces. In each case, there are inconsistencies and idiosyncrasies in the use of these terms which complicate their understanding in a material cultural context. Furthermore, their culture of use can be viewed in a continuum, which aligns the development, standardisation, and propagation of the construction techniques with broader socio-economic and cultural processes.

Historical background and material properties

The term terrazzo emerged in Venice in the 15th century to describe a flooring technique which used stone and marble chipping set in lime mortar (Howard 2002: 62). It developed as a low-cost, time intensive method for creating durable floors and pavements using recycled materials, consisting of a lower layer of crushed brick and stone, and an upper layer of fragments of coloured marble. Each layer was set in lime mortar and beaten down for several days, and several months had to pass between laying the two layers (ibid.). The surface was smoothed with mill stones and regularly polished with linseed oil to produce a highly reflective surface. From the Renaissance onwards, use of terrazzo spread across Europe, especially in representative buildings such as palaces and churches. By the 19th century, Portland cement started to be used in place of

13 Intangible heritage is here understood as an associated intellectual wealth, for example in the form of a ceremonial construction process or a social practice, which is directly related to the materiality and built form.

lime mortar, leading to the commercialisation of the technique (Henry and Stewart 2011).

As a vernacular technique, terrazzo appears to have evolved from the Roman flooring and mosaic techniques such as *opus signinum* and the medieval *pastellone*. The latter term describes floors consisting of an underbed of broken stones and bricks, a second layer of finer aggregate and crushed bricks, both with a slaked lime binder and beaten and rolled until compact, and a final layer of lime putty and crushed brick dust, which is spread with a trowel (Bagnara 2009). *Opus signinum* is described by Vitruvius, in the first century CE, as a construction technique specifically for making waterproof surfaces (an intention similar to *arga*), using a 5:2 mix of "purest and roughest" sand and lime mortar from hard limestone (Rowland and Howe 1999: 106) (Fig. 11-15). This is slightly different from Pliny the Elder's description, who in the late first century CE described a floor made of "broken pottery […] beaten to powder, and tempered with lime […] forming the cement known as the Signine composition" (Bostock 1855: 35.46). Application of this method, which in today's terminology could be described as a hydraulic lime cement,[14] had by that time become common throughout the Roman empire. The technique is thought to have emerged in North Africa, some time before 256 BCE, possibly as a rammed earth floor with added lime and ceramics, and migrated through Sicily to Italy (Tsakirgis 1990). There are some indications that ceramic was being added to lime plaster to improve its hydraulic properties by the Phoenicians in the 7th century BCE Levant, and that they exported the technique to their North African colonies (Orsingher et al. 2020).

Commonalities between terrazzo (in the traditional sense) and *arga* craft modes have been noted in Feiglstofer (2019: 44). These include the production process, specifically the layering of crushed material; the use of similar tools such as wood or iron sticks, stone rollers and whetstones for crushing, compressing, smoothing, and burnishing; and the oiling and regular polishing to achieve a glossy finish. Both techniques achieve a waterproof surface, in part resulting from the burnishing and polishing to reduce surface porosity, but possibly also as a result of hydraulic bind. In the mechanics of their binders lies the main difference, with terrazzo requiring lime mortar and a weak pozzolanic reaction from the ceramic content, and *arga* possibly containing the components for achieving a hydraulic set integrally.[15]

The modern archaeological understanding of *opus signinum* matches Pliny the Elder's description of a lime mortar with a high addition of crushed ceramics providing a hydraulic set (Bourguignon and Carbonara 2013) (Fig. 11-16). Vitruvius was clearly aware of this technology (Rowland and Howe 2001), which closely matches his description of the *nucleus*, a screed of crushed ceramics mixed with lime which formed the upper layer of a floor or road construction, above the *rudus* (broken stone and brick in a lime cement), and *statumen* (large, unbound aggregate). However, whilst some hydraulic set would likely have been necessary to enable Vitruvian *opus signinum* to function as he specified, there is no mention of added ceramics. Some floors showing the basic



Fig. 11-15 1st century CE Roman aqueduct at Italica made from *opus signinum* according to hydraulic lime mortar recipe specified by Vitruvius.
Source: Fernando Delgado Béjar / Wikimedia Commons (2005), CC BY-SA 3.0.

14 In comparison, no specific quality of clay is specified for *arga* use, so various locally-available clays can be used for this purpose (Feiglstorfer 2019: 183). Whether or not the clay content produces some form of weak hydraulic set remains an open question.

15 The proof of a hydraulic effect within the *arga* as a property according to which *arga* may be technically determined remains a task for future investigation.



Fig. 11-16 *Opus Signinum* layer in modern archaeological understanding (above layer of tufa) taken from the Roman aqueduct from Mons to Frejus (1st century CE).
Source: Michel Royon / Wikimedia Commons (2007), CC BY-SA 2.5.

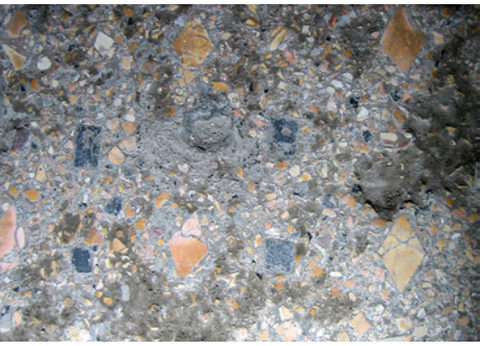


Fig. 11-17 Roman terrazzo floor at Herculaneum.
Source: AlMare / Wikimedia Commons (2002), CC BY-SA 2.5.

characteristics of Pliniean or Vitruvian *opus signinum* were polished to form surfaces akin to terrazzo (Fig. 11-17). In some mosaic floors, a finer *sopranucleus* can be identified holding tiles in place (Moore 1968), and Vitruvius specified that exposed mortar should be saturated with olive oil residue every year to protect it from frost,[16] an oil-treatment, which we also know from *arga* roofs (Feiglstorfer 2019: 165). The layering and the treatment of these ancient techniques thus set a clear precedent for the later medieval techniques.

Today the term terrazzo is used to describe any floor with pieces of stone bonded in cement (Fig. 11-18). In an archaeological context it has been adopted to describe floors as far back as the Neolithic, especially in Western Asia. In a more general context, terrazzo is used to describe any floor, or even any pattern, which bears a visual resemblance to the traditional surfaces (Porro 2018). A guild of terrazzo craftspeople formed as early as 1586 and, today, Venetian terrazzo craft is semi-regulated, with general rules for the construction of terrazzo with cement, lime, or mixed binder.[17] Similarly, *arga* construction was embedded in a guild structure in Tibet until 1959, while the *zhépön* (*gzhas dpon*) is still responsible for supervising the *arga*-ramming process in the present day. Guild structures were present in Roman times, and *opus signinum* is likely to have fallen under the *collegia fabrum*, however the precise role of Roman *collegia* is a matter of ongoing debate, with some arguing that it was a form of top-down social structure rather than a "self-regulating" standardisation of occupational procedures.[18]

However, the term terrazzo is not protected, and is arguably more associated with its pattern and with modern construction forms than with the traditional technique. While terrazzo simply as a term is widely known in Europe and beyond, the term *arga* remained in Tibetan cultural regions. While terrazzo became popularly used and industrially processed, *arga* remained as a construction technique for the Tibetan elite and still has not found its way into industrial prefabricated production.

Tracing the development of these techniques and terminologies reveals a complex pattern of local tradition, wider appropriation, and partial standardisation. The relationship between materials and culture is dependent on economic and social contexts, as well as being subject to historical revision. Dominant cultures integrated local techniques into their construction industry and reduced them to reproducible components, which were then exported across

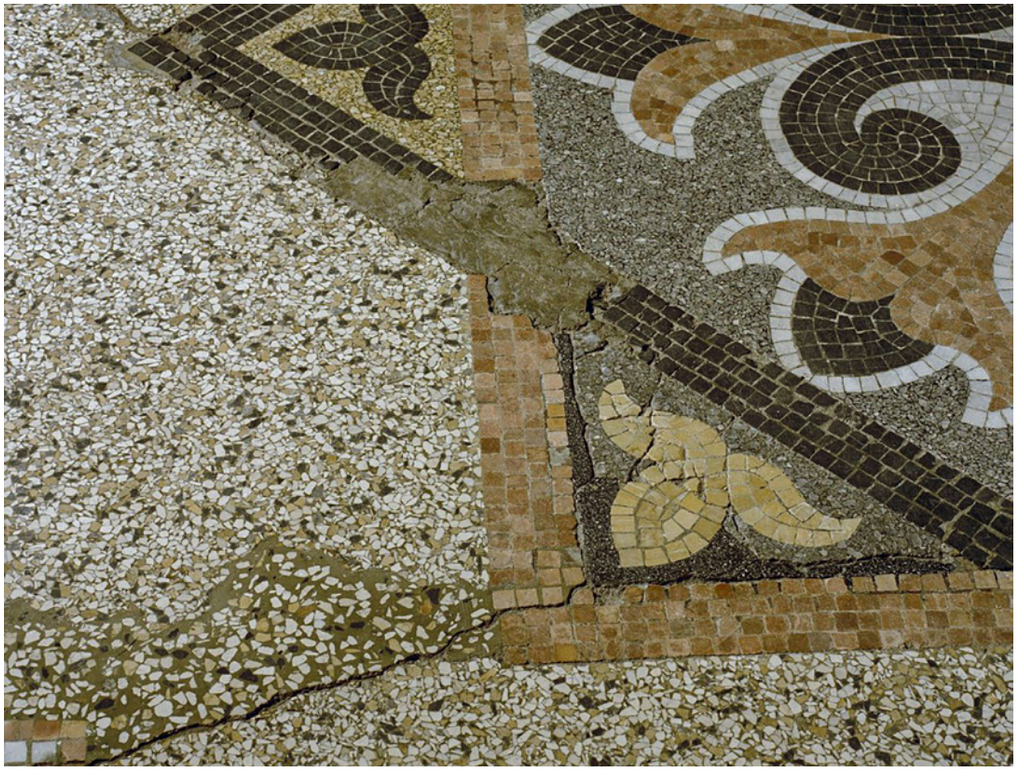


Fig. 11-18 Modern terrazzo floor in the 19th century Oudenbosch Basilica.
Source: Rijksdienst voor het Cultureel Erfgoed / Wikimedia Commons (1994), CC BY-SA 4.0.

16 Book VII, Chapter 1: *uti autem inter coagmenta materies ab gelicidiis ne laboret, fractibus quotannis ante hiemem saturetur. ita non patietur in se recipere gelicidii pruinam.* Online: https://penelope.uchicago.edu/Thayer/L/Roman/Texts/Vitruvius/7*.html#1.6 (accessed: 19.12.2021).

17 The Venetian Terrazzo Flooring Consortium acts as a modern day guild for the safeguarding of the image and reputation of terrazzo. Online: https://www.consorzioilterrazzoallaveneziana.it/en/realizzazione-pavimenti-alla-veneziana/ (accessed: 19.12.2021).

18 Online: https://brill.com/view/book/9789004331686/B9789004331686_010.xml (accessed: 19.12.2021).

their territory and left to distil into further vernacular formats when dominance waned. In both Roman and Tibetan imperial periods, knowledge of terrazzo and *arga* could easily be disseminated over long distances. These were in turn incorporated by larger industries when new superregional powers appeared. The original meaning and current usage of the terms associated with the craft modes outlined here has shifted with time, as these patterns developed. Their original use has now been superseded by a retrospective archaeological nomenclature.

In the case of terrazzo, the modern appropriation involves the use of the term to describe both similar historic techniques in an archaeological context and similar contemporary techniques in an architectural context. The traditional technique has become eponymous for a distinctive quality rather than a regulated process. A kind of standardisation results out of an intrinsic process triggered by a community, and not by an external, institutionally driven process. In the case of *arga*, it is interesting to note that the word does not have a Tibetan origin and may be associated with the introduction of certain building techniques. Perhaps a similar pattern of shifting use and meaning is at play. So, could the use of *arga* or "*arga*-like" techniques beyond the Tibetan sphere help activate new localisations of sustainable building crafts or conservation activities? Or could such approaches amount to a form of reductionism that could ultimately endanger the traditional craft? The relevance and legitimacy of the terminology needs to be carefully weighed up. Placing a technique within a material cultural framework demands an examination of the boundaries appropriate to its use, and an appraisal of the relationship between the workers, the processes, and the qualities involved.

Summary in relation to *arga*

This brief synopsis of the relationship between *Opus Signinum* and terrazzo, and their perception in different contexts, reveals that the relationship between vernacular and elite realms, and an understanding of standardised construction as complimentary aspects of the evolution of traditional craft, is not unique to *arga*. Rather, it likely reflects incremental societal change within and upon regions of economic growth in interaction with underlying cultural practices. This process enriches and entangles associated terminologies and can be seen as an essential part of emerging material culture.

FLAT EARTH ROOFS IN THE EASTERN MEDITERRANEAN

The previous section described the evolution of a construction form and the boundaries of terminology associated with its use, exploring variations across time. This section explores the variation of a construction form according to spatial factors and is less dependent on chronology. Using flat earth roofs in the Eastern Mediterranean as a case study, it will examine the material and environmental context of local variations to a historically common technique.

Historical background and socioenvironmental context

Unfired clay has a long history of use as a waterproofing material, initially being employed to line cisterns, reservoirs, and canals. Archaeological evidence of this dates back to the Neolithic period, from the Levant to Mesoamerica (O'Brien et al. 1980; Mays et al. 2013). In its earliest form it is likely to have been inspired by or augmented from natural hydrological systems, for example in the practice of digging cisterns directly into suitable clay (Wright 1970; Warren 1998: 175). From these beginnings, flat earth roofs developed as a vernacular response to arid and semi-arid climates across the world (Minke 2012: 117). When used to form roofs, *arga* falls into this category too, while other earthen flat roof typologies that use only clay rather than an additional layer of *arga* are also well documented in the Himalayas (Feiglstorfer 2019: 144; 2018).

Structurally, the *arga* roof consists of two working processes, first the making of a conventional earth roof and secondly the adding of *arga* and its connection to the earthen roof below. The basic principle of flat earth roofs is in every instance essentially comparable. Compacted layers of well bonded, fine-grained material form a barrier against precipitation, which must be regularly maintained, in particular following heavy rainfall. Well publicised examples of enduring vernacular usage include the dwellings of the Pueblo in New Mexico, USA and the Dogon in Mali (e.g., Minke 2012), but historical use of flat earth roofs has been documented in suitable climatic regions right across the world. The base material and additives, the construction form, the associated building culture, the durability, and the culture and mode of maintenance vary broadly across geographic regions. The extent to which these vernacular techniques perse-

vere, or to which they are dying out or are being studied as "lost" techniques, also varies. However, there is a common theme of decline in response to the arrival of modern building materials, followed by a recent renaissance in interest due to heritage and ecological principles (Michette 2020; Philokyprou 2021).

The abundance of archaeological remains and rich level of study make the Eastern Mediterranean a suitable region for exploring the material culture(s) of flat earth roofs. The intimate relationship between climate and building form can be seen in a high degree of variation within this geographically diverse region. Different compositions of flat and gabled roofs can be related to traditional dwelling typologies in different climatic regions. Within Turkey, however variety is evident even within individual regions depending on the local severity of rain (Özdeniz 1991). In Lebanon, which can be divided into five local climate zones, flat-earth roofs make up the traditional roofing form of three of these (El-Khoury 1975). Whilst dwelling typologies themselves are notably different in the Beqaa valley, the Akkar plain, and the Mount Lebanon range, the use of a common roofing technique in these areas of relatively lower rainfall is notable, compared to the gabled roofs used in coastal regions. Starting in the 19th century, the gradual replacement of original flat roofs in the richer communities of the Mount Lebanon range with gabled roofs provides an example of earth construction being associated with poverty. Flat earth roofs remained common in farming communities until relatively recently. This reflects a socioeconomic dimension, with earthen roofs widely associated with the poor, the farmers, and "the vernacular", while the exclusivity of particular materials is reflected by their attractive surfaces, their form, or their mode of processing, whose significance is understood across all social classes.

The existence of *arga* enables an argument to be levelled against the hypothesis that flat roofs need to be made simply of earth. This was already true in pre-modern times, long before bituminous materials took over their main role in providing water insulation. Nevertheless, the Eastern Mediterranean examples given above reflect a global adjustment of vernacular building techniques to natural environmental circumstances, one of those being the climate. A limited amount of rain is a clear precondition for earthen and *arga* flat roofs, reflecting an environment with sparse vegetation and thus insufficient capacity for building wooden roof trusses, which is the case in the arid zones of Himalayan and Tibetan regions.

In several towns and villages in the southern Levant (modern day Jordan), derelict buildings with heavily deteriorated earth roofs can still be seen today, sitting in between modern concrete buildings. In parts of Wadi Musa, enough historic fabric remains to indicate the pre-modern grain of the town (Fig. 11-19).

Owners occasionally still use these buildings for housing animals, but the roofs are increasingly collapsing due lack of maintenance following rainfall.[19] Beyond retaining the original footprint of some structures, there is no form of conservation practice for these tradi-

19 Conversation with Dr Moayad Alrwajfah and local community.



Fig. 11-19 Small conglomerates of flat earth roofed structures remain in towns like Wadi Musa, Jordan (left), but most have fallen into disuse and disrepair (centre) because of lack of maintenance and heavy water damage to their roofs (right).
Source: Moayad Alrwajfah (2022).

tional structures. In the Tibetan cultural area, local methods for the conservation of *arga* roofs are diverse. In many parts of Ladakh, for example, remaining *arga* roofs are mainly not repaired. They crack into small pieces and vanish over time. In some places, such as Lamayuru monastery, *arga* is still maintained and pride is taken in its precious appearance. In Central Ladakh also, *arga* roofs are generally well-maintained and cracks are usually repaired. Similar to earth roofs, damaged parts are replaced with fresh clay or *arga*, which has clear benefits in terms of ecological sustainability.

Although certain techniques—such as *arga*—can be associated with elite buildings, the widespread use of flat earth roofs in dwellings and their resulting effect in defining the character of urban roofscapes and public spaces are a notable aspect of these architectural features. In many regions, flat-earth roofs played an important role in extending the private space of the house into a semi-public sphere, which brings in important social aspects of flat roofs.

In some Himalayan regions, such as Labrang (Kinnaur) and Leh (Ladakh), both in India, village layout is defined by buildings built densely beside and behind each other (Feiglstorfer 2022: 272). In these hilly regions, roof terraces have a step-like appearance which stretches along the whole village. Flat roofs are variously accessible by ladder or narrow stone steps and are used for storage, sleeping, drying fruit, and sorting grain during summer (El-Khoury 1975; Jäger 2012). In mountainous areas, villages built into the hillside merge landscape terracing with the roofscape, creating a dynamic public space for social interaction. A tradition of public storytelling persisted until the early 20th century in the Dodecanese (Dawkins 1942), for example. Communities would gather together on the flat earth roofs of their village to talk and play, but also to listen to local or invited storytellers telling tales that might last several evenings.

On the flat roofs of Tibetan farmhouses, apricots are dried and processed, wood is kept, and hay is stored as winter fodder. On the flat roofs of Tibetan monasteries, one may see monks praying, chatting or taking rest. While no doubt related to a range of social factors, the decline of flat earth roof building traditions corresponds with the emergence of relatively fragile and inaccessible red-tiled roofs.

As is typical across many vernacular settlements in Tibetan and Himalayan regions, the material, the built form, and the culture of the flat earth roof were strongly intertwined.

Material properties, craft modes, and conservation approaches

As outlined above, the basic principle of flat earth roof construction is similar across the world, and certainly within the region from southern Turkey to the Levant being discussed here. Thick layers of clay (up to 0.25 m) were compressed or plastered upon a bedding of reed, straw or lathes laid on a timber substructure. Where documented, the type of timber corresponds to locally available resources (El-Khoury 1975; Isler 2013). The type of clay is less well documented, but is sometimes characterised as being white, which suggests a high calcite content or the use of additives (El-Khoury 1975). Suitable base material in parts of the Levant could include a marl known locally as *huwwar*. A variety of documented additives included straw, ash, and pebbles (Philokyprou 2021). These probably correspond to different demands on specific roof (or floor) layers, such as strength or stability. Additives to improve the water resilience of roof layers, such as chalk, are also known, particularly in regions with inadequate base material.

Although frequent mention is made of the need to perform regular maintenance of flat earth roofs, the paucity of enduring techniques and lack of (accessible) cultural references mean that little is known about specific modes of maintenance. In the Levant, large rolling stones, known as *madafeh* in Arabic (Jäger 2012), were kept permanently on the roof (Fig. 11-20). These could be used to re-compress flocculated earth after heavy rainfall. Roof-rollers have been uncovered in archaeological stratum dating back to the Hellenistic and Iron Age periods (e.g., Gibson 1994). The use of large rolling stones is seen in *arga* production as well, where they are employed to compress and level the first layer (Feiglstorfer 2019: 58).

In those areas where flat earth roof construction has been more closely studied, some further details are available. In Cyprus, for example, a distinction is made between argillaceous soil used for adobe bricks, and calcareous soil used for clay plaster in Neolithic and Late Bronze Age settlements, although both techniques benefited from the calcite rich soil of the local environment (Philokyprou 2021). The more calcareous clay plaster, similar to the calcerous *bakar in* Tibet (see above), was well suited to protecting the load-bearing el-

Fig. 11-20 Photo of Palmyra, Syria probably dating from early-mid 20th century showing stone roof-rollers stored on flat earth roofs.
Source: unknown.



ements from moisture. Roof (and floor) constructions were achieved by laying successive layers from coarse to fine grained plaster. In one example of a roof, three successive layers can be identified, each left to dry before the subsequent layer was placed on top. In Anatolia, clay with a high salt content was used in the sealing layer. The hygroscopicity caused the clay to stay moist, and therefore impermeable, for longer. Maintenance was performed by sprinkling salt on the roof (Dalokay 1969, cited in Minke 2012). The use of salt is known from various places, for example in Turkey and Iran, but is dependent on its local availability. In Tibet, salt was transported by yaks along trade routes over weeks or months and was considered to be a precious good, so earth roofs were mainly made without applying this scarce material.

As the previous section demonstrated with the term *arga*, delving deeper into the terminology of a building material can reveal cultural associations, values, and immaterial dimensions. With this in mind, the Levantine Arabic term *huwwar* deserves a little closer attention. Similarly to *arga* it is a hypernym, used to describe both a calcareous clay deposit (marl) and a plaster made from earth mixed with the same material (Rollefson 1990; Wright 2009). There are clear indications of Iron Age buildings being built into natural *huwwar* deposits to assist moisture control, and it is likely that this practice started much earlier (Wright 1970). *Huwwar* as a manufactured plaster has been dated to as early as 5,000 BCE (Rollefson 1996). There are indications that its use as a plaster was intended to protect buildings from rainwater and seepage, and it has been found in roof layers as well as floors. While its use was prevalent before gypsum and lime plasters became commonplace, the local practice of using *huwwar* continued into the late Roman period; it was identified at relatively few sites surveyed in the *Limes Arabicus* project (Parker and Betlyon 2006: 173). The precise use of the term, particularly in an international context, demands attention. In English literature by Arab academics, it most frequently appears to be used to refer to natural deposits, ranging from white to yellowish and brownish, and sometimes additionally translated as marl or soft limestone. The origin of use to describe archaeological plaster is unclear and might be a result of local craftspeople or geologists working at international digs. It has been noted that there is a great variation of use even in the southern Levant (Rollefson 1990). A closer examination of the material properties of *huwwar* and its precise modes of use could be a first step towards reintroducing the material into local building crafts and archaeological/architectural conservation. The resemblance with *arga*, both in the base materiality and the double-use of the term, suggests potential for synergistic research into these techniques.

Summary in relation to *arga*

Reflecting this discussion of earth roofs in the Eastern Mediterranean back to the earlier discussion of *arga* reveals that the Himalayan craft modes are themselves situated within a wider distribution of local variations. These variations correspond to material availability and climatic factors. High levels of precipitation form a limit to the extent of earth roofs, but within that limit the general principles of construction layers and techniques are very similar. Similarities extend even to the use of common tools and cultural practices around the use of roofscapes.

CYCLIC MAINTENANCE OF *BANCO* ARCHITECTURE IN WEST AFRICA

Whilst the flat earth roofs of the Eastern Mediterranean represent an extinct material culture, this section presents the living vernacular tradition of adobe construction, exemplarily in West Africa. There are commonalities with *arga* to be found in the strong link between construction material and cultural practices, and also in the role that globalising forces play in the contemporary understanding of heritage.

Historical background, social context, and risks to the technique

Vernacular earth construction techniques endure in some rural parts of West Africa, e.g., amongst the Dogon villages of Mali or the Hausa villages of northern Nigeria and southern Niger (Nwanodi 1989; Minke 2012). Flat earth roofs in these areas follow the same principles as elsewhere, with their own regional additives to improve performance, such as locust bean gum, and their own modes of maintenance. General maintenance, including the re-rendering of all rain exposed surfaces, was traditionally performed annually and in balance with the demands of material, environment, and society. The Hausa building calendar, for example, is determined by the availability of water for mixing earth and the

demands of the agricultural season on labour supply (Nwanodi 1989). In areas with high rural-urban[20] migration, this led to the development of specialised labour forces, such as masons, and ultimately the formation of guilds, such as the *barey-ton* in Djenné (Marchand 2014). In the contemporary setting of larger towns, several forces now coalesce to threaten the survival of this material culture.

The UNESCO world heritage at Djenné, Mali, offers a unique perspective on this shifting dynamic due to the juxtaposition of demands and expectations placed by different groups—worshippers, tourists, regional and international authorities, academics—upon its signature monument, the Great Mosque, compared to the rest of the town, which is included in the listing. The first Great Mosque of Djenné is likely to have been replastered every year between its construction in the 13th or 14th century and 1818 (Bourgeois 1987). Maintenance ceased as a result of a political power shift, and over the following century the mosque fell into ruin. The replastering of the current, third, Great Mosque (constructed 1906–1907) is once again an annual ceremony which involves the entire community. Known as the *crépissage*, it is an important cultural event tied up with religion and social identity (Marchand 2013) (Fig. 11-21). It has also gained significant international exposure. Whilst this showcase event is still led by local masons, overall there is now a complex network of local, national, and international actors and stakeholders affecting the built environment.

Arga processing is also connected to the efforts of an organised working group. Like in Djenné, a particular social order and organisation is needed to perform the making of an *arga* roof. Here it is expressed, for example, in working songs and by coordinated movements during ramming. In contrast to the act of replastering at Djenné, however, which is connected to one particular building and is known world-wide, the act of ramming *arga* is related to a great number of buildings, but is not well known beyond the Tibetan cultural area. *Arga* roofing and flooring is limited to certain parts of the building, which are commonly difficult to access for foreigners, particularly during construction. By contrast, in Djenné it concerns the central spot in the town, which is accessible from public spaces and thus attracts a large number of people. The act of making, on the other hand, is in both cases restricted to locals, to those who are part of the community and are familiar with the associated rites and meanings. The outsiders who visit Djenné each year are observers, not participants.

Social context

The masonic profession, represented by the *barey-ton* guild, has been a feature of Djenné for centuries. Masons inherit a vast knowledge on earth construction, known as *banco*, passed down orally and haptically from one generation to the next. Traditionally, each family in Djenné had a designated mason, part of a devolved system of responsibility for maintenance of the urban fabric (Brunet-Jailly and Scherrer 2018). As the economy has transitioned from its traditional form to being increasingly cash and aid based, masonry has evolved into a monetised profession (Marchand 2014). Parallels can be found in Tibetan society until 1959, where knowledge of masonry, plastering, and *arga* making was transferred within guilds. Even today, these crafts are closely related to each other. The energy itself to conduct the work was contributed by working people, in earlier days mainly by women, who were responsible for the plastering work. Families contributed their time and working power to serve the monasteries. Similar to Djenné, economic change triggered by a shift from local to globalised influences (even in remote areas), and political changes from 1959 onwards, led *arga* ramming to become an increasingly monetised profession. This led to the erosion of the strong interrelation be-

20 In the present context, "urban" refers to any densely-settled area containing a significant non-agricultural population, such as Leh in Ladakh and Lhasa in historical Tibet.



Fig. 11-21 Annual *crépissage* of the Great Mosque at Djenné.
Source: Sophie Ravier / UN Photo (2015), CC BY-NC-SA 2.0.

tween families and monasteries, changed the words of the working songs from traditional to popular (Feiglstorfer 2016), and changed *arga* ramming from being mainly a female-led process to a gender-mixed activity.

In Djenné, recent developments have placed increasing pressure on individual masons, who often lack the education and experience needed to run their craft work as businesses. Young men are less inclined to take up or persist with the profession. Ultimately, this is leading to the erosion of traditional skills such as using correct *banco* mixing proportions. Away from the Great Mosque, Djenné has witnessed a shift towards modern construction materials and away from cyclical maintenance patterns. Although brick and concrete are considerably more expensive than adobe, and less well suited to the environment, their perceived permanence and opulence has resulted in increased use (Brunet-Jailly and Scherrer 2018). Starting in the 1980s, many remaining *banco* walls were tiled on the outside in an attempt to reduce maintenance requirements (Groot and Maiga 1985). This is likely to be having a deteriorative effect on the underlying masonry. These developments have caused tension with UNESCO, who in 2016 placed Djenné on the endangered heritage list. Similarly in Tibet, where the introduction of plastic sheets into *arga* roofs was meant as a technical modernisation to reduce maintenance, it actually increases maintenance due to the prevention of vapor diffusion, which means humidity is collected inside the roof construction, resulting in the cracking of the *arga* surface.

Cultural idiosyncrasies and conservation approaches

In Djenné, UNESCO projects have also caused tension with the local communities. A restoration of the mosque, coordinated by UNESCO and the Aga Khan Trust for Culture, resulted in a riot in 2006 due to local perceptions that the work was unauthorised (Brunet-Jailly and Scherrer 2018). Ultimately, the project removed many layers of plaster that had been applied over the years. This was deemed necessary for structural reasons, but there was a striking discord between the aim of the "western" institutions to restore the Mosque to its original 1907 appearance, and the opinion of local masons. The latter is summed up by master mason Konbaba Tennepo: "The Djenné Mosque is not a little thing; it's like gold to us! Before, when you went to Djenné, the Mosque seemed very big. Now it looks smaller. It's changed. If you asked us, we would say that they did it in a European way. It's no longer the African way!" (Marchand 2014). This feeds into a wider narrative of conflicted ownership, which dates back to the construction of the mosque itself and, in the context of UNESCO driven tourism and confused guidance on architectural conservation, now extends across the town (Bourgeois 1987; Brunet-Jailly and Scherrer 2018). The criticism levelled at international actors is that they have concentrated on finding the easiest way to "get the job done", without investing in the local infrastructure (Joy 2011).

The lesson from Djenné is complicated. On the one hand, the annual replastering of the Great Mosque presents a vibrant material culture, a powerful example of how environment, natural materials, and construction technology can crystallise into social cohesion and cultural heritage. On the other hand, this conceals an economy which has rapidly distorted out of balance with local structures. Elsewhere in the city, the demands of a UNESCO world heritage site and the demands of the local community are in great tension. The *crépissage* serves to plastering over the cracks somewhat, both literally and metaphorically. Suggestions for how to resolve these issues have included calls to focus on restoring the function of enabling spaces, such as youth centres, rather than the built fabric itself (Joy 2011). This could dilute touristic impact by promoting intangible heritage and supporting civic pride. Other projects have focused on building literacy amongst masons to enable greater participation in business activities and local decision-making, as well as building capacity in earth construction for Malian architects and construction professionals (Brunet-Jailly and Scherrer 2018). Future changes to the economic framework also need to be considered. Tourist numbers have fallen dramatically due to terrorist activity and coronavirus, and the spectre of climate change looms large (Siriman and Wang 2021). Research which incentivises a more widespread re-emergence of *banco* may help re-energise the relevance of vernacular construction for the local economy (Labintan et al. 2019). Knowledge exchange between practitioners of *banco* and *arga* crafts has the potential to reveal common risks and opportunities, and provide support and inspiration to the communities engaging with them.

Reflections on *arga*

The social dimensions of building become particularly evident when the making or maintaining of structures is connected to the performance of common practices. Building maintenance as such has the potential to be conducted as a traditional practice, as we know from whitewashing in European and Tibetan areas (e.g., white washing as a preparation for the visit of a meaningful person, for instance the Dalai Lama's visit to the village of Tabo in Spiti in 2006), or the periodical maintenance of the Djenné mosque. Similarly in Tibet, the maintenance of *arga* roofs follows a particular routine, with each working step being clearly defined. Particular social hierarchies during the working process, led by a master craftsperson, shape the duties of the individual community members. Besides the guiding masters, most of the workers are laypeople, villagers and farmers. Taken together with the previous two examples, the commonalities between these material cultures extends beyond their technological and morphological response to broader socioeconomic, climatic, and material variations across time. In the examples held in comparison here, the continuation of practice, of social hierarchies and labour communities, and of prevailing value-systems all contribute to the preservation of the material culture and its associated built form.

CONCLUSION

The aim of this chapter was to extend the analysis of material cultures beyond cultural-geographic boundaries, adopting a material trans-cultural perspective in order to illuminate broader patterns in the relationship between building techniques and cultural practices. Three broad research topics guided this investigation: 1. How language and material characterisation influence each other; 2. the relationship between vernacular and standardised approaches to construction across geographic and cultural boundaries, and how they influence the emergence of representative aesthetics; and 3. the evolution of practice and labour community, and how their preservation can aid conservation or maintenance.

The first part of this chapter explored Tibetan *arga* roofs and floors from a material-cultural perspective. It provided an extensive overview of the social, procedural, and physical aspects of *arga* construction, which established a case for understanding *arga* as a material culture. Using the topics outlined above to frame this case:

1. As a hypernym, the term *arga* describes both a distinctive craft which sits at the top of a rich lexicon of associated materials, objects and practices, and also defines a particular set of material characteristics.

2. As a construction technique, it displays elements of vernacular building technology, such as the application of local knowledge to respond to environmental variation, and standardised building technology, in its manufacturing process. However, in its application of aesthetic principles it achieves a representative elite status.

3. As a cultural practice, *arga* construction reflects a highly developed interplay of social hierarchies, and geological and climatic circumstances. The cultural and geographic boundaries which determine this interplay have changed in response to regional and global dynamics, evidenced in recent co-operation between local and international stakeholders to improve conservation.

The second part of the chapter introduced three further craft traditions from other regions and examined these in contrast to *arga*. Each represents a form of earth or stone construction with its own set of cultural idiosyncrasies, but displaying distinct commonalities to *arga*. This established an argument for using a material trans-cultural approach to understanding these crafts within a wider spatio-temporal context. The main argument of this chapter is that this material trans-cultural perspective can improve the anthropological and scientific study of individual craft forms and thereby has the potential to inform conservation and learning by exchange.

The craft forms examined alongside *arga* were (1) *opus signinum* in the Roman and post-Roman territories; (2) flat earth roofs in the Eastern Mediterranean; and (3) the *banco* architecture of West Africa. Framing and comparing these distributed techniques within a material trans-cultural approach provides

some valuable insights. In summary, these can be grouped into two key findings.

Firstly, the use of geomaterials like stone and earth for constructing floors and roofs is characterised by both common global characteristics and distinct regional variations. Commonalities include the use of crushed, compressed, polished, calcareous material to achieve water-resistant layers; the use of similar tools and techniques to construct and maintain these layers, for example the employment of stone rollers, or the use of oils to polish surfaces; and the emergence of ceremonial practices to bind this craft into cultural norms and social hierarchies. These geographically dispersed commonalities suggest that the underlying craft modes in question are deeply rooted in human building culture. Variations correspond principally to local material resources, however there is an interplay between strongly vernacular craft modes which have evolved according to specific hyper-local circumstances, and standardisation as a consequence or reflection of regional or trans-regional economics. *Arga*, for example, superimposes a specialised and semi-standardised technique associated with high status on underlying elements of Himalayan vernacular variations, which are themselves part of the much wider mosaic of vernacular techniques defined by climate and material availability. Similar patterns can be observed in other geo-cultural spheres. The assimilation and spread of earth flooring through the Roman territories and their successors reflected a cumulative adaptation of local building craft into standardised technique. This resulted in complex layering of the vernacular (in the sense of hyper-local, functional) and the elite (in the sense of imposed, representative) that have persisted into the modern-day construction industry, for example with terrazzo.

Secondly, memetic practices, particularly in relation to maintenance, are a crucial aspect to keeping crushed stone and earth flooring techniques alive within a particular cultural realm. These are likely to emerge as vernacular responses to local environmental factors, such as the timing of cyclical maintenance of *banco* earth plaster surfaces in West Africa coinciding with seasonal changes. They can then evolve into elaborate terminological and social hierarchies which safeguard knowledge across generations and facilitate expansion into new territories. Social hierarchies often take the form of distinct masonic guilds, such as those that emerged to regulate the use of *banco*, terrazzo, and *arga*, but certain practices can be more broadly embedded in society and take on a ritual or ceremonial role, such as the ramming of *arga* or the annual *crépissage* of Djenné's Great Mosque. Such practices elevate the craft form beyond construction technique to cultural identifier or heritage. The rich lexicon of terms associated with *arga* provides an example of the strong role nomenclature can play in further reinforcing such cultural traits. The many different Tibetan words used for clay and to describe methods of processing clay reveal how deep-rooted the material is in Tibetan culture. The absence, or apparent absence, of terminological nuance and depth in relation to flat earth roof construction is symptomatic of the Eastern Mediterranean regions, where the practice has died out. Terminological drift and ambiguity, as witnessed in the usage of *opus signinum*, terrazzo and *huwwar*, is an interesting phenomenon that probably relates to the transfer of those practices across time and space and the cessation of their vernacular usage, a development that may also have occurred with *arga*.

Focused knowledge exchange between those involved in the research and practice of these dispersed crafts should be encouraged. This would not only promote their respective material cultures and explore solutions for common risks and challenges, but could also provide an opportunity for interpreting their use more widely. This material trans-cultural approach could identify opportunities for extending these practices beyond the conservation of specific sets of traditional buildings within defined cultural niches into more widely applicable solutions for the historic built environment. These might include sharing indigenous knowledge of material selection processes, identifying commonly available additives for improving material properties, or even transplanting the use of geo-materials for forming water resistant surfaces into different contexts (e.g., Michette 2017).

Ongoing research could for example apply the material trans-cultural approach to the traditional plaster and earth floors of the British Isles mentioned in the introduction to the second part of this chapter, helping inform conservation and potentially even identify opportunities for reintroducing earth and plaster flooring techniques more widely. In order to build on the findings presented here, such research should explore the relationships between (1) construction terminology and material characterisation; (2) the emergence of vernacular techniques and the spread of standardised techniques; (3) the conservation of

tangible and intangible heritage (in the form of cultural practices associated with the examined building craft).

GLOSSARY ON A VARIETY OF CLAYS AND THEIR USE IN TIBET

- *Dambag* (*'dam bag*) means clay: the word *'dam* refers to humid earth, while the place name "Damzhung" signifies a vast area of moist land suitable for grazing animals (see Feiglstorfer et al. 2024)

- *Dagchen* (*'dag chen*): the word *dag* is an abbreviation for *'dam bag*. It is used to refer to clay with a high water content.

- *Chamdag* (*lcam 'dag*): the word *cham* describes the secondary beam of a wooden roof construction, the substructure on which *delma* is placed and upon which clay is then poured. This substructure gives its name to the type of clay known as *chamdag*, which is the first layer of clay laid during roof construction and fills the spaces between the beams on top of the walls (Interview Tashi Drolag).

- *Migdag* (*mig 'dag*): the word *mig* means eye or hole and the term *migdag* refers to a type of clay used to fill the holes between the bricks or stones in a wall. It is applied from beside the wall, not from the top. According to Tsering Drongshar, clay is mixed with water and small rolls of *migdag* are formed according to the size of the hole to be filled.

- *Singsa* (*sing sa*): this word describes clay made from slightly humid earth. Contrary to *migdag*, spaces between the stones in a wall are filled with *singsa* from the top, before the next layer of stones is placed on top. After filling holes with this kind of clay, small stones (*leb 'jags*) are pressed and knocked into the clay to neatly fill any gaps.

- *Saböl* (*sa 'bol*): this term describes clay mortar made with the addition of a little water, which is smeared in small quantities on top of a layer of stones before the next layer of stones is placed on top. According to Tsering Drongshar, this type of clay is also used for earthen roofs and on top of stone walls. Seen from above, the large stones are in the middle of the wall surrounded by smaller stones towards the edges, with a type of clay called *jabdag* (*bcab 'dag*) in between (Interview Lama Norbu 2021).

- *Thogdag* (*thog 'dag*): describes an upper layer of clay, which is finally covered with *saru gampo* (*sa ru skam po*). The term *sa ru* describes the clay and *skam po* meaning dry, refers to loosely spreading common dry earth on top of the *thogdag*.

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TRANSLATION

Tsering Drongshar who was part of the project “Crafts and craft traditions in Tibetan Architecture” conducted translations from Tibetan into German. He is Tibetan by origin where he spent the first 20 years of his life, acted as monk in Tibetan monasteries and studied Buddhist philosophy.

INTERVIEWEES

Interview with Rinzin Gyalpo, master mason from Tibet. Feiglstorfer got to know him during field research in 2019 at Drag Yerpa where he was about coordinating the building of a monks' residence. Several interviews with him were conducted via telephone by Tsering Drongshar in 2021.

Interview with Lama Norbu from Kongar Chöde Monastery in Lhoka was conducted via telephone by Tsering Drongshar in September 2021.

Interview with Tashi Drolag, the scholar of the master and book author Chö Phuntsog (see in the bibliography) was conducted via telephone by Tsering Drongshar in September 2021.

XII

Material Mimesis and Craft Simulation: Textile Depictions and Questions of Trans-mediality in early Western Tibetan Buddhist Temples

Christiane Kalantari

Name: Christiane Kalantari
Designation: Project Leader and Researcher
Affiliation (Institute): Austrian Academy of Sciences (Institute for Social Anthropology)

Biography

Christiane Kalantari
is the Project Leader of the project "The Buddhist Sites of Khartse, Western Tibet" (funded by the FWF/Austrian Science Fund, PAT 1442524; duration: 2025–2029) and is a Research Collaborator in the interdisciplinary research project *The Scientific Tibet Legacy of Peter Aufschnaiter*, directed by Christian Jahoda (Austrian Science Fund—FWF P35249). She studied art history and Tibetology at the University of Vienna. In 2008, she completed (with distinction) her PhD in art history at the University of Vienna: *Celestial architecture: Donor depictions in the spatial iconography of the Alchi Dukhang, Ladakh*. Her research interests include: historical, visual, iconographic and theoretical investigations of the history of Western Tibetan art and culture (11–18th centuries); cross-cultural dimensions of Tibetan art and material culture; mobility of artists and objects; representations of power and devotion in Buddhist art; the evolution of visual narratives and the agency of women; art history as cultural history, and methodology. Recent major publications include: *Early West Tibetan Buddhist Monuments: Architecture, Art, History and Texts* (Austrian Academy of Sciences Press, 2021).

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INTRODUCTION

Painted and resist-dyed Indian cottons, shimmering Persian silks, vibrant gem-set jewellery, multi-coloured inlaid metalwork, and intricate woodcarvings—such highly valued material culture created by specialised artisans from India and Kashmir as well as from the Islamic lands of Central Asia reached Western Tibet through trade and pilgrimage, itinerant artists, and monks. They were imported directly or received indirectly via artists from Kashmir and Nepal, who were involved in the design and decoration of temples newly founded by the Buddhist elite in Western Tibet from the end of the 10th century onwards.[1] These highly valued objects stimulated the evocation of materials in other media, inspired new creations and gave impetus for the emergence of a distinctive Western Tibetan artistic tradition. The focus of this chapter is hence on the interrelations between material and visual culture, exploring in particular the places of textiles and metalwork at the intersection of various media and materials, traditionally assigned to different groups within the so-called craft traditions, or tool manufacture.[2]

The primary goal here is to examine the paintings in these early temples as source of information for the study of material culture with respect to local craft traditions, and to the trans-regional and international trade in prestigious objects. The chapter focuses on the various values of crafted objects, in particular of textiles, in early western Tibetan Buddhist culture. It shows how these objects had not only monetary and symbolic meanings, but reflect also the functions and uses of the temples, as well as the needs of donors and the community. In a second step the relations between material culture and visual culture are explored. Exemplary here are the multifaceted ceiling paintings of traditional buildings in Western Tibet, in particular the earliest sacred space of Tabo monastery, built around 1000 CE and related mobile artworks.

Although the ceiling paintings of early Buddhist temples were created with the utmost care and are technically as complex as murals, they were long neglected in art historical studies, having been regarded as purely decorative marginalia or imitations of canopies. This, once again, raises questions of the limitations of "Western" art-historical approaches in studies of Tibetology, characterised by an imposed hierarchisation in the distinction between genres such as figurative art and decorative art, to which often lesser creative power



Fig. 12-1 Replica of Khorchag "Silver Brothers", Western Tibet, 16th century, Pritzker collection.
Source: Khoklov & Laurent (2020: Fig. 1).

was attributed. This chapter attempts to transcend these facile oppositions.[3]

Very little written information exists on the identity and status of the artists and artisans who produced devotional images in pre-modern Tibet, commonly referred to as "those who make images of gods" (*lha bzo ba*). An exception are the inscriptions on two splendid metal statues with extensive metal inlay to create lavish decoration that mimics Ming Chinese silks. One of them is found on the replica (Fig. 12-1 and Fig. 12-2) of the Khorchag Jowo (a monumental altarpiece in the Jokhang,



Fig. 12-2 Sutra cover, Ming Dynasty silk with alternating rows of peonies with characteristic divided leaves and lotus flowers, 16th century.
Source: Metropolitan Museum of Art (MET, NY, access. nr. 2011.221.27), Purchase, Friends of Asian Art Gifts, in honor of James C.Y. Watt (2011).

1 The monasteries patronised in Western Tibet from the end of the 10th century onwards often acted as nodes of trade and exchange across cultures, areas and geographies, notably concerning the export of wool and gold, and the import of luxury items (Vitali 1996: 554). This not only cemented links between Western Tibet, India and Greater Kashmir, but also, from the 13th century onwards, with Buddhist kingdoms in China.

2 Intersections between materials and crafts have been long been overlooked in art historical studies of the early Buddhist temples of Tibet. Famous comparable examples from Europe include the royal workshop in Palermo during the 12th–13th century (for example the magnificent Cappella Palatina), where architecture, sculpture, paintings, and crafts such as cloths, ivories, goldsmith art and crystals were created and stimulated complex intersections in different media (see Andalaro 2004).

3 Art history in Austria is characterised by a combination of museology—with its reference to objects—and art historiography, which opens the discipline to issues of material culture and luxury art, resulting in a further expansion of research interests into trans-cultural and trans-medial studies. The most prominent proponent of this approach was the art historian Alois Riegl, (1858–1905), who from 1885 onwards was head of the textile collection of the Museum of Applied Art (formerly the Museum of Art and Industry), Vienna.

Purang; cf. Gyalpo et al. 2015; Gyalpo, Jahoda, Kalantari, Sutherland 2015, Fig. 147) in the Pritzker collection. A new translation by Khokhlov and Laurent (2020: 236) ascribes it to the artist Nam mkha' grags, a 16th-century master artist (*dpon mo che*) from Western Tibet.[4] Further textual evidence describes him as "a divine artisan" (*sprul pa'i lha bzo*) and "a great pandit of the arts of manufacture" (*bzo rig paṇ chen*). The authors further elaborate that the juxtaposition of these two terms, *bzo rig* and *paṇchen*, is unique in the artisanal context as it is usually reserved for renowned Buddhist scholars (Khokhlov and Laurent 2020: 247).[5] In general, mastery in the creation of cult images, including details of material culture and ornament, is not achieved only for art's sake. It is usually a prerequisite to represent the seat of a deity, and to transform the object into a focus of worship that "touches" the believer and serves as a visual aid in ritual practice and in meditation. Little is also known about artisanal activities related to cloth and weaving in pre-modern Tibet, but from early paintings as well as textual sources we can deduce that the manufacture of cloth and clothing not only had aesthetic dimensions but also spiritual significance in many different ways (Kalantari 2016c; Ahmed, this volume).[6] This issue provides a further focus of the current paper. Historical wall paintings provide important evidence concerning local sartorial traditions, which are analysed together with contemporary weaving traditions of woollen textiles in historical Western Tibet, Ngari province (China).

Furthermore, studies on material culture and craft traditions in pre-modern Western Tibetan temples invite us to rethink the cultural and religious boundaries that are commonly seen to separate Buddhist, Hindu, and Islamic realms.[7] While scholars have long been intrigued by the art of Alchi (Ladakh, ca. 1150–1200 CE, see Goepper and Poncar 1996: 243), with its resonances between elite culture portrayed in donor depictions evoking Islamicate luxury art and crafts simulated in the medium of religious imagery, analysis of transcultural dynamics and the processes of transfer between material culture and visual art in Tabo monastery (Spiti, Himachal Pradesh), one of the major early Western Tibetan royal foundations, is relatively new.

Textile aesthetics play a special role in these transmedial processes in the Buddhist sphere due to their function in shrine construction, ritual furnishings in temples, and meritorious donations, as well as the "accumulation of spiritual properties" (Schneider 2006: 204) attached to textiles and other objects based on these social interactions and rituals. The roles of precious cloths in international trade and as a medium of worldly power and religious prestige are additional factors shaping their impact on visual art. It is thus necessary to explore the contextual background of textiles, the place of cloth and clothes in Buddhist ritual and Tibetan society, as well as the concept and function of Buddhist art creation in general.[8] This chapter examines these various values of cloth and clothing, as well as the workshops responsible for the production of textile hangings and vestments of votive objects and deities derived from the precious donations offered to the Lhasa Jokhang. While avoiding an exclusive focus on textile media, it is nonetheless necessary to consider their enormous significance as intermediaries of artistic innovation in the pre-modern period.[9] Yet I will also look at the trans-medial and trans-material dynamics that connect painting, woodcarving, jewellery, and metal art. This is not limited to questions of the interchangeability of media, but rather investigates the contexts in which these materials are imitated across different material forms.

4 The second inscription is on a portrait of the great abbot of Mustang, *bSod nams lhun grub* (Philadelphia Museum of Art). The written evidence found on them also clarifies *Nam mkha' grags'* artistic involvement in the renovation of Khorchag Monastery in the year 1512 (Khokhlov and Laurent 2020: 247).

5 Artists in pre-modern Tibet may have held a status similar to that expressed in the Greek term *téchne* (skill), which expresses mastery of a range of applied arts and crafts.

6 See Schneider (2006) for a study of various aspects and values associated with cloth and clothing.

7 In recent decades, one can observe an increasing interest in craft traditions in Europe. The terms "material turn" and "re-materialisation" were coined to help in the study of processes of intermediality in medieval European art (Lehmann 2014: 21; see also Schulz 2016 and Dümpelmann, in press). Experts in Islamic art such as Flood (2019) have proposed thought-provoking methodological approaches to textile arts and trans-cultural and transmaterial dynamics (see also Schulz 2016). Flood (2009) also addresses trans-regional phenomena of material culture in Islamic art, including in pre-modern Ladakh. Goepper and Poncar (1996) was a pioneer in the study of textile representations in the Buddhist temples of Alchi, followed by Wandl (1997) and Linrothe (2015) for studies in the material culture and art of Kashmir. For studies on the interrelation between Tibetan art and Chinese material culture, see Linrothe (2004), and Laurent and Khokhlov (2021). *The Handbook of Material Culture* (Tilley et al. 2004) provides a helpful critical survey of the theories and concepts of material culture studies.

8 For analyses of the symbolism of the motifs of Western Tibetan ceiling textiles, see Goepper (1996) and Kalantari (2016).

9 Regarding interrelations between textiles and other media, Oleg Grabar notably drew on a statement by the 11th-century Persian poet and philosopher, Nasir Khusraw, author of the *Safarnameh* (The Book of Travels) in observing that much of the pre-modern world "acquired its aesthetic judgment through textiles" (Grabar 1976: 45, in Schulz 2016: 98).

HISTORICAL CONTEXT

The sacred Buddhist compound of Tabo is situated on the banks of the River Spiti, at an altitude of ca. 3,300 m, in the western Trans-Himalayas (Lahaul-Spiti district, Himachal Pradesh, India) (see Allinger and Kalantari 2012: Fig. 1). The history of this religious site is embedded in the development of the Western Tibetan kingdom of Ngari Khorsum (mNga' ri skor gsum). In western Tibet during the late 10th century, a period of Buddhist flourishment started when religious teachings intertwined with state ideology. Buddhism was given an important new role as the protector of the state, ruled by the sons of Kyide Nyimagön (sKyid lde Nyi ma mgon), Khorre ('Khor re) and Yeshe Ö (Ye shes 'od, 947–1024 CE), descendants of the Central Tibetan Yarlung dynasty, who consolidated a kingdom in Purang and Guge.

Tabo monastery — with the *gtsug lag khang* as the earliest sacred building — was founded in 996 by the Royal Lama Yeshe Ö, who played a significant role in the Buddhist transformation of the region. In a joint effort with the Great Translator Rinchen Zangpo (Rin chen bzang po, 958–1055 CE), he supported the translation of sacred texts from Sanskrit into Tibetan and sent promising students to Kashmir in his effort towards the establishment of a "pure" Mahāyāna doctrine in Western Tibet. He also endowed a range of artworks of the highest technical and intellectual sophistication.

Early paintings from the founding period of Tabo sacred compound survive only in the main temple (*gtsug lag khang*). According to inscriptional evidence, the programme can be dated to two phases from the late 10th to mid-11th century (Steinkellner and Luzanits 1999; Jahoda and Kalantari 2016). The main temple consists of three spaces on an east-west axis: the small (old) entrance hall (*sgo khang*), the assembly hall or *'du khang* and at the western end, an apse containing a *cella* (sanctum; *dri gtsang khang*) and an ambulatory (*skor lam*). The original wooden portal is no longer extant (see Allinger and Kalantari 2012: Fig. 29; and Fig. 12-16).[10]

The initial iconographic concept of the foundation phase was centred on an image of Vairocana in the sanctum. This programme was transformed and complemented in the mid-11th century with a free-standing statue of a four-fold Vairocana and 32 clay sculptures placed side by side along the walls. Together the latter represent the core assembly of a Vajradhātu mandala. The narratives running along the lowest zone in the *'du khang* and in the ambulatory are from the renovation phase as well. The programme of the ambulatory is dominated by some of the most sophisticated wall paintings representing Buddhas and Bodhisattvas of the fortunate aeon (*bhadrakalpa*).

In line with local building traditions found in all early temples in historical Western Tibet, the sacred structures of Tabo are built of mud bricks and rubble stone. Timber was used for the walls as timber lacing and also for the flat roof, which also included clay. The traditional floor covering consists of *arga* (Feiglstorfer 2011; Feiglstorfer and Michette, this volume). The ceiling is constructed of beams and rafters, which are set cross-wise, forming smaller ceiling segments on which wooden planks rest.

According to art historical reasoning, the ceiling paintings on these wooden boards in the *'du khang*, *cella* and ambulatory are attributed to the early decorative phase of the temple (there are no indications of ceiling paintings in the entrance hall). These highly sophisticated paintings replicate cloths, providing the impression that individually designed textile banners or lengths of cloth are attached to it, giving a kind of *trompe-l'oeil* effect (see also Kalantari 2016b: Fig. 146). It is important to note that only at Tabo were these paintings done on actual coarse fabrics spanning the ceiling segments. Radiocarbon dating of the cloths on the painted ceiling at Tabo verifies an early origin.[11] The fact that these paintings survived largely intact is proof of the refined techniques used in their creation.

10 The original portal must have existed where today there is a new entrance hall. A fragment of an original carved doorway of the foundation period is now in the monastery's museum (**Fig. 12-16**). It must have had shared characteristics and complexity with the portals of the royal foundations of Khorchag and Tholing founded in the same period (Kalantari 2015, 2016a).

11 New art historical studies confirm that those paintings above the *cella* (Luczanits 2015) and those above the *'du khang* are from the founding period, around 1000 CE (Kalantari 2016a). Klimburg-Salter (1997: 48 and footnote 7f.) summarises that the results of the three C-14 samples are very close (the average being 1075) and thus they come from the first 100 years of the Tabo monastery. She leaves the question of dating the ceilings open, but on page 71 states that "the entrance hall is the only part of the temple to retain the decorative programme from when the monastery was founded in 996".

TABO CEILING PAINTINGS

CLOTHS AS SUPPORT OF CEILING PAINTINGS IN THE EARLY ARCHITECTURE OF TABO[12]

As stated above, only at Tabo were the ceiling paintings from the earliest phase of the temple's decoration done on coarse fabrics spanning the ceiling segments. This suggests the need to take a closer look at the construction methods and the painting techniques employed.

The roof of the Tabo main temple rests primarily on the outer earthen walls. It is further supported by eight wooden pillars in the temple's hall (*'du khang*) and by the walls of the *cella*. The main beams run parallel to the entrance wall of the *'du khang* and the rafters—set across the beams—are also firmly anchored in the walls. Smaller segments are formed by this system of beams and rafters, which are closed by wooden planks resting directly on the rafters.

Each segment of the wooden ceiling in the sanctum is covered with a length of coarse cloth as support for paintings. These ceiling cloths consist of several pieces of fabric sewn together (Fig. 12-3).[13] In contrast, in later temples, such as at Nako (Kinnaur, Himachal Pradesh, India, ca. 1150 CE), the representations of textiles were directly painted on the wooden boards of the roof (Krist 2016; Kalantari 2016b).[14]

During a conservation campaign at Nako between 2002 and 2004, the individual wooden panels making up the ceiling were examined in a joint project between the University of Applied Arts and the University of Vienna.[15] According to the conservator, Katharina Kohler, the technique of the paintings on the wooden ceiling planks is very similar to that of the early wall paintings: the first layer on the wall contains clay, which is comparable with the top layer of the wall paintings, followed by a gypsum ground.[16]

At Tabo, the ceiling and wall paintings appear also to be of comparable complexity, although these technological aspects need further investigation. Furthermore, a comparative analysis of the technique of painting on cloth already common at that time with that of other media such as ceremonial banners and *thangka* is a desideratum for future studies.[17]

Fig. 12-3 Tabo *gtsug lag khang*, ceiling, sanctum.
Source: Christiane Kalantari (2015).



12 In cooperation with H. Feiglstorfer

13 A close examination of the edges suggests that when attaching the fabrics, the edge was folded over and then fixed to the ceiling. Animal glue might have been used to attach these materials (Feiglstorfer, verbal communication); but this needs further studies on site to confirm.

14 The wooden boards at Nako are finished on the recto. The investigations of conservators at Nako have shown that the original ceiling paintings are of the highest quality both in motifs and execution (Krist 2016: 287).

15 According to Kohler (2006: 27), the Nako Lotsawa Lhakhang was topped with an insulating layer of birch bark, which in turn was covered by a ca. 30 cm-thick outer layer of highly compressed mud to protect against water infiltration. In the Central Tibetan temple of Shalu (ca. 1030 CE), the paintings on the ceilings are also directly executed on the wooden planks.

16 The material analysis by the conservator Kohler (2006) showed that the wood used for the roof is *cedrus deodara* (Himalayan cedar).

17 Kashmiri wooden book covers can be cited as examples of painting on wood (10th and 11th century, private collection; Linrothe 2014: 121). Further examples are a Kashmir-style wooden statue of a seated Buddha, ca. 1000 (found in Tibet by Tucci in the 1930s and now in the Cleveland Museum, Andrew R. and Martha Holden Jennings Fund (1986.6, https://www.clevelandart.org/art/1986.6).

18 The same working procedures have been described for the ceilings at Nako, created around 1150. Similar to Tabo, their designs show a painting technique extending across all the boards, so one must assume that the painting was applied in situ after the completion of the wooden structure (Kohler 2006: 19; Krist 2016: 290). Furthermore, Feiglstorfer suggests that from a constructive point of view, the planks are difficult to place after finishing the roof construction. Thus the paintings must have been created in situ. He also presumes that the process of roofing with a thick layer of earth might create humidity, making it necessary to let the roof and planks dry for some time prior to decoration.

While not excluding the possibility that the textiles were painted first and then applied to the ceiling, the fact that the motifs are precisely matched to the ceiling segments leads us to assume that the paintings were rather executed in situ.[18]

The question arises as to why real fabrics were used only in the earliest phase of the royal foundations, despite the existence of a long tradition of painting directly onto wood.[19] Furthermore, why do they evoke the illusion of lengths of cloth spanning the ceiling segments? A technological reason for the use of cloth may be that the more complex design and perhaps more durable, sophisticated technology represents a privilege for royal foundations, but this remains speculative.

First and foremost, art historical and iconological clues can be provided on the basis of an analysis of the ornamental and figural motifs. As stated above, most of them relate to Central Asian silk cloths, which were highly valued as luxury objects, or to textiles imported from India (notably Gujarat). While there is no proven tradition of hanging soffits in adobe brick buildings in Tibet, the situation is completely different in India. There, temple hangings of printed and painted cotton cloths are important for shrine constructions, and ritual cloths are also represented in paintings in Gujarat. This tradition is particularly relevant in this context because the ceilings of the Tabo '*du khang* mainly depict textiles from Gujarat and, as discussed above, there were established connections to this artistic-religious centre.

The importance of textiles for meritorious donations and cloths tailored to ritual paraphernalia in Buddhist temples is another aspect of their replication in paintings; all this would suggest that the intention was to further enhance the visual effect by the use of textiles. Furthermore, the paintings let the structure of the coarse fabric of the painting ground shine through. One can therefore hypothesise that this effect is intentional and aimed at strengthening the mimetic relationship between the materials of painting ground and paint, and the material depicted.

The appearance of textiles in painting and sculptures in numerous Buddhist sites in India and South East Asia illustrates the wide incorporation of textiles into the decoration of built structures and as furnishings. Cloths are frequently used in Indian temples as hangings and ceiling canopies. From early on, replicating them on painted ceilings was thus a pan-Indian practice.[20]

In this context, it should be noted that textiles play an important role in shrine construction and worship in Gujarat. *Mata ni pachedi* ("behind the mother goddess") are elaborate painted temple cloths used to create temporary places of worship or "temples" in the form of awnings and canopies to perform ceremonies invoking goddesses. The Chitara family, situated in the Vasna district east of Ahmedabad, are bearers of this tradition and continue this deep-rooted knowledge passed down over generations.[21] We have no evidence of how far back this practice of shrine construction goes, but the association with Gujarat is evidenced not only by the textile types shown in the paintings, but also by specific motifs on the ceilings that, as mentioned above, echo early Gujarati book paintings (Fig. 12-14). However, this possible link needs further investigation of the material and techniques used for the ceiling textiles at Tabo.

DEFINING SACRED SPACE: ON THE RELATION OF TEMPLES AND TEXTILES IN INDIA AND IN TIBET AS REFLECTED IN TEXTUAL SOURCES

As already stated, textile awnings and canopies are widely used to protect, honour, and elevate gods and humans alike in the Indian cultural sphere and these values of cloth are of great significance in Tibet as well. Of particular relevance for the understanding of the genesis of textile representations in Tibetan Buddhist temples are Sanskrit texts such as the *Kāśyapaśilpa*, a South Indian treatise on art, architecture and ritual dating from the 11th–12th century CE. It illustrates how the canopy and its performative erection effects a sacralisation of an otherwise profane space, a process that Eliade (1959) calls "hierophany". A passage of the *Kāśyapaśilpa* dealing with construction rituals of religious buildings describes *vitāna*: religious protective cloth coverings mounted on poles, which define a sacred space. According to this text "one should cover the [pavillion] from above with a canopy (*vitāna*, the pavilion which is endowed) with 'waves', with pillar wrappings and which is equipped with doors and arches and with *darbha* grass[22] and garlands" (Slaczka 2007: 108). In another passage the pavilion is described as follows: "It is nine *hasta* long, has 16 pillars, gateways and a canopy. Further to this, it is decorated with banners, garlands, *darbha* grass and strings of pearls. A platform

19 A later example of actual textiles used as support for ceiling paintings can be found in the small Guru Ganthal temple (Chandra valley, Himachal Pradesh). Textiles used as support for paintings in Buddhist temples of Bhutan in the 19th century are discussed in Shekede and Rickerby (2014: 232), who relate this practice to the beginning of availability of mass produced cotton fabrics in this period — see also Yeshey et al. (this volume).

20 For an early example evoking the use of cloths as hangings in temples, see the murals and paintings on the ceiling of a 7th century Jain temple in Tamil Nadu (Guy 1988: 32, Fig. 33).

21 The Vaghari community, of nomadic origin from Gujarat, still create these painted images of the goddess on fabric hangings, which are traditionally displayed during ceremonies. They belong to an underprivileged group who was not allowed to enter temples, so instead created their own sacred spaces using elaborate paintings of the Mother Goddess (Mata) on elaborate pieces of cotton cloth. According to Kirit Chitara, the son of Jayentibahi Chitara, traditionally men make outlines on the traditional *maaderpaat* or unbleached handwoven cloth, and women fill them in with colours using a method of painting similar to *kalamkar* fabrics, namely using a pen (*kalam*) made of bamboo reed (Alexandra Pruscha, verbal communication). Today these textiles are used in decorating temples and shrines with narrative illustrations of religious stories (see also Fischer 2014).

22 *Darbha* grass (*Desmostachya bipinnata*) is also known as *kusha* grass, commonly known in English by the names Halfa grass or Big cordgrass. This material was used for the Buddha's meditation seat when he attained enlightenment under the Bodhi tree.

(*vedikā*) is constructed in the middle of it" (ibid. 173). Gautam Vajracharya (verbal communication, IATS Prague, July 2022) informed the author that the ritual of the erection of *vitāna* is still practiced in Nepal up to the present and these canopies are also replicated in the temple's decorations and have the same Sanskrit designation. Given the intense artistic interactions between Northern India, Nepal, and western Tibet, it is hardly surprising that such Indic notions and modes for generating a potent sacred space would have been creatively adapted in the decoration of newly erected western Tibetan temples, with their local tradition of wooden ceilings. Cloth as a transforming medium is omnipresent in present-day western Tibetan temples, where exquisite silk brocades delineate and adorn sacred spaces in form of banners hung on pillars, the attire of icons, and fine cloths draped on ritual paraphernalia. All of these items are tailored by a specific group of artisans in the temple, as discussed below.

SILK, PEARLS, AND PRECIOUS METALS — THE CEILINGS ABOVE THE TABO SANCTUM AND AMBULATORY

The rich ceiling paintings above the sanctum cum ambulatory are completely preserved and, as stated above, attributed to the earliest decorative phase, around 1000 CE. Stylistically, the ornament depicted there shares characteristics with the wall paintings in the old entrance hall from the foundation period, showing minor protective deities and donor tableaus (Jahoda and Kalantari 2016). On each ceiling segment, one finds repeating patterns of large medallions in white dotted circles suggesting pearls (Fig. 12-4 and Fig. 12-5). Each roundel is a space for artistic representation: naturalistic renderings of full-blown, yellow and rose lotus flowers seen from a top-down perspective.

These splendid flowers — recalling ceiling decorations in temples of Greater Kashmir (such as Martand in Kashmir, Jammu and Kashmir, India, and Masrur in Kangra, Himachal Pradesh, India) — alternate with differently designed crowned airborne divinities set against a blue background. The interstices

Fig. 12-4 Left: Tabo *gtsug lag khang*, ceiling above the sanctum.
Source: Christiane Kalantari (2009).

Fig. 12-5 Right: Idem.
Source: Christiane Kalantari (2009).





hold vegetal motifs alluding to lotus stems or bouquets typical of patterns on textiles. However, most of these bouquets emit petals or buds reminiscent of the lustrous surfaces and glowing colours of pearls or jewels in characteristic blue and red, recalling combinations of rubies and Persian (bluish) turquoise or sapphires. Rather than fictitious textiles, these motifs thus echo the jewel offerings held by divinities in the early wall paintings of the *cella* (Fig. 12-6). Moreover, real stones were used to adorn the metal statues "collected" by 11th century royal preceptors in Western Tibet (Heller 2019: Fig. 7; Linrothe 2015: 118; and Fig. 12-7). It is also apt to mention here the splendid ornaments that adorn a Bodhisattva of the *bhadrakalpa* (fortunate aeon) in the ambulatory of Tabo.

The ceiling's divinities hold different kinds of offerings, instruments, banners, and precious objects in their four arms. They are pictorial representations of music and offerings of textiles, flowers, and ornaments offered during consecration rituals and commemorating meritorious donations to the Buddha seated below. These figures overlap the border of the roundels, as if the latter represent openings that connect the temple's centre of worship to the celestial sphere above.[23]

The popular medallion pattern covering the ceiling raise questions of trans-mediality and trans-temporal aspects. While the figural mo-



Fig. 12-6 Tabo *gtsug lag khang*, **Bodhisattva image, transition zone to the sanctum.**
Paintings from the foundation phase, ca. 1000.
Source: Christiane Kalantari (2009).

Fig. 12-7 Khartse, **Bodhisattva Vajrasattva**
Source: Tsering Gyalpo (2006).



23 Linrothe (2014: 205, Fig. 26) suggests that the origins of ornaments mimicking textiles and depicting lotus flowers and other offerings may be traced back to the idea of creating the atmosphere of the *gandhakuṭī*, the dwelling of the Buddha after his Enlightenment.

tifs reflect a local strand of late 10th-century Kashmiri art, the roundel patterns were widespread on earlier medieval silk fabrics. They are reminiscent of ornaments such as those on pilasters of the eighth century Avantisvamin temple in Kashmir (Fig. 12-8),[24] with flowers and animal depictions in pearl roundels. The patterns can clearly be traced back to ornamental forms known from precious silk fabrics of eastern Iranian and Sogdian origin[25] (Fig. 12-9), which were highly prised as luxury goods in Kashmir. The latter region was a major centre of Buddhist learning and renowned for its refined art, as well as being famous as a powerful trade hub along the Silk Routes. It is well known that Kashmir had a huge impact on the art of Western Tibet. Furthermore, this illustrates that the deliberate simulation of media and techniques of crafted objects in architectural ornament is a phenomenon that could be found very early on in Kashmir.

However, precious materials in the paintings were not only evoked with pearl roundels recalling luxury textiles. The ceiling of the Nako Translator's temple shows strings of pearls or precious stones, laid across to form a grid (see Kalantari 2016b: Fig. 144). The latter forms rectangular spaces for figural representations of mythical hybrid creatures (horses with fish-tails, water buffalo, and *vyala*—winged lions with elephant's heads),[26] which descend from heaven together with rain. These are associated, both in Hinduism and Buddhism, with wealth symbolism and the riches of water. This ornament recalls precious materials such as metalwork rather than textile designs. It is a pattern that was also simulated on a pilaster (Fig. 12-10) at Avantipur, Avantisvamin temple, Kashmir.



Fig. 12-10 Avantisvamin temple, Kashmir, detail of a pilaster ornament.
Source: Christiane Kalantari (2004).



Fig. 12-9 Sogdian silk fragment showing roundels with pheasants, 680–900 CE, silk weft-faced compound twill (samite).
Source: Los Anges County Museum of Art (LACMA, M.2007.32.2. Online: https://collections.lacma.org/node/213022).

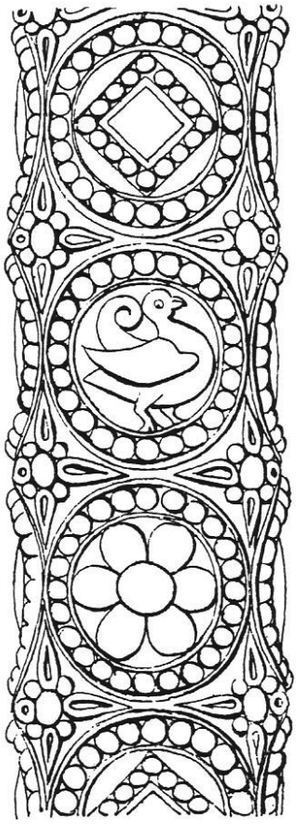


Fig. 12-8 Kashmir, Martand temple, roundels on pilaster
Source: Pal (1992: 9-13, Fig. 6).

24 Some patterns are also found as architectural ornaments on Martand temple, although this is barely carved, in contrast to the sculpturesque exteriors of Indian temple architecture. Similarities can also be observed between Western Tibetan portals and the densely decorated facade of the ca. 11th-century Mirkuladevi temple at Lahaul (Western Himalayas).

25 Pearl roundel textiles (ultimately deriving from Sasanian models current in 3rd–6th century Iran) were especially important for Sogdiana, a loose confederation of states based in Central Asia that embraced many Sasanian customs. They were great patrons of the weaving of such patterned textiles, the majority of which were silk woven into the samite (weft-faced compound twill) technique, see Compareti (2009) and Watt and Wardwell (1997).

26 These creatures were first identified by Vajracharya (2009).

The ceiling paintings above the Tabo *cella* thus represent a specific aspect of material mimesis: typical Buddhist motifs are placed in the medallion patterns, evoking visual references to highly valued luxury textiles. The original "secular" character of the textile medium is thereby transformed into images of religious significance. Textile aesthetics and artful illusions of crafts were also transmitted through ornaments on precious Kashmiri bronzes "collected" and held in high esteem by Western Tibetan royal preceptors. They are thus also media of religious and political power, legitimating the ruling elite, and this stimulated replication in different media. The popular pearled roundels were a frequent pattern on such Kashmiri bronzes, in particular as pillows for deities, reflecting their role in furnishings (Fig. 12-11; Heller 2019). As we shall see, such bronzes had enormous impact on the taste and passion for depictions of textiles in the Western Himalayas.

Highly significant iconographic motifs are depicted in each of the corners of the Tabo ambulatory. These motifs connect the ceiling ornament to an overall design: sea-snail shell, precious jewels, paired fish (see also Gyalpo and Kalantari 2011: Fig. 19a), which all relate to the *aṣṭamaṅgala* (*bkra shis rtags brgyad*) and thus turn the ceiling into a mandalic configuration. These objects are again associated both with meritorious donations and items used during consecration ceremonies (cf. Bentor 1996). Together with the offering spirits shown on the ceilings of the sanctum, they visualise rituals that purify and sacralise the temple, and make it effective as a sacred space (suitable for the habitation of the Buddha). They thus serve to protect and promote welfare and spiritual progress of both donors and devotees.[27]

An intriguing detail is shown on one of the Tabo ceiling sections above the sanctum: there the ceiling's textile—hence the succession of large roundels—is interrupted by a simulation of a patch of cloth with a small, simple pattern. This illusion is intended to make the viewer think they are looking at real textiles. Within the image, different levels of space and transmediality are thus separated from—but related to—each other (Fig. 12-12). In the Tabo sanctum paintings, we observe very particular processes of transfer between material and visual culture. Viewed from a distance, the appearance is that of a ceiling covered with precious textiles, while the individual figural motifs on them each have their own symbolism and Buddhist iconographic themes, independent of the actual textiles seen in the paintings. As mentioned above, these patterns evoking cloths also refer to other craft traditions such as bronzes and jewellery, which are associated with prestige, wealth, and splendour.

27 See Tucci (1949 Vol. I: 309f.) for a summary of Tibetan Buddhist texts concerning consecration.



Fig. 12-11 Buddha, Dankhar monastery collection (Spiti), from Gilgit in Greater Kashmir, 8th century.
Cast-metal alloy (brass) with copper and silver inlay, with inscription (added later) giving the name and title of the royal preceptor from the Guge kingdom, Lha bla ma Zhi ba 'od.
Source Linrothe (2014: 4).



Fig. 12-12 Tabo *gtsug lag khang*, sanctum's ceiling.
Figural motifs combined with illusionistic patchwork imitation.
Source: Christiane Kalantari (2015).

INTERSECTIONS OF WOODCARVINGS, ARCHITECTURE AND PAINTING — THE TRI-PARTITE PASSAGE

The most intricate motifs at Tabo are in the transition zone between the assembly hall and the *cella*, representing the border and interface to the cultic centre. The rectangular segment, framed by a string of pearls, is set with pearl roundels enclosing flowers and lotus-vines emitting aquatic creatures (such as tortoises, *makara*, birds, "rain babies", and elephants) symbolic of the exuberance and plenitude, as well as purification associated with rain and rivers[28] (Fig. 12-13). The intricate motifs are not only reminiscent of fabrics but also evoke woodcarvings on portals with characteristic motifs associated with water symbolism.

They share elements with wooden portals in the region, such as that of the ca. 1000 CE Khorchag Monastery at Ngari, TAR, China (Fig. 12-15). A fragment of an early wooden portal (ca. 1000 CE), presumably from the at Tabo *gtsug lag khang*, also shares the same visual vocabulary (Fig. 12-16), as do earlier traditions of elaborate wooden temples carving in Himachal Pradesh. Characteristic of early portals are the river goddesses Gaṅgā and Yamunā and their treasures, depicted in the lowest sphere of the doorway. These are personifications of the holiest Indian rivers, which confer ritual purity and make the temple itself a guarantor of plenty. From vases above, luscious meandering lotus vines rise, emitting auspicious symbols and lotus rosettes. The ceiling and the transition zone at Tabo is thus a meaningful place for wealth and rain symbolism, again reinforcing the idea of offerings. Furthermore, the paintings and their style echo early Gujarati book paintings, which show the *kīrtimukha* (glorious face) emanating meandering lotus vines, as well as humans and water-related animals sitting on lotus pedestals (Fig. 12-14; Wandl 1997: 186).

28 Opulent lotus flowers combined with pearl strings (frequently combined with hybrid creatures) are a widespread motif in early Buddhist temple ceilings, such as at Ajanta. These correspond to canonical writings for the embellishment of temples such as the Cullavagga (Zin 2003: 66). The lotus is a central symbol of the teaching and the path towards awakening in the Tabo renovation inscription, which is rich in images: "In this [excellent house] the defilements are used as servants which [we] employ as [we] please, and the pond of release is filled with the water of meditation [...] with the lotus of [...] spread [...] from all [...] may [we] be *bathed* in the teaching of good thoughts [...] !" (Steinkellner and Luczanits 1999: 24).



Fig. 12-13 Tabo, ceiling design, sanctum.
Meandering lotus scrolls emitting humans and aquatic creatures.
Source: Christiane Kalantari (2015).



Fig. 12-14 MS cover, Jain, 1125, Gujarat, *kirtimukha* emanating meandering lotus vine.
Source: Pal (1995: 198).



Fig. 12-15 Khorchag, Ngari, TAR, China, ca. 1000.
Wooden portal, geometric patterns such as connected roundels and flower rosettes, used to organise and frame scenes or figures in different media.
See also: Gyalpo et al. (2015: Fig. 99).
Source: Christiane Kalantari (2010).



Fig. 12-16 Tabo, fragment of a wooden portal in the monastery's museum, perhaps from the foundation phase around 1000.
Source: Christiane Kalantari (2009).

In addition, connected medallions with deities allude to tendrils or lotus vines growing up wooden portals in the region, which are used to organise and frame figures (Fig. 12-15; Kalantari 2015). All this illustrates a playful reversal of roles between painting and other media such as bronzes or book painting. One can argue that the symbolism of the lotus vine is very common in various media in the Buddhist context. However, they are perhaps not chosen at random. The evocation of a wooden portal in this transition zone serves to mark and emphasise this important area, to convey a hierarchy and to lead the devotee through this passage from the assembly hall to the centre of worship in the sanctum.

On the ceilings in the transition zone from the assembly hall and in the sanctum we thus observe an evocation of a visual effect of precious textiles with large medallions associated with medieval silk fabrics, as well as jewellery given as meritorious donations in the Tibetan cultural sphere and re-used in monasteries. This is broken up by motifs common to Buddhist visual culture, such as airborne divinities, naturalistic flowers, and lotus vines as water plants populated with various creatures. This interlacing of textile and visual arts also shares characteristics with other media such as woodcarvings or filigree metalwork. From these processes a condensation of meaning and multivalent motifs developed, from which a new and independent visual culture arose in Western Tibet (see also the splendid soffit decorations in the Alchi Sumtsek; Goepper 1996: 243).

Particularly in the early artistic phase of Tabo (ca. 1000), transmedial processes connecting painting, textile art, splendid jewellery, woodcarvings, and bronze sculptures is quite evident. This interlacing of luxury art and precious mobile religious objects created by highly specialised craftspeople in royal workshops is also a medium for the display of power and prestige by the ruling religious-political elite. The result of this process is an extraordinary visual splendour characteristic of the art of Tabo.

Essential aspects of craftsmanship in this context, such as questions of the colour palette and choice of pigments, are still little studied, as is the exploration of the patterns of their distribution in a temple related to specific modes of painting and iconographic topics. With respect to the ceiling depictions, the most complex techniques and the richest colour palette consisting of most precious and brightest pigments can be found above the sanctum's soffit (see Fig. 12-4 and Fig. 12-5). An aspect of this richness is their function as visual expressions of spiritual majesty, which in early Western Tibetan Buddhist art is mainly an aesthetic one, represented through luxuriant spaces and in particular by means of lavishly decorated portals,[29] as found also in canonical texts such as the *Lalitavistara*.[30] Another motivation for the creation of such a rich atmosphere based on the availability of respective material resources is the drive to attain merit, as discussed below.

29 The *Lalitavistara* recounts in detail the splendour of the abode of the Buddha and the outburst of nature's beauty and abundance; it symbolizes the qualities developed by the Bodhisattva and his actions and accomplishments. Comparable eulogies can be found in the story of Sudhana (Tib.: *Nor bzang*) story: the moment of attaining higher states of perfections is described as entering through the portal of a tower adorned with ornaments, jewels, while signs and light appear.

30 For the *Lalitavistara* the author uses the English translation by Gwendolyn Bays, which is based on the French translation from the Sanskrit and Tibetan by Edouard Foucaux.

TEXTILES IN THE ASSEMBLY HALL (*'DU KHANG*)

The ceiling decorations in the assembly hall are not as well preserved as those in other parts of the Tabo complex. We can therefore no longer record the programme as a whole.[31] The motifs on the remaining paintings on the ceiling of the assembly hall also differ considerably from those in the *cella*, and the approach to transmediality is quite different (see Kalantari 2016b: Fig. 156). In contrast to the sanctum, no figural representations or naturalistic elements, such as large lotus flowers, are to be found. Instead, each section appears to be an individually designed length of decorated textile spanning the ceiling segment. The latter have stylised natural motifs (mainly with lotus rosettes and leaf spouts set in rhomboid patterns), auspicious objects such as vases and conches, as well as ornamental motifs which echo the symbolism found on the aforementioned Khorchag portal (Fig. 12-15). This second aspect of simulated materials emphasises more the evocation of the material qualities of textiles.

In the *'du khang*'s soffit we find references to a specific decorative vocabulary and a characteristic layout with border designs. Some of these designs can be related to ritual cloths produced in Gujarat and they evoke traditions of textiles offered as meritorious donations in temples and used in shrine constructions (Fig. 12-17).

31 Old pictures before the restoration show textile fragments still hanging from them.



Fig. 12-17 Cotton cloth, Gujarat for the Indonesian market, ca. 14th century.
Source: Metropolitan Museum of Art (MET, NY, 2011: access. no.: 2005.407).

However, the auspicious objects shown on them refer to iconographic themes independent of the textile design, and they are components of the overall iconographic programme.

An interesting transformation of the symbolism of abundance in 11th–13th century Western Tibet can also be observed. Key motifs in the early temple of Tabo in this respect are Indic strings of auspicious vases and conches (Fig. 12-18), while in later phases (ca. 1200 CE) symbols of plenty such as crossing circles known as Chinese cash motifs become popular ceiling designs for example at Dungkar (Tsamda district, Ngari prefecture, TAR China; Fig. 12-19, Fig. 12-20). The latter resonate with Liao (907–1125) silk damasks (Fig. 12-21), which are also replicated on soffit decorations in the Mogao cave temples (Gansu province, China). One example is the Buddhist cave temple at Yulin (see Duan 1997: Fig. 9), patronised in the time of the Tangut Xi Xia Empire (1038–1227 CE) and a hub of intellectual and material exchange in the eastern part of the Silk Road. These parallels illustrate the intensive dialogues between Western Tibet and its Central Asian neighbours in the years around 1200 CE. As already mentioned, the trade in textiles of Indian origin, which had the greatest impact on the art of Tabo (see below), appears to have been complemented by the import of other kinds of textiles of eastern Iranian or Sogdian origin, which were highly prized as luxury goods in the medieval West as well as in pre-modern Asia.



Fig. 12-18 Above: Tabo *gtsug lag khang*, *'du khang*.
Length of cloth showing stings of stylised vases, flowers and conches, symbolizing purity and abundance.
Source: Hubert Feiglstorfer (2019).



Fig. 12-19 Dungkar cave temple, early 13th century.
Ceiling with strings of stylised vases and flowers and overlapping circles known as cash/coin motif.
Source: Christiane Kalantari (2009).



Fig. 12-20 Idem.
See also: Kalantari (2016b: Fig. 158).
Source: Christiane Kalantari (2009).

Evidence of this can be found in early Kashmiri bronzes as well as in ceiling and wall paintings. The popular geometric pattern of connected roundels with pearl borders is again exemplary here. The design of one ceiling segment shows medallions characterised by a central rosette seen from a top-down perspective, surrounded by smaller blossoms in slanted perspectives (Fig. 12-22). This motif is combined with half-leaf spouts set in the interstices. From very early on, this type of pattern, which refers to imported material culture from Sogdiana and Persia,[32] can be found on sophisticated bronzes of Greater Kashmir. The latter is important as an example of the use of specific textiles associated with luxury furnishings. Furthermore, the medallion patterns shown on pillows of Kashmir-style bronzes evoke costly silks, illustrating the translation of the language of status and prestige from the worldly sphere into the spiritual realm.

An important example is an inscribed early bronze sculpture dating back to the eighth century, transferred to Dankhar in western Tibet in the 11th century (Fig. 12-11). This Buddha image was created in the 8th century in Kashmir or Gilgit (cf. Linrothe 2015: 4–6) and bears an inscription giving the name of the royal preceptor from the Guge kingdom, Zhiba Ö (*lha bla ma* Zhi ba 'od), which was added by the latter.[33] The ornamentation on the pillow the Buddha sits on has pearl roundels and flower rosettes in the centre, recalling the ceiling designs at Tabo. The latter are depicted in the same area of the temple where the portrait of Zhiba Ö is shown as a donor. This suggests that many patterns reached western Tibet through mobile objects such as the splendid metal sculptures that the Western Himalayan elite "collected". In this context another early bronze can also be referred to, namely a seated Buddha (Kashmir, ca. 700 CE, inlay in copper and silver, Norton Simon Museum), which again illustrates the importance of this type of luxury textile in furnishings in a Buddhist context (Fig. 12-23).

These medallions remained highly popular motifs in western Tibet for centuries and were

32 The textile fragment shows a pheasant in pearl roundels: Sogdia (Central Asia), 680–900 CE, silk weft-faced compound twill (samite) — LACMA, M.2007.32.2. Online: https://collections.lacma.org/node/213022.

33 Zhiwa Ö (Zhi ba 'od) is known in the Tibetan sources as a learned translator and is depicted at Tabo as donor. Along with his elder relative Yeshe Ö (Ye shes 'od), he actively promoted the transfer of Kashmiri art into the Western Himalaya. Royal donors had strong relations to Kashmiri objects and added their names to them as signs of ownership and devotion (Linrothe 2014: 5).



Fig. 12-22 Tabo *gtsug lag khang*, *'du khang*.
Ceiling ornament.
Source: Christiane Kalantari (2015).



Fig. 12-21 Liao (907–1125) silk damask, China, 11th century.
Crossing cycles known as cash motif.
Source: China National Silk Museum (CNSM, Hangzhou, China).

represented in various different media, for example at Alchi (Goepper 1996: 243).[34]

Some of the paintings on the ceiling segments in the Tabo assembly hall are of particular interest because they point to the direct or indirect presence of large Indian cloths, which were highly valued items of Indian Ocean trade.[35] Complementing earlier studies on the patterns mimicking Indian textiles in the art of Tabo (Wandl 1997: 179), I will focus on the processes of transfer and translation between material and visual culture, asking what artists have done with these crafts.

One length of cloth shows parallel strings of objects with connected vases and sea-snail shells (Fig. 12-18), echoing the vertical ornamental bands on Western Tibetan portals (Fig. 12-15) combined with end panel motifs evoking Indian cloths. The graphic qualities of the rendering of these widespread Buddhist motifs on the ceiling textile is rather reminiscent of other media such as metal reliefs. Thus, while the main motifs represent wealth and purification symbols as well as images of offerings, in line with the programme above the sanctum, the ornament on the end-panel motifs shown on this ceiling segment evoke patterns drawn from Indian textiles. As already mentioned, Indian textile aesthetics on ceilings was also transmitted through ornaments on Kashmiri bronzes treasured in Western Tibetan temples. It appears likely that pattern books were used, but no examples have survived.

Another good example is the famous monumental Avalokiteśvara statue in Khartse, Ngari (TAR/China). The pattern on its *dhotī* (loincloth) proves that Indian cotton textiles had an enormous influence on Kashmiri aesthetics (Fig. 12-24). According to the textual evidence, in the 11th century Rinchen Zangpo (Rin chen bzang po) patronised the statue in honour of his father and transferred it from Kashmir to his ancestral village in Western Tibet. The *dhotī* shows motifs and colours reminiscent of Indian textiles: rows of lotus flowers, combined with motifs of vegetative ornamentation, lotus vine and lozenges filled with leaf shoots. It is also an example of sophisticated Kashmiri artworks in brass with complex inlays in copper, silver and gold, which enriched the visual culture and aesthetics of Western Tibet.[36]

Another ceiling design has rows of flower rosettes alternating with leaf spouts organised in lozenges (Fig. 12-25) and replicates a popular pattern found both on bronzes (Fig. 12-26) and architectural ornaments such as in Masrur. In the wall-paintings from the renovation

34 Alchi belongs to a remarkably rich phase of Buddhist institutionalisation in Ladakh, instigated by wealthy and powerful clans at the end of the 12th and start of the 13th century. Some of these ceiling panels mimic precious cloths, with *tirāz* strips showing pseudo-Arabic Kufic inscriptions. The specified textiles were inscribed with good wishes, the workshop name and the name of the ruler who ordered the fabric in order to make robes of honour use in elite-dressing and diplomacy (see Flood 2009; Kalantari 2016b).

35 They featured prominently in international trade, reaching as far as eastern Indonesia and Egypt in the west. The earliest examples found in Egypt can be dated to the 5th century. The Ashmolean Museum at Oxford houses more than 1,200 textile fragments collected in Egypt and involved in the western Indian Ocean trade (see Barnes 1997, 2006).

36 Leaf spouts and lotus rosettes are a constant motif in greater Kashmir. For example they are carved in stone on ceilings at Masrur and Martand; however, there they are shown as large naturalistic open flowers.



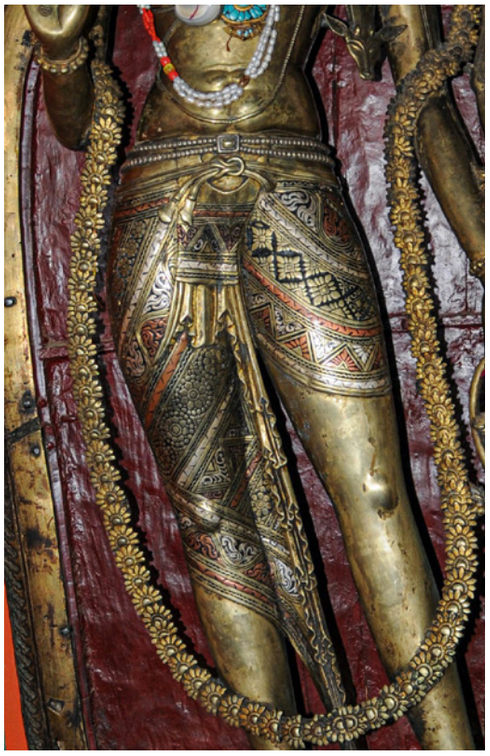


Fig. 12-23 Left: Buddha, Kashmir, ca. 700.
Inlay in copper and silver, with references of imported material culture form Sogdiana and Persia.
Source: Norton Simon Museum (accession no. F.1972.48.2.S).

Fig. 12-24 Khartse Avalokiteśvara (transferred by Rinchen Zangpo from Kashmir, early 11th century).
Source: Tsering Gyalpo (2012).



Fig. 12-25 Right: Tabo *gtsug lag khang, 'du khang*.
Ceiling ornament.
Source: Hubert Feiglstorfer (2019).

period it is shown as furnishing the throne backdrops of the local protectress deity depicted above the portal (see Kalantari 2007: Fig. 26).[37] In addition, donor depictions at Tabo show clothes suspended from above or placed behind the seats. These reflect the role of real or idealised mobile ritual spaces in Western Tibet.[38]

Of particular interest for the identification of the sources of the textile patterns at Tabo are the early, complex Gujarati textiles which featured prominently on the medieval Indonesian market. These were not only important as items of trade and for practical use but became highly valued objects in rituals in Indonesia, taking on sacred meanings.[39] Surviving large Indian textiles in Indonesia are dated as early as the late 13th and 14th centuries.

Similarities with textile motifs on ceilings are found with respect to large-scale motifs (connected stylised leaves), combined with characteristic end-panel motifs consisting of parallel strips containing strings of small-scale motifs. Another commonality is the red, blue, and white colour scheme. Potential examples for comparison can be found in early Indian "heirloom" textiles from Indonesia (Fig. 12-27). This cloth from eastern Indonesia (V&A Museum, London, ca. 1340–1380) is made of plain woven cotton with bold, block-printed and batik designs using mordant dyes. The dyes used were indigo for blue, and madder (*Morinda citrifolia*) for red, which recalls colour combinations of specific textile patterns found in wall paintings (Fig. 12-28).

A third approach towards the representation of textile media and craft traditions can be found in the narrative paintings of Tabo in the form of different cloths tailored to be worn by male and female protagonists (Fig. 12-29). These painted fabrics mimic the crafts and motifs of cottons with simpler designs, specific colours and patterning techniques. They appear to be naturalistic representations of lightweight fabrics with resist-dyed, block-printed, and painted designs, typically used for clothing in the textile-producing centres of Gujarat. These patterns are depicted on the dresses of the deities and in the narratives in the wall paintings, which largely depict Indic settings and people wearing the light cotton attire typical to much of India (cf. Wandl 1997: 179). The cloths feature rows of patterns and lines, composed of small elements such as crosses and rosettes, sharing characteristics with Gujarati cloths (Fig. 12-30 and Fig. 12-15).[40] One very common motif is of vine tendrils rendered in the characteristic blue and red.

37 Despite paintings being executed by different groups of artists, the ornaments mostly remain similar. This suggests that specialists in ornamentation and textile designs were responsible and thus they shed light on workshop organisation.

38 A wooden Kashmiri book cover (10th–11th century; see Linrothe 2015: 121) illustrates the function of textiles in furnishings, namely as background cloths. The jewellery-studded throne backrest of the Buddha seen in the book cover is decorated with a printed cloth or woven silk (with diamonds and inserted small crosses). See also a 9th century wooden travelling shrine with Tibetan inscription, perhaps created in Kashmir (Linrothe 2015: 32).

39 As pointed out by Sardjono (2021), over time these textiles also took on sacred meanings and their presence became essential for certain rituals: they are used as a canopy to honour ancestral spirits in the house.

40 Block-printed cottons from Gujarat, some featuring Arabic inscriptions in Kufic script, have been found as far west as the Red Sea and Fustat (Old Cairo).



Fig. 12-27 Left: Gujarati cloth from Eastern Indonesia, ca. 1340–1380, block-printed, batik and mordant dyes on cotton.
Source: V&A Museum, London, Image ID 2006AT8154.

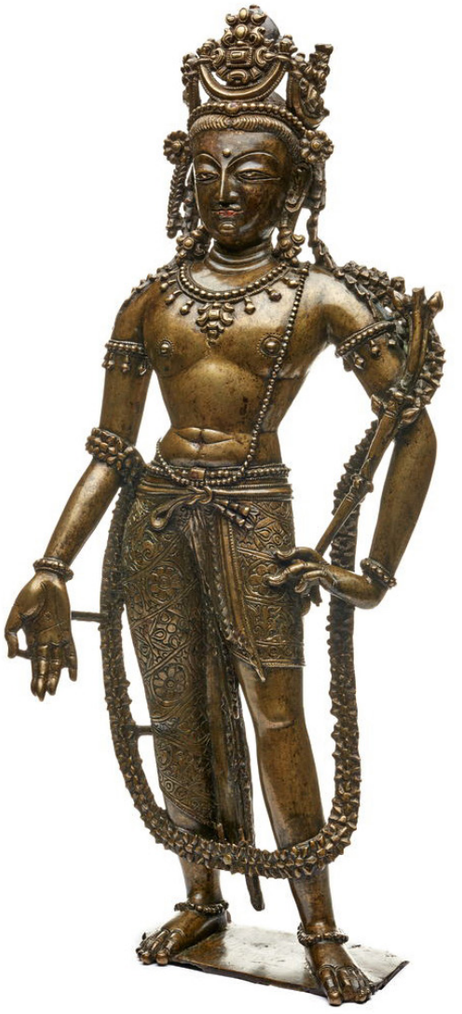


Fig. 12-26 Bodhisattva, possibly Avalokitesvara.
Source: Asia Society, NY, Mr. and Mrs. John D. Rockefeller 3rd Collection, 1979.45 .



Fig. 12-28 Tabo *gtsug lag khang*, ambulatory.
Wall-painting, detail of the attire of a Bodhisattva.
Source: Christiane Kalantari (2015).



Fig. 12-29 Tabo *gtsug lag khang*, *'du khang*.
Buddha's life, Maya asking Śuddhodana for austerity.
Source: Christiane Kalantari (2015).



Fig. 12-30 Indian cotton, block-printed with resist, and dyed blue, Gujarat 10th–13th century.
Source: Ashmolean Museum (EA1990.130).



Fig. 12-31 Dungkar, cave temple, ca. 1200.
Life of the Buddha in a Tibetan setting, King Śuddhodana in local attire presenting the Buddha-to-Be to the hermit Asita.
Source: Christiane Kalantari (2010).

SOME OBSERVATIONS ON TIBETAN SARTORIAL AND CRAFT TRADITIONS DEPICTED AT TABO

The "foreign" Indic elements of material culture shown in the narrative of the Buddha's life at Tabo differ from the local Tibetan textile and sartorial traditions that are depicted, for example, in donor scenes. These feature long, heavy woollen cloaks (*chuba*) tailored from *snam bu* (locally woven strips of woollen cloth) with large collars and linings in different colours. Men wear sashes wrapped around the waists and women white woollen capes above their *chuba*, made of un-dyed cloth in the natural white colour of the sheep's wool. In the visual narratives of the Buddha's life at Dungkar in Tsamda, Ngari prefecture (TAR, China), King Śuddhodana is shown clad in a long, red woollen cloak with a blue lining (Fig. 12-31).[41] This kind of long-sleeved, warm *chuba*, adapted to the harsh climate, is still worn today (see Gyalpo et al. 2015: 242f.) and in Khorchag (Purang) the artisanal activity of weaving *snam bu* is still widespread, using a backstrap loom (*sked 'thags*) usually employed by women (see Ahmed, this volume). The women's robes in the Tabo depictions, with capes worn above long cloaks, also belong to sartorial customs of western Tibet that persist up to the present day (Fig. 12-32 and Fig. 12-33). However, the historical dying practices and possible connections between colour preferences and signs of rank reflected in these murals remain under-studied, although Monisha Ahmed (2002: 105f.; this volume) has examined historical and contemporary dyeing practices and colour prescriptions in Ladakh. Her accounts of the 20th century describe the prestige associated with dyed garments and their central place in the dress codes of the nobility and clergy, with such markers of status retaining importance in contemporary Ladakhi culture as well. The issue of colour distribution and application appears to be more complex in historical paintings at Tabo. In depictions of members of the royal line and other high-ranking male and female personalities, both white and red appear to be prestigious colours for robes. Also the local goddess Dorje Chenmo (rDo rje chen mo), depicted above the portal to the Tabo *'du khang* (Fig. 12-27), is shown clad with a red cloak and a white cape, similar to the status robes of the female elite shown in the temple.[42] In this context, the special significance of white in Buddhist colour symbolism has to be taken into account. The choice of colour also depends, of course, on the availability of pigments. Similarly to the division of labour in Western Tibetan manuscript paint-

41 Tibetan male attire in the narrative consists of a long woven woollen ankle-length robe with overlong sleeves (tailored of *snam bu*) and sash typical to that worn today, and black woven shoes with raised toe cap; note also the jewel-studded long braids of hair and the flat woollen headgear resonating the *pakul* worn in the Hindukush.

42 In later temples such as in the Zhag cave (Ngari, TAR, China), high-ranking male donors wear either white or light blue *chuba* (Jahoda and Kalantari 2021: 412, 414).





Fig. 12-32 Village ladies dressed in festive attire at Khorchag Monastery on occasion of a *Cham* dance.
Note the cape with *thikma* patterns (left).
Source: Christiane Kalantari (2010).
Fig. 12-33 Idem.
Source: Christiane Kalantari (2010).

ing, it can be assumed that in wall paintings also it was master artists who were responsible for the outlines and the faces of the figures, while less experienced artisans executed the patterns. All of these factors have to be considered when using the paintings as sources to reflect upon actual contemporary sartorial traditions. Questions regarding the function of colours in "dress-codes" and as markers of status and hierarchy reflected in historical images, in particular in donor portraits, will be important for future research. Moreover, there is still little comparative study into the social, economic and spiritual dimensions of cloth and weaving in Western Tibet, including regions of present Ngari province.

Some early paintings provide interesting information on local textile-related craft practices, in particular the pivotal importance of wool in Tibetan culture and trade.[43] Exemplary is the consecration scene in an early manuscript in which a donor is shown using a spindle and engaged in producing woollen threads (Fig. 12-34). It recalls symbolic connections between the weaving of textiles and the very origins of human existence, as in Ladakh even the act of giving birth can be related to the making of textiles (Ahmed 2002: 11).[44] In the mentioned manuscript illumination, the spindle can perhaps be interpreted as the equivalent of the new-born baby, and the scene with a group of female donors emphasises the wish of protection and well-being of the donors and their offspring hoped for as merit accrued from patronising that manuscript.

MATERIAL MIMESIS, WORLDLY REPRESENTATION AND SPIRITUAL POWER IN A BUDDHIST TEMPLE

Representations of material culture and processes of "intermediality" are not restricted to textiles and must be understood in the wider context of intersection between the various craft traditions typical of the early art of the Western Himalayas. For example, at Nako (Translator's temple, Kinnaur, Himachal Pradesh, ca. 1100–1150) intricate metalwork was transferred to wall paintings, notably in the nimbs (halos) surrounding the Bodhisattvas in clay or painted Buddhas (Fig. 12-35).[45] These halos are made of raised pastiglia relief and painted with gold and silver, replicating the material and haptic qualities of the filigree metalwork found on Kashmir-style bronzes and in the art of goldsmiths.

The large Bodhisattvas shown in the mid-11th century wall painting at Tabo can be cited as one of the most spectacular examples. They illustrate the predilection for the representation of jewellery, typical of Kashmir-inspired art (Fig. 12-36 and Fig. 12-37).

43 The importance of the trade in wool and other products of pastoralism are not only emphasised in sources referring to Tibet (e.g., Vitali 1996). A Persian geographical text from 982 CE, the *Hudūd al-'Ālam* ("Horizons of the World"), lists gold, furs, and sheep among the most important commodities coming out of Tibet (Minorsky 1970: 92f.).

44 Ahmed (2002; this volume) notes particular taboos pertaining to spinning, weaving, dyeing, and finishing artisanal fabric products, as well as the symbolic coding of colours, which all contribute to the remarkable spiritual significance attached to fabrics in Ladakh.

45 For an example at Nako, see Allinger and Kalantari (2012: Fig. 2). Gold jewellery is evoked in manuscript illumination in the region, such as the frontispiece of the Pooh Manuscript (ibid.: Fig. 3).





Fig. 12-34 Right: Dolpo, manuscript, detail of devotees.
Source: Heller (2009: 132).

Fig. 12-35 Left: Nako, Translator's temple, Buddha.
Source: Christiane Kalantari (2005).



Fig. 12-36 Tabo *gtsug lag khang*.
Bodhisattvas in the ambulatory, details.
Source: Hubert Feiglstorfer (2019).



Fig. 12-37 Idem.
Source: Hubert Feiglstorfer (2019).

Opulent tiaras, pearl-studded bracelets, and necklaces set with precious stones are represented in such detail and treated with such great attention that they closely replicate actual imported ornaments, transferred into the medium of painting.[46]

Mahāyāna literature is full of allusions to flowering trees, lotuses, jewels and silks showering from heaven as expression of the majesty of the Buddha in the spiritual realm, which may go some way towards explaining the passion for valuable crafts and their associated symbolism. For example, an epic presentation of the life of the Buddha, known as the *Lalitavistara* (Tib.: *'Phags pa rgya cher rol pa zhes bya ba theg pa chen po'i mdo*) is a text rich in images and exuberance. It describes the "excellent abode", or "great celestial palace", where the Bodhisattva dwelled on his throne, decked with "rich results of his merits" and "[…] fitted with the finest cotton cloth, redolent of both heavenly perfumes and the smoke of purest incense, gleamed softly with the rainbow colours of fragrant flowers, the throne glowed with hundreds of thousands of precious stones, and over it hung a jeweled lattice, resonating with the sounds of many little bells" (Bays 1983, Volume II: 54).

The predilection for images of luxury in the art of both Kashmir and the early temples of Western Tibet is also the result of various other circumstances, such as the role of courtly representational art and geographical location, which from early on led to a complex intertwining of material culture and visual art. Due to Kashmir's position and role as a trading hub on the southern branches of the Silk Roads, which connected central Asia to Kashmir and Tibet, the region came into contact with lucrative trade items and precious objects. The crucial role of transcultural networks and connectivity through trade and pilgrimage in the region created complex intersections between architecture, luxury objects, and craft traditions.

While in much of India,[47] the interest in international luxury art seems to have been less pronounced, the situation must have been different in royal centres such as Kashmir. There the high standards of representation associated with the concept of kingship must have demanded sophisticated furnishings of the temples they founded. A parallel phenomenon can also be found in early Buddhist royal foundations in Indonesia, which have long fascinated scholars for their similarities to textiles from the Silk Road.[48] In the art of Alchi from around 1,200 Islamic luxury art also acquired a special significance. First and foremost this concerned elite fashions (Fig. 12-38), but it also reflected the luxury textiles and kaftans made of precious silks with complex embroidered designs that were created in royal workshops in Central Asia.

46 Pearls were traded along southern branches of the Silk Road and perhaps those from Persia reached Tibet together with other objects such as silks, of which there are numerous examples (Linrothe, verbal communication). Most jewellery made from precious metals was considered auspicious and lucky in Tibet, as well as having valuable protective properties (Clarke 2004: 16). Such items also have important functions in the highly developed Tibetan relic cults (cf. Martin 1994).

47 Only a small number of Indian murals have survived from later periods. However, the artefacts, in particular the architectural ornament on temples that have been preserved in India, mostly show a focus on the riches of nature, symbolic of divine forces from which the figural depictions emerge. An exception is perhaps the art of the Pāla period, but of its temples little survived. The figural presentations are typically loaded with ornaments and wearing attire evoking lightweight Indian cottons. Elaborate carvings evoking luxury items and international status culture are also found on the reliefs at the 8th century Candi Sewu in Java, proving that at major royal sites there was a need to represent the splendor of luxury arts in temple constructions.

48 For images of the patterns on the relief panels on the outer walls of Candi Sewu, central Java, see Sardjono (2021).

Such displays of splendour certainly conformed to the self-representations of the sponsoring elite in Western Tibet.

Another aspect that has to be mentioned in this context is the spiritual dimension of objects and clothing in Vajrayāna symbolism. The Buddha is typically dressed in a monk's robe, but we also find Buddha images with a crown, necklace, and cape (associated with kingship in Kashmir), giving him the look of a bodhisattva who wears such costly objects not as a sign of attachment to the material world but as a visual expression of spiritual attainment. In addition, many of this type of early Kashmiri bronzes—with rich metal inlay replicating early Sogdian or Iranian silks—depict Vairocana, again signalling sacral supremacy. All this reflects Vajrayāna ideology through its codified iconography, which includes silk items that manifest the Buddha's *saṃbhogakāya* nature.



Fig. 12-38 Alchi, Sumtsek.
Tower with princely couple, image on the *dhoti* of monumental Bodhisattva.
Source: Goepper (1996: 49).

ART FOR MERIT AND MEDITATION — MATERIAL SIMULATION AND ART CREATION IN A BUDDHIST TEMPLE

To better understand transmediality, artful simulations of textiles and the mimesis of craft traditions represented in Western Tibetan temples, it is useful to look closely at what art objects represent in Buddhist socioreligious and ritual contexts, and to delve further into the functions of art and material culture in a Buddhist environment. The main motivation for creating Buddhist art is to support meditation and ritual, to protect and promote welfare (Park 2014). Moreover, it is also connected to the drive individuals have to earn merit and gain karmic benefit. Buddhists are encouraged to offer textiles to Buddhist images along with flowers, incense, and other precious objects. These offerings are replicated at Tabo as various kinds of objects, vases, flowers, and conch shells, but also in the form of fictitious textiles and jewellery on the ceilings and in the wall paintings.[49] Tansen Sen emphasises the importance of generating merit by donating precious textiles, positing that Buddhist rituals requiring elaborate paraphernalia and the belief in accumulation of merit through offerings were key factors in the circulation of precious objects and cloths (Sardjono 2021).

Giving gifts to monasteries or a *lama* — including precious textiles, metal objects, and jewellery — was and remains a common way to generate merit and bring spiritual benefits for individuals.[50] As pointed out by Clark (2004: 19), an early example of such offering practices was recorded during the journey to Central Tibet by the great Indian Buddhist teacher Atīśa,[51] during which a girl spontaneously gave him the ornaments on her head as an offering. As emphasised by the author, any objects that have been worn by or come into contact with revered religious figures or statues, such as scraps of clothing or *katag* (silk scarves), are highly regarded for their protective power and may be used to make amulets. Such precious objects accumulate spiritual properties and take on meaning in highly elaborate Tibetan relic cults. They have also been incorporated into *stupa* and the furnishing of temples, as well as in paintings and architectural ornaments, preserving memory and intensifying the merit-granting act. For example, offerings by devotees are tailored to ritual paraphernalia at Khorchag monastery, adorning the Khartse Jowo. This illustrates the central function of meritorious donations to cult images, as well showing how the aesthetics of religious spaces are shaped in the Tibetan cultural sphere (see Gyalpo et al. 2015: Fig. 147).[52]

That objects can have a spiritual dimension was long ago established by Marcel Mauss (1954) and the spiritual properties of cloth, derived from contact with revered masters or icons, render these materials "ideal media for connecting humans with the world of spirits and divinities" (Schneider 2006: 204). During a research trip to Nako monastery in 2009, a local lama told the author that the Dalai Lama had offered specific *katak* during the 1990s and the locals believe that the spirit of this highly revered giver is now embodied in the sculptures on which they were hung. In the Lhasa Jokhang, the author documented a textile workshop situated on the uppermost floor and on the roof, where the silks offered by devotees are sewn into robes for deities and other ritual paraphernalia (Fig. 12-39, Fig. 12-40 and Fig. 12-41). In a room close to the Jowo statue, worn out but spiritually "charged" ritual textiles are then returned to believers as contact relics in the form of amulets. Hubert Feiglstorfer documented a textile workshop specialising in similar ritual attire at Kundeling Monastery, Lhasa (verbal communication, May 2022). One could summarise that ritual textiles in the Tibetan Buddhist context function as true spiritual "transformers".

49 A typical textile function in the Buddhist world is the honorific cover. Many honorary covers of precious materials have been preserved in Dunhuang, some of which were hung from the ceiling by suspension loops. Miniature painted canopies made of coarse hemp depict open lotus flowers, which may have been used by devotees. One of them is decorated with artificial flowers. This combines donations of textiles and flowers as offerings (Zhao Feng 2007: 39–45), recalling the ceiling designs in the Tabo sanctum.

50 Often, offerings of precious metal objects or jewellery were used to adorn the *stupa* of important lamas after their lifetime (Clarke 2004: 19). When new decorative surrounds or *torana* to particularly important religious images were commissioned, it was usual to set an abundance of stones and pieces of jewellery into the metalwork as decoration. Such uses can be observed on the metal stupa in the Jokhang of Khorchag, which is richly adorned with large cut and polished semi-precious stones (Gyalpo et al. 2015).

51 Atīśa's journeys are good examples of the mobility of monks in the interconnected Buddhist world of that time, despite the geographical distances involved. It is significant to note that in 1012 CE, Atīśa lived for 12 years in Srivijaya (Sumatra), a major centre of Buddhist learning at that time. (Kalantari, 2022; Sardjono, 2022).

52 Kerin (2013: 294) discusses popular devotional practices and spaces, located in temples as well as homes, created by devotees in Ladakh. They are made of arrangements of devotional objects and offerings, including flowers, textiles, bowls, festive streamers and canopies (ibid.: Fig. 3). The shrines analysed are thus defined not only by the iconographic programme, but also by devotional practices that reflect the needs of the community.







Fig. 12-39 Lhasa Jokhang, roof.
Craftwomanship of tailoring paraphernalia for the temple.
Source: Christiane Kalantari (2010).

Fig. 12-40 Idem.
Source: Christiane Kalantari (2010).

Fig. 12-41 Idem.
Source: Christiane Kalantari (2010).

CONCLUSION

The art of Kashmir and Western Tibet is characterised by a tremendous predilection for material culture and luxury art. Filigree frames of metal statues are transformed to shimmering gold-plated halos in wall paintings, replicating the haptic qualities of three-dimensional precious objects. Pearled medallions painted on ceilings evoke popular luxury textiles, such as silks of central Asian origin. The interstices between the roundels hold naturalistic renderings of bouquets made of shimmering jewels, mimicking precious ornaments set with gemstones.

This chapter has explored how artists' knowledge of craft traditions has been portrayed in the medium of painting, and how the splendour of Indian and Silk Road textile visual culture and other crafts shaped the aesthetics of Kashmir and Western Tibet, stimulated artistic innovation and created complex intersections between different media. Artful simulations of textiles and material culture allow insights into trade networks, the mobility of artists and artisans, and the transfer of highly valued crafted objects. All this reflects major functions of Buddhist art and ritual related to the "art of merit" — and as media of status, prestige, and power in both worldly and sacred realms. In particular, monasteries functioned as nodes for the transfer of both knowledge and the crafted objects required in rituals. These objects accumulated spiritual properties, transformed sacred space, and created powerful places; they stimulated the aesthetics and the "tastes" of western Tibetan artists and patrons, and contributed to the development of an extraordinarily refined and complex visual culture.

However, rather than focusing on the description of different materials and objects of material culture as isolated media, the chapter has examined the interrelationships and processes of transmediality between objects of material culture and visual art. For instance, textiles on the ceilings in the *cella* of Tabo, such as the pearled roundels, which come from a secular background, are given characteristic and purely Buddhist motifs which thus places them in a religious context. This, in turn, can be understood as part of the overall programme of the temple. The compositions resulting from this interlacing are presented with great care, both intellectually and manually, as well as with a great sense for variety. Furthermore, different aspects of transmediality are subtly varied and used only in certain areas of the temple, precluding simple assumptions about the interchangeability of media. The contexts in which materials and techniques are deliberately evoked or simulated in the temple were investigated, as was their function in the shaping of sacred space, narrating hierarchy of sacrality and leading the worshipper to the focus of worship.

Thus the ceiling paintings are by no means merely examples of ornamentation or decoration. Through the intersection of material culture and Buddhist content an independent form of religious-artistic expression emerged. If one follows the evolutionary history of the art of ornament in Western Tibet — which developed in close exchange with Greater Kashmir and Gujarat, as well as drawing on Silk Road aesthetics — an intensive condensation of meaning is evident. The ceiling decoration in the sanctum of Tabo, with its simulation of precious materials and luxury art, the refined quality of the paintings including the use of costly pigments, and the intricacy and richness of its ornamentation, helped devotees to experience spiritually heightened rituals and aided in their practices of worship and meditation. The Tabo renovation inscription is a written record of the transfer of merit and the result of the donation of artworks in the temple: it expresses the wish that the paintings lead to spiritual benefits for the donors, extending to all visitors who "see or touch all these many painted images".[53]

To conclude, this multi-disciplinary methodological approach combining material culture studies, transmaterial perspectives, and art history offers many advantages for the reconstruction of the art of Western Tibet, while also affording insight into contemporary artisanal traditions replicated in different media. Thus, rather than a singular interpretation of material mimesis, the analysis and contextualisation reveals a multi-layered significance to the genre. This can help us to better realise and appreciate this highly refined art in its originality and its artistic-religious quality.

53 The inscription — located on the lower part of the left frontal end of the wall enclosing the *cella* — contains an expression of the "transfer of merit" to mark the occasion of the conclusion of the renovation work in the Tabo *gtsug lag khang* (Steinkellner and Luzanits 1999: 11). The formulation for the transfer of merit consists of the "primary merit" accrued from the actual renovation work, which is dedicated to the main donor (the king) and extended to all visitors to the temple, while the "secondary merit" is accrued by dedicating the primary merit to other beings (ibid.: 12). The inscription includes further wishes for the visitors: "May also all the visitors who see or touch all these many painted images of the lords of (the five kinds of) existence, the Sugata, together with their sons, after seeing in person the Sugata of the good age and their sons, and hearing the best teaching identify [their] minds with [...] the guides who rescue all living beings from the ocean of samsara!" (ibid.: 23). For images of the inscriptions by Kurt Tropper, see online: https://www.univie.ac.at/Tibetaninscriptions/index7a44.html?Itemid=171&id=965&option=com_phocagallery&view=category (accessed: 1.2.2022).

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XIII

The Emergence and Contemporary Craft of Marouflage Wall Paintings in Bhutan

Karma Yeshey, Lan Pu and Joshua A. Hill

Name: Karma Yeshey
Designation: Wall Painting Conservator
Affiliation (Institute): Department of Culture and Dzongkha Development, Kingdom of Bhutan
E-mail address for correspondence: karmagho@gmail.com

Name: Lan Pu
Designation: Wall Painting Conservator and Researcher
Affiliation (Institute): Courtauld Institute of Art, Department of Conservation, London, UK
E-mail address for correspondence: lan.pu@courtauld.ac.uk

Name: Joshua A. Hill
Designation: Wall Painting Conservator and Conservation Scientist
Affiliation (Institute): Nottingham Trent University, Department of Chemistry & Forensics, UK
E-mail address for correspondence: joshua.hill@ntu.ac.uk

Biography

Karma Yeshey
is a wall paintings conservator with the Antiquities Division, Department of Culture, Ministry of Home and Cultural Affairs, Kingdom of Bhutan. He is responsible for preserving the wall painting heritage of Bhutan. He studied Conservation of Wall Paintings (MA) at the Courtauld Institute of Art in London, UK. His research interests include wall painting traditions (Bhutanese and regional), Buddhist art history, and Bhutanese material culture.

Lan Pu
is a wall painting conservator and researcher. Her research interest is on Himalayan wall paintings and their conservation, focusing on art history studies, painting technology and its development in the region, as well as sustainable approaches to painting conservation and heritage preservation. She is currently an associate lecturer of wall painting conservation at the Courtauld Institute of Art.

Joshua A. Hill
is a wall painting conservator and conservation scientist. His interests lie in wall painting technology, improving remedial and preventive conservation approaches to salt-related deterioration, and the conservation of earth and gypsum plasters. He has taught at The Courtauld Institute of Art, University of Oxford, and University College London and is currently an Academic Fellow in Cultural Heritage at Nottingham Trent University.

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INTRODUCTION — THE WALL PAINTINGS OF BHUTAN

Bhutan is home to more than 3,000 monuments, including temples, monasteries, *dzong* (monastery-fortresses), and *stupa* (Tshering 2013: 219). The devotional embellishments found in Bhutanese temples encompass not only painted sculptures, *thangka* (religious scroll paintings), and manuscripts, but also a huge body of spectacular mural painting (Shekede and Rickerby 2013). These buildings serve as repositories of the Kingdom's rich cultural and religious heritage and are intimately associated with some of Bhutan's most important political and religious histories. The patronage of visual arts and crafts has been prominent in the history of Bhutan both before and after unification in 1616. This has extended to the degree of political and religious leaders taking significant interest in the arts as practitioners themselves e.g., Pema Lingpa (1450–1521) whose taboo-breaking practices included weaving, an activity exclusively for women at the time (Aris 1994: 33) and the 25th Je Khenpo, Sherab Gyeltsen (r. 1836–1839), who was responsible for numerous renovation projects including extensive artistic commissions (Pommarett 2007: 142; Phuntsho 2013: 393).

Today, paintings on the walls of monasteries, temples, and *dzong* across Bhutan are most likely to be executed primarily, or entirely, on canvas affixed to the wall. Here we refer to these as marouflage wall paintings,[1] or in Dzongkha *reyja debri*. In contrast, the oldest wall paintings in Bhutan were painted onto earthen plaster (Shekede and Rickerby 2013: 231). When did textile supports first come to be used in Bhutan, how were they first used, and in what ways did this craft technology change over time? What characterises the transition between these two technologies and the implications for the making, and makers, of wall paintings? Were there changes in who executed these paintings? How did practices in adjacent artistic/craft production, in particular *thangka* painting and developments therein (Mass et al. 2008), influence the execution of marouflage wall painting?

The oldest surviving wall painting in a built structure in present day Bhutan date from the early 16th century and are located at Tamzhing Lhakhang in Bumthang (Aris 1988: 33; Imaeda and Pommaret 1987: 29). Pre-dating these by more than a century were paintings in the *Goenkhang* of Changangkha Lhakhang in Thimphu. However, these extraordinary 13th century paintings, with cosmological iconography unique for Bhutan, were destroyed in the 1990s in a period of extensive renovation (Neumann and Neuman 1990: 64; Aris 1994: 32) forming a significant marker in a pattern of ongoing loss.[2] Such renovation and renewal remains a threat to the wall paintings of many parts of the world, and has been an important driving force in Bhutan (Dujardin, this volume). Joining these are threats from fires, whether originating from electrical faults or loss of control of ritual or domestic flames, natural disasters such as earthquakes, and water ingress (Yeshey 2019: 20; Shekede and Rickerby 2013: 235f.).

The production of mural paintings continues to be an important aspect of the decoration of new and renovated religious buildings. Placed in the context of historic techniques, we discuss the continuity and change in production of such murals in Bhutan. The past two centuries bear evidence of changes in artistic/craft practice on the path to the current mural painting industry of Bhutan that has diverged significantly from its 18th century forebear. In addition to changes in availability of pigments and the introduction of modern synthetic materials, the vast majority of wall paintings executed in Bhutan today have a textile secondary or tertiary support (Fig. 13-1). It is this change in support, the implications

1 Derived from the French word *maroufle* referring to the sticky residue of paint (Chilvers 2009).

2 In recent years attention has been drawn to significant fragments of a pre-13th century wall painting on plaster that survive on the rock face at Taktshang (Ura 2023: 82).

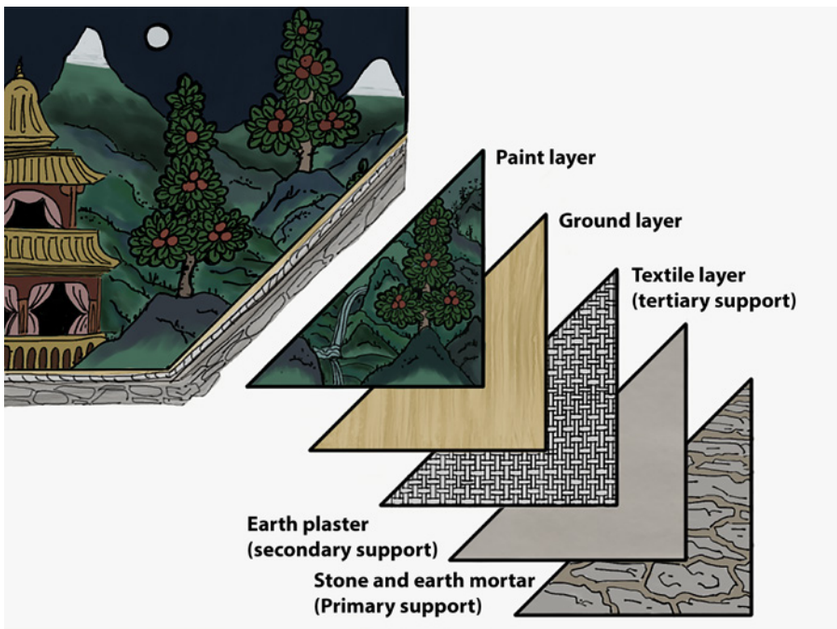


Fig. 13-1 Schematic representation of the layers of a typical marouflage wall painting in Bhutan.
Coming towards the surface these are as follows: primary support (e.g., rubble wall), secondary support (e.g., earthen plaster), sealant and adhesives (not shown), tertiary support (e.g., canvas), ground/priming layer(s), paint layers. In many instances there may be an older scheme of painting underneath the tertiary support (not shown).
Source: Lan Pu (2021).

for artistic production, and the diversity of modes of execution that will be our focus.

This paper seeks to lay the foundations for understanding the use and development of marouflage wall painting in Bhutan and describe historic production methodologies through surviving physical evidence. These findings are contrasted with contemporary craft production of marouflage wall paintings within Bhutan. Through semi-structured interviews with practitioners and observation of painting execution and installation, we will identify streams of continuity and change within these craft practices.

THE TECHNOLOGY OF WALL PAINTINGS

A large part of the significance of wall paintings is derived from their intimate physical connection to the place for which they were made. Our experience of such paintings is mediated by their relationship with the architecture of the structure. Wall paintings comprise, at minimum, a primary support and a paint layer. The primary support is the wall itself and might be made of stone, adobe, rammed earth, concrete, or a wide range of other materials. Wall paintings commonly have a more complicated structure than this with more layers in their stratigraphy including secondary supports, most commonly plasters whether bound together with lime, gypsum, earth, or another material. Other layers in a wall painting may include sealants, which modify the porosity of a support; ground layers, which modify the optical properties of the support; glazes and coatings, which modify the surface optical properties of the painting; and attachments, such as gilding or elements in relief.[3] These components can be seen in Fig. 13-2, showing a wall painting executed on an earthen plaster at Tango Monastery, Bhutan, and a sample taken from an area of gilding shown in cross-section.

MAROUFLAGE WALL PAINTINGS

Clear terminology relating to mural paintings where a textile support is present has not been established in the English language.[4] Our use of the term "marouflage wall paintings" is intended to refer to mural paintings characterised by the following features:

i. the presence of a primary support made from stone, brick, etc. that is not readily moveable;

ii. the possible presence of one of more plaster layers as secondary support; and

iii. the presence of a textile adhered to the primary/secondary support as secondary/tertiary support on at least part of the wall paintings.

Unlike a wall painting on plaster it is possible for all, or parts, of the paint layers of the marouflage wall painting to be executed off-site. At one extreme, the textile may be used as a means of preparing (areas of) the wall with the painting being executed entirely in situ. At the other is the practice of completing a paint-

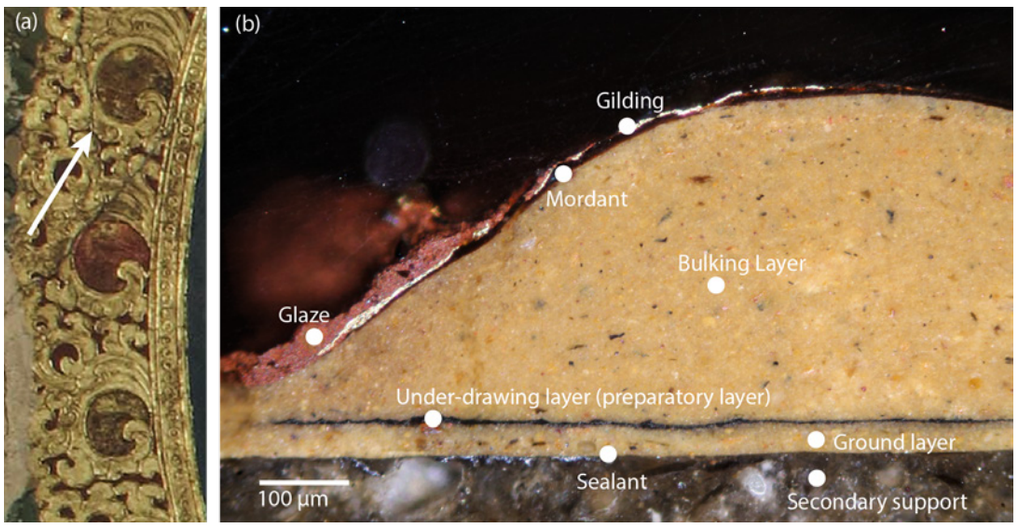


Fig. 13-2 Tango Monastery. Detail of late 17th century wall paintings in the second floor north shrine with arrow indicating location of sample (a). Sample prepared as a polished cross-section showing the stratigraphy of the painting (b). Visible in this sample are the fine earth plaster (secondary support), sealant, ground layer, preparatory paint layer, and the bulking layer for gilding, mordant, gold leaf, and paint/glaze layers (Pu 2016: 59). Not visible are underlying layers i.e. rubble wall (primary support), and coarse plaster layer (secondary support). Source: Lan Pu (2015), © Courtauld Institute of Art (CIA)/Department of Culture, Bhutan (DoC)/Lan Pu. Image ref: TNG15_2N_Nyi_S38_5582.

3 In some contexts, a piece of painted textile might reasonably be described as an attachment rather than a (tertiary) support.

4 The term marouflage is also commonly used for easel paintings on canvas or works on paper that have, at some point after their creation, been adhered to a wooden panel or board (Getty Research Institute 2018). Examples of this include Rubens' ceiling at Banqueting House in London (UK), the component canvases of which were attached to plywood boards in the early 20th century (Frame et al. 2020).

ing off-site (e.g., in the artist's studio) and later adhering it to the wall with no further painting. In between lie a large number of approaches where parts of the painting are executed on-site and parts off-site. Understanding these processes has important implications for studio practice, commissioning, and planning of paintings, as well as the preparation and use of materials. A particular focus in this paper will be the use of textiles, describing and tracking the diverse use of textile patches of different sizes and shapes.

A common feature of the production of wall paintings in a global context is that they are typically produced by teams in a workshop system. These can reflect different areas of expertise (e.g., plastering vs. painting)[5], the level of training or experience of practitioners, and a variety of organisational structures for the division and sequencing of labour.[6] This division of labour also typically reflects systems of training and hierarchies in which apprentices might be allocated laborious tasks such as material preparation and gradually be entrusted with aspects of pictorial production of increasing prominence. Such practices are attested in textual sources, including in Bhutan, for example the Fourth Druk Desi Tenzin Rabgye's biography details the leading masters and other artisan names in the workshop team responsible for producing wall paintings at Tango Monastery (Lhundrup 2005: 273).

Compared with painting on plaster, we make some initial observations on possible influences on artistic production and workshop practice:

- Painting or preparation for painting can be done off-site, for example in a studio, resulting in reduced costs associated with accommodating craftspeople on site and allowing them to spend less time working away from their studio.
- The use of textile supports for wall paintings may be influenced by practices in the production of *thangka* paintings.
- Imperfections of primary or secondary support can be readily and rapidly concealed, setting a lower threshold for the quality of finish than for wall paintings painted directly onto plaster.
- Schemes of painting could be replaced by adhering a new scheme on top of an existing scheme painted on plaster or by removing and replacing an existing adhered textile.
- Marouflage wall paintings may be perceived as being removable and/or portable. Removal will invariably lead to substantial physical damage to the painting, but may be considered a viable option to relocate the paintings or to allow structural work to be undertaken.

Regional and global technological context

The use of tertiary supports, in particular textiles and paper, in wall paintings has important precedents in the region and in Asia more widely. However, in each instance, the examples found tend to be the exception rather than the rule in their own technological contexts. In Ladakh, for example, painted textiles adhered to wooden boards were used in the late 10th/11th century ceiling paintings in the Tabo Main Temple (Luczanits 2014: 110; Kalantari, this volume).[7] These paintings exist in the context of contemporary temple paintings where ceilings are commonly painted to imitate textiles but the paint layers are most-commonly applied directly to the wooden ceiling boards (Papa-Kalantari 2007: 159).

At Bagan (Myanmar) cloth appears to have been used from as early as the 11th century, embedded in the uppermost plaster layers of some statues and potentially as a surface preparatory layer in some areas for wall paintings. Detailed characterisation of the latter use is not currently available (Oo 2015).

At the Mogao Grottoes (Gansu province, China) Cave 465 features at least one figure reportedly painted on paper and pasted to the earth plaster walls (Kogou 2017: 140). The tantric Buddhist iconography of this cave is unusual for Dunhuang. The paintings on plaster have been variously dated to the 9th, 11th–13th, and 13th–14th centuries (Kogou et al. 2020) but the relative dating of the painting on paper, which appears to be adhered over existing paintings, is currently unclear.

A related technology exists in Korea, where paper has been used as a tertiary support for entire wall paintings. At present there is one extant example of this technology, which is found in Daeung-jeon Hall of Heungguk-sa Temple and has been dated to 1690 (Hanrim 2008; pers. comm. by A. Hahn[8]).

In the Jokhang Temple in Lhasa, Tibet, the paintings in the pilgrimage corridor, which have been loosely dated between the late Qing dynasty and 1980s, reportedly feature a layer of silk as tertiary support (Wang 2014). Also in Tibet, Gazhi Lhakhang, Gyantse, contains

5 An account of the construction of Tamzhing Lhakhang in 1501–1505, for example, shows that plastering and painting were separate areas of expertise "Meanwhile the plastering of the walls of the *mdo-khyams* vestibule (A) had proceeded under the supervision of lama Chos-rgyam (who had earlier supervised the woodwork) and they were now ready to be painted" (Aris 1988: 35).

6 Production within a workshop has been the historic norm for wall paintings from medieval England (Howard 1993) to ancient Egypt (Rickerby and Wong 2016: 150).

7 For further photographs of Tabo Main Temple see online: https://luczanits.net/galleries/index.php?/category/72 (accesed: 30.10.2021).

8 Amanda (Yeonjoo) Hahn, Courtauld Institute of Art / Korea Cultural Heritage Foundation, 11/03/2021.

wall paintings executed with a paper tertiary support. They are not securely dated but are thought to date from shortly after the construction of the building in the mid 18th century (Yang et al. 2019). The paper layer was found sandwiched between two yellow ground layers with the possibility that the paper was used to prepare the surface of the wall for painting; the authors point out a similar common use of paper in China in *cǎihuà* — decorative painting on, typically wooden, architectural elements.

Early examples outside of Asia include paintings at Maryam Dengelat in Ethiopia, dating to the second half of the 17th century (Priday et al. 2021: 34). In Europe, the practice of marouflage reportedly emerged in Italy in the late 16th century and spread across Europe, though its technological development has received little specialist study (Koller 2005). While the technique of adhering canvas to walls only became popular in Great Britain by the end of the 19th century (Willsdon 2000: 61) there were longer histories of related large scale, painted textiles used for interior decoration up to the 17th century, which were mechanically fixed (i.e. nailed) to walls rather than glued (Mander 1997).

HISTORIC MAROUFLAGE

A suitable textile is an essential component of marouflage wall painting. Bhutan has a vibrant history of producing hand-woven textiles, the most common weaving loom being about 1 m wide. Textiles from neighbouring areas have long been traded into Bhutan, for example from Cooch Bihar and Kamarupa or Kamrup (Assam) since at least the 17th century (Pommaret 2000). An 1860s account of Bhutan by a visiting French missionary detailed in Myers and Pommaret (1994: 58) describes local textiles being sold in the streets along with British, American, Russian, Nepalese, Indian, and Chinese textiles. Prior to this, a source of ca. 1760 detailing both tax receipts and gifts to the public made during the reign of Sherab Wangchuk, the 13th Druk Desi (r. 1744–1763), makes reference to *"bha ra ha ti"* or *"bha ras ha sti"* — a thin cotton "used for lining walls before painting" (Aris 1994: 39). This points to potential earlier practice of marouflage than known surviving examples in Bhutan today.

SURVEY

As part of this research a survey of wall paintings in the Paro and Thimphu districts was undertaken. Additional sites from other regions of Bhutan are also discussed for comparison. The survey led to the study of five sites in detail, totalling 13 spaces containing marouflage wall paintings.[9] The dates of the examined paintings span the period of 1839 (Kyichu) to 1997 (Tango 2nd floor corridor). Among these examples we observed significant diversity in materials and practice, including within individual schemes. In most cases, marouflage is employed for the purpose of covering a wall, or part of a wall, and creating a new scheme. However, the decorated architectural surfaces differ in size and shape meaning that installation or execution of the painting may be more or less challenging. There are other occasions when a canvas patch is added to a wall with no intention of creating a new scheme but rather to adjust an existing scheme, in which case the canvas patch is often cut into a shape directly related to the subject matter. Overall, the execution of a marouflage wall painting involves two major interdependent parts — painting on a canvas (off-site or on-site) and adhering canvas(es) to the wall. Importantly, the approaches used to execute these paintings will inevitably depend on both material resources and the experience, skills, and technological preferences of the practitioners. The following sections discuss examples of marouflage wall paintings that illustrate the wide range of reasons for using a textile tertiary support in wall paintings. The grouping is according to use, rather than by chronology or site, and is primarily based on surviving physical evidence.

WHOLESALE CHANGE OF EXISTING DECORATION

Most of the examples of marouflage studied in this paper were observed on top of existing, earlier schemes of painting, meaning the marouflage was used to change or renew the interior design of a space. The surface for attaching a tertiary support may not necessarily be a newly prepared plaster layer (or other prima-

9 Site investigations were carried out in Dumtseg Lhakhang and Menchuna in Paro, Tango Monastery in Thimphu. Studies on Kyichu Lhakhang in Paro and Khandro Sonam Pelden House in Thimphu were based on secondary sources.

ry/secondary support) but may be directly onto a surface bearing existing decorative paintings. The pre-existing decorated surfaces might be fully painted with figurative subject matter, which the application of a marouflage entirely conceals and replaces (case 1); or in other cases, the pre-decorated surfaces were simply painted with a single colour (normally yellow) and perhaps adorned with a decorative upper register and dado[10]. The marouflage then covers the colored main part of the wall and joins, or partially replaces, the existing upper register and dado (case 2).

Case 1: Dumtseg Lhakhang (0F, internal and external circumambulatories) and Kyichu Lhakhang (Dukhang)

Schemes observed in two early sites, Dumtseg Lhakhang and Kyichu Lhakhang, demonstrate the execution of marouflage as a way of concealing an older painting scheme rendered on plaster. Dumtseg Lhakhang in the Paro Valley was built by Thantong Gyalpo in the 15th century. More commonly known for his works as "The Iron Bridge Builder", he was also involved in the design of Buddhist monuments in Tibet. The structure is a *chorten*-like three-storey building that represents a mandala (Pommaret 1997: 216). The ground floor has both internal and external circumambulatories while the two upper floors each hold their own circumambulatory. Paintings at Dumtseg are spread across all the spaces with multiple schemes and periods of renovation. It is beyond the scope of this paper to consider all of the schemes but we highlight the variety of approaches to the use of tertiary textile supports at Dumtseg. The Lhakhang was restored under the patronage of the 25th Je Khenpo in 1841. While Pommaret has described that "all the previous paintings were effaced" (Pommaret 1997: 216), there is evidence of older schemes of painting on plaster underlying those currently visible on the surface. These are evident both in areas with damage to overlying canvas (Shekede and Rickerby 2012: 42) and due to the recent removal of an altar in the ground floor inner circumambulatory that had concealed paintings on the wall behind (CERS 2019). (Fig. 13-3) This suggests that any marouflage wall painting present at Dumtseg dates to no earlier than 1841. More recently, Dumtseg Lhakhang was

10 The dado is the lower part of the wall, typically extending roughly 1 m from the ground. This part is often simply painted as it is particularly susceptible to wear and deterioration. In a Bhutanese context the dado, where present, is commonly painted in red.



Fig. 13-3 An earlier painting on plaster was revealed at Dumtseg Lhakhang, ground floor internal circumambulatory, surrounded by later marouflage.
Note that the painting on plaster is likely to have been subject to restoration (repainting) in 2017–2019.
Source: Karma Yeshey (2021), © DoC/ Karma Yeshey.

the subject of a conservation-restoration project in 2017–2019 under the patronage of The Royal Grandmother, Ashi Kesang Choden.[11]

Kyichu Lhakhang is located in Paro, and purported in legend to be one of the 108 temples built by Songtsen Gampo in the seventh century (Bartholomew 2008: 44). The site was renovated and redecorated in 1839 by the 25th Je Khenpo, Je Sherab Gyelshen (Pommaret 2007: 131; Dorje 2004: 113), the same patron who sponsored the renovation at Dumtseg three years later. A scheme of marouflage was identified in Kyichu Dukhang (assembly hall), likely associated with the 1839 period of renovation, and is currently the earliest dated marouflage in Bhutan (Shekede and Rickerby 2013: 232).[12] The marouflage in Kyichu Dukhang covers the entire wall behind the main statue. The large marouflage scheme was assembled from imperfectly matching individual canvas patches (see further discussion below). The patches overlap in places and in others there are gaps between canvas patches: the latter were supplemented with additional in situ painting aimed at concealing this gap and visually integrating the patches. Visual examination and technical analysis have confirmed the presence of an existing, older painting scheme underneath the marouflage scheme (Shekede and Rickerby 2012: 40).

Case 2: Tango Monastery (*utse* 1F, west chapel)

Tango *utse* (central tower) is a three-storey building founded by the Fourth Druk Desi Tenzin Rabgye in the Thimphu Valley and was constructed in 1688–89 (Ardussi 2008: 94). As of 2013, the building comprised 24 rooms, 16 of which were decorated with paintings on various supports: earthen plaster, wood, and canvas.[13] Apart from four original wall paintings on plaster that were made during the late 17th century, the rest of the paintings were gradually added over the following three centuries. The west chapel of the first floor (1F) contains a marouflage wall painting dated to no later than the mid-20th century with evidence through historical photographs and support of scientific analysis (Pu 2023: 326). Canvas pieces employed in the room were approximately 2 m in height and wide enough, whether alone or in combination, to cover most of the wall surface. Physical evidence indicates that, prior to the execution of the marouflage, the room was initially simply painted in yellow with a decorative upper register and plain red dado (Fig. 13-4).

Later, additional marouflage was used to redecorate the entire space with two separate themes, one dedicated to Guru Rinpoche and the other depicting the landscape of Lhasa.



Fig. 13-4 A fragmentary piece of marouflage from the 1F west chapel at Tango Monastery.
Grey earthen plaster (secondary support) and earlier yellow painting were exposed from the lost surrounding area. The painted canvas was adhered to the pre-existing plain yellow paint; losses on the canvas reveal the similarly coloured additional yellow ground used to prepare the canvas before painting.
Source: Lan Pu (2017), © CIA/DoC/Lan Pu.

11 Online: http://www.cers.org.hk/index.php/en/preserving-culture/culture-and-history/260-dumtseg-monastery-a-project-a-memory (accessed: 30.10.2021).

12 Interpretation of Kyichu marouflage was based on previous technical studies in Shekede and Rickerby (2012: 38ff.).

13 A renovation carried out since 2014 resulted in the detachment of marouflage wall paintings and wooden panel paintings from their original locations.

The whole marouflage was removed in 2014, and painting residues left on wall edges suggest that the painting scheme extended across canvas to wall plaster—indicating the painting was possibly, at least partly, an in situ practice. Under such a scenario, the canvas applied in the room may not function as a method of transferring studio painting to an architectural space, but as a convenient method to prepare the wall surface for painting in situ (compare with case 1: Tango 2F east chapel).[14]

REPAIR OR MODIFICATION OF STRUCTURAL SUPPORT

Case 1: Tango Monastery (2F, east chapel)

As for the 1F west chapel at Tango, the east chapel on 2F at Tango was initially painted in yellow with a decorative upper register and plain red dado. Additional canvas and figurative paintings were applied later, sometime during the 19th century (Pu 2023: 317). In contrast to the employment of canvas in the west chapel, the east chapel only used canvas strips in selected areas to cover cracks in the wall (Fig. 13-5). An additional yellow ground layer was then applied over the entire surface including both plastered walls and canvas strips, followed by execution of figurative painting. The continuity of the painting scheme across plastered wall and canvas indicates that the painting was executed in situ. The use of canvas strips here was clearly a convenient way to fix structural imperfection and to prepare a better surface for painting. Both Tango 1F west chapel and 2F east chapel demonstrate that marouflage practice includes painting on-site, where the canvas can function as a convenient tool for surface preparation.

Case 2: Dumtseg Lhakhang (ground floor)

The outer wall of Dumtseg's ground floor external circumambulatory was fully decorated with a figurative painting scheme on plaster. In addition to this scheme, a long canvas patch was at some stage applied on top, adding three more vertically arranged figures to the scene (Fig. 13-6).

More importantly, the additional marouflage piece covered part of the existing scheme and sealed a structural opening. Landscape elements on the additional marouflage do not match with the surrounding existing painting and the figures form an independent scene, suggesting that it was largely prepared ex situ and later added. However, some effort was clearly made to integrate the lower part of the painting with the existing scheme using a stylised mountain landscape. Unlike the canvas strips used at Tango, which functioned as a surface preparation tool for in situ painting, the employment of an already-painted canvas piece here results in both a modification of the existing painting scheme and the concealment of an opening.

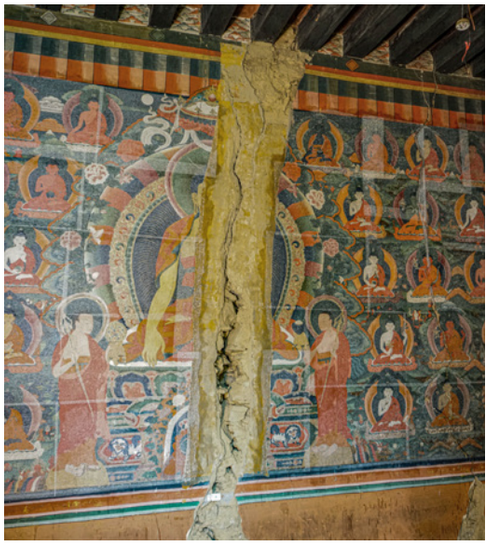


Fig. 13-5 Strips of canvas were attached to the wall at the 2F east chapel in Tango, covering structural cracks and preparing a smooth surface for in situ painting.
Canvas strips are absent from this photo as they were detached from the wall in 2014.
Source: Lan Pu (2015), © CIA/DoC/Lan Pu.



Fig. 13-6 A separate canvas patch attached to the painted wall at Dumtseg external circumambulatory (ground floor) was used to seal a window opening (left).
The shape of the canvas patch and concealed window, based on the pattern of dirt deposition, is marked in the diagram (right).
Source: Karma Yeshey (2021) and Lan Pu (2021), Photo: © DoC/Karma Yeshey. Diagram: © Lan Pu 2021.

14 Scientific analysis and visual observation both suggested that a yellow ground layer was a common preparatory method used in Bhutanese wall paintings. The additional marouflage found in Tango's 1F west chapel also contained a yellow ground applied on top of the canvas. Scientific analysis demonstrated similar chemical components between the pre-existing yellow surface and the additional yellow ground on top of the canvas, which highlighted the peculiar employment of canvas as described above (Pu 2023: 238).

MODIFICATION OR ENHANCEMENT OF PAINTING SCHEME

Case 1: Menchuna (side chapel)

Menchuna in Paro was founded by Tsang Khenchen (1610–1684) in the second half of the 17th century after his exile from Tibet (Maki 2017: 103). Tsang Khenchen has been described as a pioneering artist in Bhutanese history who provided artistic training to local Bhutanese (Ardussi 2008: 90). Menchuna is a single-floor square structure which is divided into four spaces: a shrine on the north side without painting, a shrine and a side chapel on the east, and a main hall on the west. The majority of wall paintings at Menchuna are executed on plaster. However, in the side chapel, wall painting on plaster has been modified by the application of canvas patches. These patches are cut to shape, covering and replacing three of the figures depicted. (Fig. 13-7) It is unclear whether this selective replacement of figures was motivated by a desire to repair damaged, but iconographically important, figures or conversely a desire to change something about the figure depicted–whether their whole identity or some other facet. The execution of these painted canvas patches is often associated with areas of repainting of the background and, in some cases, of adjacent figures. In their current appearance, however, parts of the underlying figures can be seen to protrude from the sides since they are incompletely covered by the canvas patches.

Case 2: Family home of Khandro Sonam Pelden

The family home of Khandro Sonam Pelden is located in Wang Danglo village in Thimphu. The house is believed to be the birthplace of the noble Khandro Sonam Pelden from the 13th century.[15] The building and its marouflage wall paintings are of unknown dates. The scheme based around Khandro Sonam Pelden appears to be executed on a large piece of canvas. However, two additional small canvas patches have been used on top of the main patch, on which are individually depicted the father and mother of Khandro Sonam Pelden (Fig. 13-8). It is unclear what the purpose of these original patches was but their precise integration with the rest of the painting implies they are part of the original production, in contrast with Menchuna (Case 1).[16]

15 Khandro Soman Pelden was the consort of Phajo Drugom Zhigpo (attributed variously 1184–1251 or 1208–1275 (Dargye & Sørensen 2001: X)).

16 The site is only known to the authors through the images online at: https://mandala.library.virginia.edu/places/21087/photos/nojs (accessed: 3.10.2021).

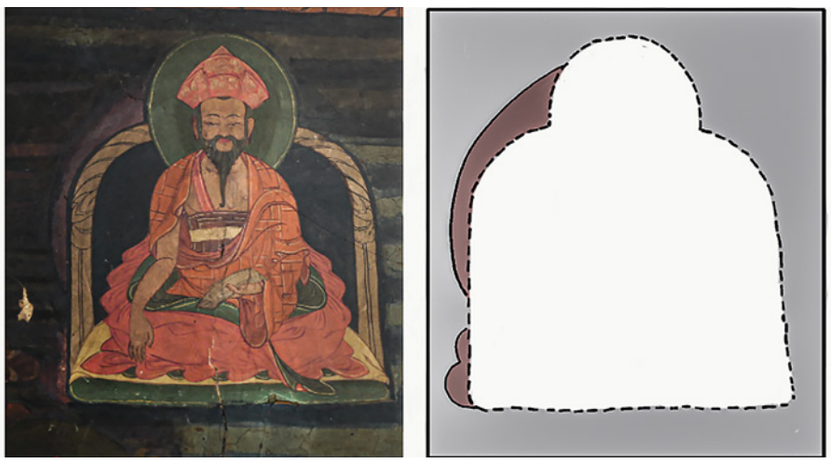


Fig. 13-7 A portrait of Shabdrung Rinpoche found on the south wall of the side chapel at Menchuna.
The portrait was made on a canvas patch and cut to the shape of the design. The canvas patch was attached to the wall and replaced an old, unidentified figure from the existing scheme. The edge of the seat of the old figure remains visible, behind Shabdrung Rinpoche's proper right seat back. To his proper left the background has been repainted (on plaster), potentially concealing other parts of the underlying figure.
Source: Karma Yeshey (2021) and Lan Pu (2021). Photo © DoC/Karma Yeshey. Diagram © Lan Pu 2021.



Fig. 13-8 A portrait of the mother of Khandro Sonam Pelden making an offering of milk to Khandro Sonam Pelden.
The figure is executed on a patch of canvas closely fitting her shape. The inscription to the right appears to cross over the small patch onto the rest of the painting. The daughter of Khandro Sonam Pelden can be partially seen on the right (hands holding basket of fruit) and is painted on the main canvas patch.
Source: Sonam Chophel (2.7.2017), CC BY-NC 4.0.

Case 3: Dumtseg Lhakhang (ground floor external circumambulatory)

Another case of adding canvas pieces to a complete large marouflage scheme was discovered on the inner wall of Dumtseg's ground floor external circumambulatory. Large marouflage schemes (ca. 3 m in height) decorate the spaces between the upper register and the dado. Additional canvas patches with repeated imitation-gilded six-syllable mantra of Avalokiteshvara (*oṃ maṇi padme hūṃ*) and fictive brocade borders were added to the upper part of the dado. This feature, which conceals the edge of the large, figurative marouflage scheme, is not necessarily coeval with the main scheme. In some areas this dado border appears to be executed on a long piece of textile and is of one gilding colour. However, elsewhere, it is assembled from multiple pieces. It is clear from Fig. 13-9 that the six-syllable mantra was gilded in different colours and on separate patches. The imperfect matching of the patches and incomplete coverage of the wall indicates that these were likely originally painted ex situ. In this area it seems likely that ready-made patches were cut and rejoined to fill the space in this area of the painting.



Fig. 13-9 Additional dado border decoration found on the inner wall of Dumtseg ground floor external circumambulatory.
Syllables on separate canvas patches with different colours were assembled to form the complete mantra of Avalokiteshvara.
Source: Karma Yeshey (2021), © DoC/ Karma Yeshey.

DIVERSITY OF CANVAS USE

Case 1: Dumtseg Lhakhang (1F, outer wall)

The outer wall of the first floor circumambulatory at Dumtseg appears to use a large canvas to cover the entire wall where the canvas piece with a width about 3 m (employed vertically).[17] Large figures were painted in the spaces between window openings while smaller figures were added in fragmentary spaces such as underneath windows and around the upper register. Compared with marouflage paintings at Kyichu, where figurative compositions were limited by the size of canvas, the apparently uninterrupted canvas surface enabled the creation of large and coherent subject matter. The employment of large canvases can be seen in many other spaces, such as parts of Dumtseg, Tango Monastery, and Paro Taktsang (Tiger Nest).

In most cases, the composition of a marouflage, like other wall paintings, must take account of the needs of a space, meaning the painting will be affected by the architecture. As mentioned, the canvases on the outer wall of Dumtseg 1F were installed in a space that contains window openings. The painting composition specifically accounts for the available surface area, demonstrating successful space measurement and planning as part of the painting process. This is in contrast with the next example.

Case 2: Tango Monastery (2F, east corridor)

Another interesting case showing the relationship between marouflage making and space planning can be seen at the second floor east corridor in Tango Monastery. The majority of the walls in the space were covered by



Fig. 13-10 Dumtseg first floor.
The outer wall (left side of image) was executed on large canvases and maximises the use of the available space, taking into account architectural features such as window openings.
Source: Karma Yeshey (2021), © DoC/ Karma Yeshey.

17 To cover the entire area it may have been necessary to stitch canvas patches together or to overlap patches, though we did not observe evidence of this in situ.

canvas of ca. 1.8 m in height, likely dating to 1997.[18] Physical evidence suggests the large marouflage (including figurative scheme and upper register) was painted off-site and subsequently installed in the space. Interestingly, in addition to the large, continuous canvas pieces, there are small canvas pieces found in two different contexts which were cut to match the painted subject matter. The first context is in small areas of wall space such as above doorways and on side walls. Additional painting was then carried out in situ onto the surrounding wall, creating a background landscape, that visually integrates the canvas patches with the overall scheme. This may indicate that the space measurement and planning was less carefully made in this case, subsequently leading to the employment of a more flexible method to fill fragmentary spaces by using cut-to-shape canvas patches. The painting surviving on the plaster in Fig. 13-11 (after the removal of the canvas) is comparatively simple, indicating that installation may not necessarily be carried out with highly experienced painters on site.

The second scenario of small canvas patch use was found where additional subjects were placed on the edges of large marouflage schemes. Differing from the case identified at Menchuna, cut-to-shape patches were often found in painting where the additional patches do not change the subject matter but rather unify the composition of the installed marouflage wall painting. A charming example was identified from the Tango 2F east corridor, west wall. The pictorial field of this wall is primarily executed on a large piece of canvas. However, along the bottom edge there is a strip painted on plaster along with some patches cut into the shapes of a small crane, an offering bowl, a group of flowers, and patches of stylised trees which span the canvas edge and plaster (Fig. 13-12 and Fig. 13-13). While at first, these might appear to be an interesting way to help conceal the canvas edge, the surviving evidence suggests an alternative possibility. Between the flowers and trees at the very edge of the large canvas patch is a small piece of painting in yellow and red, an apparent remnant of an object (Fig. 13-12). The large canvas may have been made too tall for the installation space (not leaving enough space for the dado) and so had to be resized, likely on site. This may have involved cutting a strip off from the bottom of the painting. However, to ensure that the figurative elements were not abruptly cut in half, the canvas had to be made too short for the space and the small crane and other features were salvaged from the existing excess canvas before the composition was reconstituted with these supplementary plaster patches and strip of painting on plaster.[19]



Fig. 13-11 Iconographic cut-to-shape marouflage attached to the wall during the adhering process followed by in situ painting with landscape to integrate canvas patches into a holistic pictorial scheme.
An example identified in the 2F east corridor (south-east wall) at Tango. The canvases were detached in 2014, leaving behind landscape elements on the wall and the silhouette of previous canvas pieces. Source: Lan Pu (2017), © CIA/DoC/ Lan Pu.

Case 3: Kyichu Lhakhang

The marouflage at Kyichu Dukhang is a large scheme assembled from small canvas patches as described by Shekede and Rickerby (2012). The support consists of roughly rectangular canvas pieces reportedly measuring 90 × 80–105 cm (ibid.), attached to the wall with some of their edges overlapping one another. The incomplete coverage of the wall leaves some gaps in between the canvas patches, which appear to have been painted after the installation of the patches to unify the painting. Losses of the upper paint layer in these interstitial areas reveal parts of a pre-existing scheme of painting. The painting composition on each canvas piece shows a relatively independent and complete painting subject, with figures and architectural elements confined to individual patches. Taken collectively, the scenes create a larger and more complicated scheme.

18 The dating is based on an interview with a Bhutanese colleague who was familiar with the artist.

19 This scheme was removed in 2014 so it is not possible to compare the canvas supports of the small patches with the main patch. The wall opposite the one shown is consistent with there having been problems with a size mismatch of the wall space and canvas. We can only speculate as to the reason for the mismatch between painted scheme and installation space.



Fig. 13-12 The bottom edge of the large canvas is visible in the lower part of the image, on top of which, the offering bowl on the left, the stylised trees in the middle, and the group of flowers were added as separate canvas patches (west wall of the 2F east corridor at Tango).
The tiny yellow and red paint remains on the edge of the large canvas (between the trees and flowers) is most likely a remnant of an object, evidence for resizing during installation.
Source: CIA/DoC (2013).

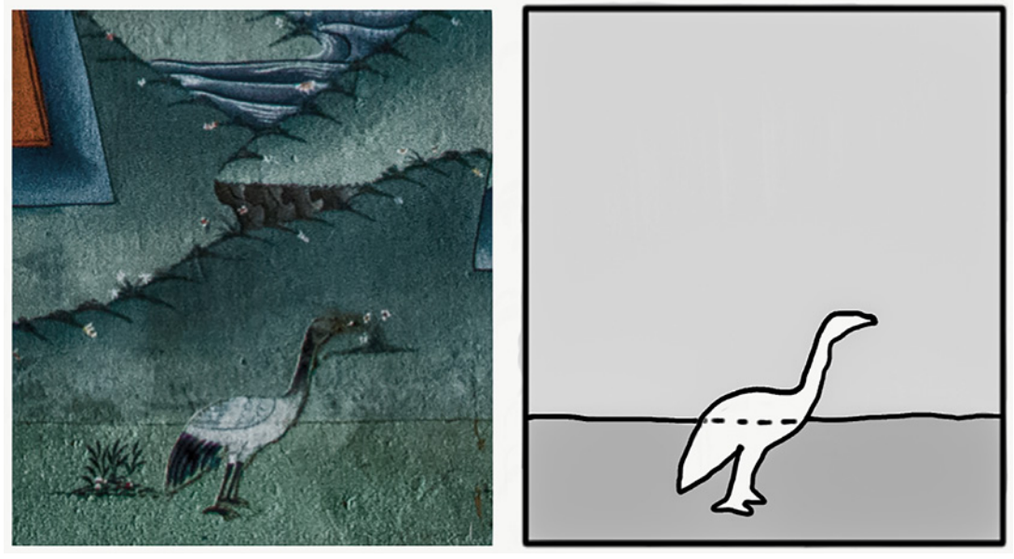


Fig. 13-13 A small crane painted on a separate canvas patch and attached to the landscape of a larger marouflage scheme, on the west wall of the 2F east corridor at Tango.
Along with three other surviving canvas patches at the bottom edge of the main canvas (Fig. 13-12), this points towards an inventive solution to installing a pre-painted canvas that was mismatched in size with the installation space.
Source: Lan Pu (2021) and CIA/DoC (2013). Photo © CIA/DoC, 2013.
Diagram: © Lan Pu 2021.



Fig. 13-14 Dumtse 1F, inner wall. Overlapping canvas patches in the form of a grid of strips and multiple large pictorial canvases with roughly cut edges. The strips are first laid out with large gaps left between them (vertical over horizontal). The large pictorial patches are then glued into those spaces, overlapping with the narrow strips.
Source: Karma Yeshey (2021) and Lan Pu (2021). Photo © DoC/Karma Yeshey. Diagram © Lan Pu 2021.

Case 4: Dumtseg Lhakhang (1F, inner wall)

As at Kyichu, the large marouflage composition on the inner wall of Dumtseg first floor was assembled through a group of smaller canvas patches. In this case, however, coverage of the wall was achieved in a very different manner. Both long canvas strips (ca. 10 cm wide) and rectangular canvas patches (ca. 30 cm by 60 cm) were utilised in a more complex arrangement. The entirety of the pictorial surface of Dumtseg Lhakhang 1F inner wall is lined with textile, the plain weave of which is visible in much of the painting. The yellow-brown ground is visible in areas of loss and is scantily applied across much of the surface.

Through visual examination of the overlapping patches it is evident that the long strips were first adhered to the wall in a grid pattern, followed by the large rectangular patches bearing the major pictorial scenes (Fig. 13-14). The purpose of the long strips was to fill in any gaps between the rectangular patches. The rectangular canvas patches were applied in a sequence from top to bottom. The major pictorial areas exist on the rectangular patches, which are adhered on top of the grid of strips and in many cases partially overlap one another, thus concealing areas of painting (Fig. 13-15). Figures are confined to the rectangular patches which are visually unified with stylised mountain landscapes and clouds bridging across the patches.

The concealed raised gilding of a throne in the left of Fig. 13-15, a feature repeated in at least two other places within this scheme, demonstrates that the major figures were executed (likely off-site) before the canvas was adhered to the wall. The landscape and cloud elements that cross over rectangular patches and underlying strips were painted later, or at least modified, on site to unify the painting. The significant degree to which the canvas patches are mismatched in size with the space available at Dumtseg 1F inner wall begs the question: why? A number of observations are pertinent here:

i. The main canvas patches have roughly cut edges consistent with having been cut under tension, for example from a stretcher as commonly used for *thangka* (Jackson and Jackson 1984: 142f.)[20] and

20 The edges of painted textile *thangka* are normally concealed under the mount, meaning that a cleanly finished edge is not of particular importance.



Fig. 13-15 Dumtse 1F, inner wall. Overlapping canvas patches in the form of a grid of strips and multiple large pictorial canvases with roughly cut edges. The top left patch is partially concealed by the bottom left patch as evident by the texture of the raised gilding on the throne visible through the covering canvas.
Source: Karma Yeshey (2021), © DoC/Karma Yeshey.

ii. many of the rectangular patches overlap with each other, but the amount of overlap is variable around the inner wall.

The physical evidence is consistent with a variety of scenarios that warrant further consideration. First, perhaps the careful measurement and fitting of canvases was not considered important. This seems unlikely given the extra work required in adapting the paintings where overlap of studio-painted canvases is substantial. Second, it is possible that the canvases were not originally intended for this space but were instead first designed as *thangka* or, more likely on the basis of composition to adorn a different space as marouflage. Third, the dimensions may have been driven by other technological factors, such as availability of certain widths of cloth or of stretchers of particular dimensions. By dividing the figures in this way it would, in principle, allow for parallel production i.e. with different figures simultaneously being produced on different pieces of canvas, potentially by a variety of (groups of) artists.

DISCUSSION

The examples discussed above illustrate a wide range of practice in the use of canvas for marouflage wall paintings in Bhutan. There continues to be variety in how canvases are used but the use of small rectangular patches is confined to the earliest marouflage paintings, such as at Kyichu (dating from 1839), which demonstrate artistic production that may be limited by the size of canvas, with important figurative elements not designed to span multiple canvas patches. Later paintings use a combination of large rectangular fields and patches cut to figurative or architectural shapes. Paintings such as those in Tango 2F east corridor (1997) demonstrate a flexible approach by practitioners to integrating their paintings into architectural spaces. A unifying feature is a clear aspiration to make the paintings integrated into the architectural space and conceal the edges of any canvas elements. Doing so may involve the addition of large canvas patches, for example at the upper register, small canvas patches, and/or painting over the edge of the canvas onto adjacent plaster or canvas.

This survey of Bhutanese marouflage has explored aspects of the diversity of historic painting practices and illustrated their close relationship with earlier and co-existing practices of painting on plaster. We hope that further investigations will be undertaken into this technology, including of the textiles used for marouflage (weave patterns and counts, fibre type), the adhesives used to attach them to the wall, and the processes of preparing walls to receive the cloth. Detailed analysis of textiles may reveal information about trade routes, the availability of resources, and potential connection to state acquisition and distribution of goods (Aris 1994: 39).

The evidence gathered here points towards the likelihood that marouflage wall painting practice emerged in Bhutan alongside the availability of mechanically-produced textiles, but a crucial question remains: why did marouflage start in Bhutan and replace highly sophisticated wall painting practices? We now contrast these historic marouflage wall paintings with the systems of production of marouflage wall paintings in Bhutan today, considering workshop practice, training, materials, and technological change.

CONTEMPORARY PRODUCTION OF MAROUFLAGE WALL PAINTINGS IN BHUTAN

In Bhutan, the traditional arts and crafts as practiced today are categorised into 13 domains known as *Zorig Chusum*[21] (Dujardin, this volume). *Lhazo* or painting, encompasses the art of mural or *debri* painting; scroll or *thangka* painting; decorative painting on statues; and painting on wood (Dorji 2015: 196). The traditional painters are called *Lhadrips* (one who makes drawings of *lha*—higher beings). As indicated in the Bhutanese term, many of the artists have traditionally dedicated their work to religious objects, including murals, *thangka*, and sculptures. Today, there is a nascent fine art scene emerging, especially in the capital, Thimphu. Artists are seen adapting concepts and traditional motifs into their fine art pieces. In traditional style Bhutanese architecture, wooden architectural features are still commonly ornately decorated with carvings and paintings, even for ordinary vernacular dwellings, though there are significant currents of material and stylistic change (see Dujardin, this volume). Focussing on the contemporary practice of *debri* painting, here we summarise the findings of semi-structured interviews with marouflage wall painting practitioners, one of whom is also an instructor at the National Institute of Zorig Chusum in Thimphu.

TRAINING AND TRANSMISSION

Lhazo is taught as one of the 13 traditional arts and crafts at the National Institute of Zorig Chusum in Thimphu (established 1971) and at the Trashiyangtse Institute of Zorig Chusum (established 1997) in Trashiyangtse, eastern Bhutan. Before the existence of such institutes, painters learnt the art directly from their masters, during long apprenticeships. It is also common for painting to be passed down through the generations within family lineages.

Students at Zorig Chusum institutes undertake a year and a half course for NC 2 (National Certificate 2) and two years for a course in NC 3 (National Certificate 3) in *lhazo* (Lhazom n.d.: 93). On completion of NC 2, students are qualified to paint on wooden architectural elements and furniture. Some of these students will progress to NC 3, which allows them to execute wall paintings and *thangka*. The National Certificate structure was adopted in 2018. When the Thimphu institute started in 1971, the course duration was indefinite, so trainees left the institute as and when they felt they were sufficiently qualified. From 1986 onwards, the formal course duration was set at 11 years. In 1999, the course duration was further reduced to six years.[22] Interviews showed a slight discrepancy, however, with one individual training for ten years from 1991 and another training for five years from 1999.

Courses on painting of murals, scrolls (*thangka*), and decorative surfaces are not taught separately. All the interviewed artists said they have been working on both murals and *thangka*. However, they indicate a perception that scroll paintings demand higher acumen and attention to detail as compared to murals and paintings on decorative architectural surfaces, due to their scale and typical viewing situations. Students, therefore, gradually progress from making paintings on decorative surfaces onto mural and scroll paintings. As interviewee Thinley Norbu described "I do paint murals as well as *thangka*. There are certain differences in painting practices between the two. In painting murals, we cannot be as meticulous and as assiduous (owing to the scale and time involved) as we are with *thangka*."

Traditional *lhazo*,[23] in Bhutan, typically revolves around Buddhism. A crucial aspect of this is the ability to produce definite iconometric proportions in relation to descriptions from Buddhist texts. Artist instruction manuals and guidebooks provide important visual interpretations and demonstrations of these iconographies. According to our interviewees, students in their initial stages begin by learning iconographic mensuration[24] and line drawings. Students gradually progress onto drawing symbols and in their final stages, they become competent at making complex images of deities and Buddhas of the Buddhist pantheon (Phuntsho 2017).

The National Institute of Zorig Chusum in Thimphu at the time of writing (September 2021) enrols 193 trainees (male: 147, female: 46), out of which, 75 trainees (male: 70, female: 5) are undertaking courses in *lhazo*. The Trashiyangtse Institute of Zorig Chusum has 124 trainees.[25] Courses in painting and clay sculpting are particularly popular amongst the students there.

21 The 13 categories are: (1) calligraphy or *yigzo*, (2) painting or *lhazo*, (3) carving or *parzo*, (4) clay sculpture or *jinzo*, (5) metal casting or *lugzo*, (6) silver and gold smithery or *trözo*, (7) needlework or *tsemzo*, (8) woodwork/ carpentry or *shingzo*, (9) textile production or *thagzo*, (10) papermaking or *delzo*, (11) bamboo craft or *tsarzo*, (12) black smithery or *garzo*, and (13) masonry or *dozo*.

22 http://www.nizc.gov.bt/?p=44

23 The term "traditional *lhazo*" is used here to distinguish from contemporary Bhutanese fine art, which may also be referred to as *lhazo*.

24 Mensuration refers to the reproduction of lengths and areas from specified angles and dimensions, for example in adhering to iconometric guidelines.

25 Tshering, Vice Principal, National Institute of Zorig Chusum, Thimphu, personal communication, 22.9.2021; http://tizc.bt/

LEGAL/PROFESSIONAL CONTEXT

According to the Regional Office of Economic Affairs, anyone can apply for a license to operate a painting firm. The licensing requirement is for maintaining tax records as a business entity rather than regulation of professional practice.

CONTEMPORARY METHODOLOGY OF MAROUFLAGE WALL PAINTINGS

Patrons approach artists and their workshops through referrals from previous clients as well as through word-of-mouth. Interviewed artists suggested that the patron almost always commands the subject matter of the murals according to their practice or their tradition (Buddhist sect). Supplementing this, the painters refer to religious texts and treatises, some deriving from specific lineages, to aid in their design of painting schemes. The business of making mural paintings is a time consuming job that involves a team, usually 4–5 painters overseen and managed by a master painter. As an indication of the rate of output of such a team, Thinley Norbu estimates that a big temple, typically two storeyed, will warrant at least a 12 month duration to complete the paintings. Whereas for a smaller temple, he asserts that his team can accomplish paintings for two temples in a year. The entire execution work involves complicated processes both off- and on-site. The following description of the contemporary production of marouflage wall paintings is gathered from existing literature and from interviews with wall painting workshops based in western Bhutan.

As a prerequisite, the artists make a visit to the site. Once on site, they take measurements of the wall dimensions to plan their work accordingly. The architectural drawings, interviewee Tshewang Tenzin claims, are not reliable since the dimensions on the paper often do not match the final measurements of the finished wall. They get the painting works commissioned to them once the true dimensions of the space become apparent. Based on the dimensions measured on site, the artists can design the composition accordingly, in which figurative paintings were found commonly (if not absolutely) to be done in studio while the decorative frills for the upper register can be done either in studio (on separate canvas patches) or in situ (directly painted on the wall).

Practitioners noted a distinct preference for working from their own studios for the purposes of comfort and avoiding having to spend extended periods away from home. Tshewang Tenzin, like the rest of the interviewees, attested he prefers working from his studio "for reasons of comfort, access to painting materials and being near our families". He also shared the following anecdote "In those days, from what I have heard, there were very few painters then. When the painters would leave to undertake a painting job in a faraway *lhakhang*, the artisans would leave when their wives were pregnant. By the time they return, their child would have attained 10–12 years of age. Such was the ordeal then."

Interviews indicated common use of Indian-made canvas of 6 ft (roughly 1.8 m) or, more often, 10 ft (roughly 3 m) width, both of which are readily available in the hardware shops of Thimphu.

First, the canvas needs to be cut and stitched according to the dimensions of the wall. The canvas is then stretched on wooden frames (Fig. 13-16). Although the cloth is normally stitched onto the wooden frames, nowadays, the canvas may instead be stapled onto the frames. Both the techniques are in use today, but one of the artists suggested that stapling is unsuitable for *thangka* paintings.

In preparation for the painting, the stretched canvas is sized with *kow spyin* (cowhide glue). Some artists vary this step by sizing the extended canvas with a commercial acrylic dispersion paint mixed with animal glue or the polyvinyl acetate resin "Fevicol SH".[26] The canvas is left to dry (for about one hour during the summer and for the whole day during winter) before paintings can be executed. A uniform ground layer, typically white, may be applied as a final layer before the painting commences. For some artists, this is the last stage of canvas preparation for the paintings but for others, the dried surface is subsequently polished with a smooth stone before painting.

Once the canvas is sized, and the ground layers dry (if present) and (perhaps) polished, the artist will often divide the space into grids. Traditionally, a *soeri*, charcoal (of willow tree or juniper), is used for making the preparatory drawings. While some artists still use *soeri*, others have a preference for graphite pencils for their ease of use and readier availability. Outlines of the designs are transferred to the canvas by pouncing—a process of using a



Fig. 13-16 Studio of Shri Yoebar painting workshop showing partly completed marouflage wall paintings commissioned for Kunzang Shedrub Choling Retreat Centre, Zhemgang.
Once the canvas is cut and stitched to the required proportions, the canvas is made taut by stitching the edges on a wooden frame (shown). Some artists use staple guns to bind the edges of the canvas to the frame rather than stitching.
Source: Karma Yeshey (2021).

26 "Fevicol SH" is a polyvinyl acetate resin produced in India by Pidilite Industries Limited and is advertised as being suitable for forming a bond where one or both of the surfaces are porous.



Fig. 13-17 Top: Stencil and pouncing materials (pigment tied in a loose bag) used by trainees at the National Institute of Zorig Chusum.
Source: Karma Yeshey (2021).



Fig. 13-18 Right: Stencil and pouncing technique at Shri Yoebar painting workshop, used by one of the artists interviewed, to transfer drawings onto the canvas.
In this case the pouncing has been reinforced by drawing a solid outline.
Source: Karma Yeshey (2021).

Paint materials

Today, paint materials are readily available from local markets, the bulk of which are now imported from India. These tend to be acrylic-based pre-prepared paints and commonly include synthetic (rather than plant-derived) organic colourants as well as inorganic/mineral pigments. Interviews showed a perception that modern materials can be relied upon to provide a vibrant range of colours. Thinley Norbu, who has been painting for more than four decades, reported that earlier in his career certain pigments were brought from Tibet to Bhutan but this is no longer the case. Interestingly, the interviews indicated that the preference for ready-made commercial materials is linked more to cost than to availability, as interviewee Thinley Dorji affirmed: "certain clients, those who can afford [it], demand that the paintings be done with mineral pigments, which we cater to accordingly." Tshewang Tenzin explained further: "things have changed in the type of materials we use. Previously, people used organic (plant derived) pigments which were more expensive and more durable, but now we use modern materials sourced from India."

Interviews indicated a perception that the process of extraction of organic colourants or production of mineral pigments is time consuming and together with the rarity of source material, natural pigments tend to be more expensive than commercial products.[29] The commonly and geographically common preparatory technique for painting (Fraser 1996). The stencils are often reused when the drawings are transferable within or between schemes of painting.[28] Such preparatory techniques form an essential part of the painting process. The sequencing of paint layers themselves was not explored in interviews but Fig. 13-19 gives an indication of such processes in one studio; as part of this, the master painter will be responsible for the composition of the scheme, delegating certain other duties to junior members of the workshop.

27 White, black, and (less commonly) yellow powders are used for pouncing depending on the colour of the painting ground. They are typically earth pigments (black is *sa na*, yellow is *sa ser*) and are sourced from various locations in Bhutan including Gasa, Bumthang, Wamrong, Phuentsholing, Trashigang, and Paro.

28 Such reuse is also common for paintings on plaster, for example at Tango monastery where basic figures outlines are used in multiple instances (Pu 2016: 240).

29 The market for organic colourants as painting materials will inevitably be affected by parallel changes in the dying and textile industries.

mercial products are seen to offer a wider range of colour choices when compared to natural pigments. The preference for cheaper and easily accessible materials will necessarily affect the final cost of the work. Tshewang Tenzin believes that it is the decisive factor for a workshop to be hired: "the main deciding factor for them (patrons), I think, is our competitive prices". None of the interviewed artists suggested the use of a coating or vanish on the painted surface, although, one did note that "varnishes are likely to darken over time, although they might give an appealing sheen at first".

Installation: Adhesion process

The finished canvas is transported to the site in rolls. Upon arrival at the site, the walls are cleaned of any debris or accretions. In preparation for the paintings, the walls are "smoothened and plastered in fine clay" by the plasterer (*bji chab mi*) well in advance to allow the plaster to dry before the adhesion process. The artists then undertake or install, if already on canvas, the paintings of the decorative frills on the upper register of the wall.[30] Subsequently they progress to installation of the main scheme followed by the dado, if present. An adhesive (commonly "Fevicol SH") is applied on the surface of the wall onto which the painted canvas is laid. The painted canvas is then unfurled from the top and gently adhered downwards.

An additional practice of adhering a thinner cloth to the "prepared wall" before the painted canvas is attached has also been in vogue recently. The plastered wall is lined with a thin cloth (the same material as the canvas used for painting, but of a thinner grade). For adhesion, "Fevicol SH" is most commonly used. However, some practitioners use a mixture of "Fevicol SH" and *maida* (a white flour made from wheat) glue. *Maida* is used with the intended purpose of thickening the glue; the mixed adhesive is prepared by bringing a mixture of *maida* in water to the boil and then adding an estimated quantity of "Fevicol SH". The adhesive is first applied to the wall with a brush and the cloth is stuck to the wall. Subsequently, the glue is now applied to the thin cloth and the painted canvas is stuck onto the cloth. The lining purportedly provides added support to the painted canvas.

After completion

What are the perceived prospects for the durability of a marouflage painting scheme? The interviewed painters generally expect their works to last for a long time, in the absence of unexpected damage and depending upon the care of the building, with estimates ranging from 50–200 years. Once the works are handed over to the patrons, the painters will not normally be involved in maintenance or future modification of their own works. However, some painters may be involved in aspects of the repair of existing mural schemes, with two of the interviewed artists attesting to their personal involvement in repainting existing schemes (Thinley Dorji and Tshewang Tenzin). Nevertheless, Tshewang Tenzin also expressed that it was challenging for him to match the colours of the old scheme on which he worked, in particular due to lack of experience in predicting the precise colour changes associated with drying. It was apparent that repairing or repainting existing schemes was not taught as part of the artists' training.[31]

Fig. 13-19 Painting in progress at Kheng Thinley Arts.
The Master painter sets out the broad outline of the painting, the placementing of figures, and decorative elements with certain tasks delegated to junior members of the workshop. At this stage we can see some preparatory drawings, the blocking in of areas of colour and gradients as well as the application of areas of raised gilding.
Source: Karma Yeshey (2021).



30 The decorative upper register may either be painted directly onto the plaster or onto canvas. The canvas may be either be painted before it is adhered to the wall or painted in situ.

31 The forces determining the survival and condition of wall paintings are complex and multi-factorial (Cather 2006). The conservation of marouflage wall paintings is not the subject of this paper, but will be informed by factors including susceptibility of original technologies to deterioration.

CONCLUSION — CONTINUITY AND CHANGE IN MAROUFLAGE WALL PAINTING

This paper has explored the emergence and development of marouflage wall painting in Bhutan. From its first known use in the 19th century it has grown to become the dominant form of wall painting in Bhutan, supplanting painting on earthen plaster. This substantial technological change in support has been mirrored by changes in the use of painting materials, with a transition towards modern synthetic pigments and binding materials. As discussed more broadly for building craft traditions by Dujardin (this volume), the integration of new materials and methods into "traditional" decorative expression can itself lead to stylistic shifts.

Interviews with current practitioners in western Bhutan reveal a vibrant sector where masters, and junior painters within their workshops, commonly paint both *thangka* and marouflage wall paintings. The recently established (2018) formal National Certificate system of training painters in the Zorig Chusum institutes continues to be supplemented by training in master-apprentice relationships. With the shortening of training periods within the institutes, it seems likely that training after graduation will remain important.

There are significant links to earlier artistic practice, though modern materials have come to dominate the workshops of commercial artists. Marouflage practice is primarily confined to artists' studios and is rarely executed on site, despite the greater availability of pre-made painting materials, which could make painting outside of the studio more convenient. This important break with historic wall painting production has only been made possible by the ready availability of affordably-priced textile supports for painting.

Looking back to the emergence of marouflage wall paintings in Bhutan, much remains unknown. We have identified technological diversity of size, shape, and purpose of the use of cloth patches illustrating that marouflage painting does not necessarily mean the (total) abandonment of painting in situ. Further work will be required to properly characterise the transitional period with substantial concurrent execution of marouflage and earth plaster wall paintings. This paper takes a first look at marouflage wall paintings in Bhutan as a significant technology in its own right. Important avenues of future research include characterising the cloth supports used in the hope of better understanding the sources of these materials and changes over time; characterisation of adhesives used in historic marouflage to better inform their conservation; and seeking out earlier examples of marouflage in Bhutan. The intersection of wall painting and canvas painting conservation is an area in need of development to best serve the conservation of marouflage wall paintings.

Seeing contemporary marouflage painting in its historic context reveals an evolution of practice that changed significantly from the painting on plaster that preceded it, but also forms an important part of the loss and obscuration of that same earlier technology. We have seen that marouflage wall painting is today primarily a studio practice. Alongside substantial shifts in material traditions, this means the connection between marouflage painting and place does not necessarily hold the same inevitable strength expressed in wall paintings on plaster, painted in situ.

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D

Conclusion: Characterising Tibetan and Himalayan Building Craft Traditions

Calum Blaikie and Hubert Feiglstorfer

Name: Hubert Feiglstorfer
Designation: Senior Researcher
Affiliation (Institute): Austrian Academy of Sciences (Institute for Social Anthropology)

Name: Calum Blaikie
Designation: Researcher
Affiliation (Institute): Austrian Academy of Sciences (Institute for Social Anthropology)

For author biographies, see page 12 and for acknowledgements, see page v.

The contributions to this volume examine diverse aspects of craft-based building across a range of spatial, social, and temporal locations. In this concluding chapter we consider some of the main themes that emerge from the case studies, position them in relation to the wider scholarly literature, and reflect back on the framing questions raised in the introduction. What shared characteristics can be discerned across the various traditions and in what ways do they differ from one another? What can we say about the identity, training, and organisation of the craftspeople, or the forms of knowledge and skill they apply in practice? What have we learned from the diverse ways in which craft-based construction work is commissioned, organised, implemented, and assessed? Perhaps most pertinently, what can we conclude about the way building craft traditions both persist and change over time, or about the factors that are shaping them in the present day? The largely descriptive material presented in the individual chapters invites both close and comparative analysis, which enables us to at least begin to answer these questions and to establish some general characteristics of these traditions. In the process, we locate resonances and connections that enlarge our analytical scope, allowing us to sketch out a broader field for further study of this hitherto neglected topic.

We begin by breaking the title of the volume down into its constituent parts, asking what the contributions and the wider literature can tell us about buildings, building, craft, and tradition in Tibetan and Himalayan regions. Focus then turns to the way different groups of craftspeople identify and represent themselves, how they are positioned socially and economically and organised internally. This includes discussion of various levels of ability, engagement, and specialisation amongst different groups and how these factors influence the way craft-centred building work takes place. We then position Tibetan and Himalayan building craft traditions in relation to the literature on vernacular architecture and heritage conservation, before pulling the various strands together in search of tentative conclusions and promising avenues for further research.

BUILDINGS, BUILDERS AND BUILDING

Buildings are objects intentionally constructed by human beings to provide sheltered spaces for various activities to take place. Beyond this simplest of definitions, it is hard to think of any other artefacts that display such a broad range of forms, have such vital practical uses, fulfil as many social roles and functions, or hold such depths of meaning and symbolism.[1] Recognising this, the contributors to this volume approach buildings as material objects that emerge from technical processes and simultaneously as socially and culturally significant entities, possessing layers of meaning that are linked to their properties and functions but also extend far beyond them into realms of identity, memory, symbolism, kinship, and ritual. This is not to suggest that material-technical and sociocultural aspects of buildings cannot be fruitfully studied separately, but rather to underscore our holistic approach that treats them as integral.

Understanding objects in anything more than a superficial manner demands careful consideration of all the processes involved in their creation, yet a great deal of work in architecture, anthropology, material culture, and art history continues to overlook this crucial observation, to the extent that "processes of making appear swallowed up in objects made" (Ingold 2013: 7). Recognising this common oversight, this book focuses on the material, technical, and social processes implied by *building*. These range from the conception and planning of construction projects, the processing of materials and assembling of work teams through to the many steps involved in actually constructing, adorning, and finalizing buildings. This results in close attention being paid to the people engaging in these transformative processes—the craftspeople directly involved in constructing, decorating or maintaining buildings, as well as their knowledge, skills, practices, social dynamics, and forms of organisation. We also take note of the people engaged in sourcing, transporting, and processing raw materials or producing components such as bricks or window frames, as well as the relatively unskilled labourers who assist during the construction of buildings. In some cases these roles overlap with those of skilled craftspeople and in other cases they are quite separate, but all contribute to the process of

1 See, for example: Campbell (2020); Carsten and Hugh-Jones (1995); Feiglstorfer (2021); Geertz (1973); Gutschow (2011, 2006, 1982); Handa (2008); Herdick (2003); Toffin (1991); and Watts (1999).

building and thus to the materiality, functionality and meaning of buildings.

A brief reflection on the various terms used for "building" in some of the languages of our focal regions serves to raise awareness of the nuances inherent to these terms. In Tibetan,[2] the term བཟོ་ (*bzo*) means "making" as well as "building". ཁང་པ་བཟོ་ (*Khang pa bzo*) can thus be translated as "making a house" or "building a house". The same verb, *bzo*, is used for making a road, an oven, a door, or a bridge. When sacred or religious objects are concerned, however, the honorific verb form བཞེངས་ (*bzhengs*) is used instead of *bzo*, for example དགོན་པ་བཞེངས་ (*dgon pa bzhengs*) meaning "building a monastery" or མཆོད་རྟེན་བཞེངས་ (*mchod rten bzhengs*) meaning "building a *stupa*". For erecting, or bringing something into vertical position, bslangs is used, for example, སྒོ་བསླངས་ (*sgo bslangs*) meaning "erecting a door", རྩིག་པ་བསླངས་ (*rtsig pa bslangs*) meaning "erecting a wall", or ཀ་བ་བསླངས་ (*ka ba bslangs*; erecting a pillar). For setting up a small covered structure, the verb ཕུབ་ (*phub*) is used, for example, གུར་ཕུབ་ (*gur phub*; setting up a tent), ཐོག་ཕུབ་ (*thog phub*) meaning "setting up a roof", or སྤྱིལ་པོ་ཕུབ་ (*spyil po phub*) meaning "setting up a small sheltering structure made of grass, bushes or clay". Thus, we can see how the Tibetan language differentiates between the construction of sacred and secular buildings, as well as how the general term for building implies a whole range of sub-activities such as establishing and erecting.

In Bhutan's national language of Dzongkha,[3] the two main verbs used for "building" are བཟོ་བསྐྲུན (*bzo skrun*) and རྩྭ་ནི (*rkyab ni*). The terms ཁྱིམ་བཟོ་བསྐྲུན (k*hyim bzo skrun*) and ཁྱིམ་རྩྭ་ནི (*khyim rkyab ni*) thus both mean "to build a house" or "building a house". Different terms are used for making a road, an oven or a bridge, leaving བཟོ་བསྐྲུན (*bzo skrun*) exclusively referring to the process of constructing buildings, which does not appear to have an equivalent in Tibetan. For making religious objects or buildings, the honorific verb form བཞེངས་ནི (*bzhengs ni*) is used, similarly to Tibetan. For erecting, ལྷོང་ནི (*lhong ni*) is used, for example, སྒོ་ལྷོང་ནི (*sgo lhong ni*; erecting a door), or ཀ་བ་ལྷོང་ནི (*ka ba lhong ni*; erecting a pillar). However, erecting a wall has its own formulation of རྩིག་རྩྭ་ནི (*rtsig pa rkyab ni*), which places it closer to building རྩྭ་ནི (*rkyab ni*) than to erecting. For erecting a small structure with a protective cover, like a roof or an umbrella, the verb སྤུབ་ནི (*spub ni*) is used, such as གུར་སྤུབ་ནི (*gur spub ni*; setting up a tent), while སྦ་སྒོར་རྩྭབ་ནི (*sb sgor rkyab ni*) refers to the setting up of a small sheltering structure. While Dzongkha and Tibetan languages have shared origins and many similarities, we can see how they use different words for several construction-related activities. We also note how Dzongkha uses a specific term བཟོ་བསྐྲུན (*bzo skrun*) to distinguish house building from other forms of making, whereas Tibetan does not.

In contemporary Chinese,[4] the verb "to build" is best translated as 建造 (*jian zao*), which is comprised of two single words: 建 (*jian*) and 造 (*zao*). The first word, 建 (*jian*), specifically refers to building a house or another structure such as a bridge. It further references "founding"—the act of basing a structure on a specified piece of land. In older Chinese texts, this word also refers to establishing a kingdom or making a law. The second word, 造 (*zao*), refers to "making" in a more general sense. When brought together, 建造 can be literally translated as "building-making" and thus references both the general act of making something and the specific act of erecting a built structure in a particular location. This specific term for building or construction only came into usage in modern times, however. In the context of pre-modern China, 营造 (*ying zao*) or 营建 (*ying jian*) were the main terms used, with 营 (*ying*) meaning "planning and organizing", 造 (*zao*) "making" and 建 (*jian*) "to build". The term 营造 (*ying zao*) thus references planning, organising, and making. It appears in the titles of a corpus of books on traditional building techniques, such as the Yingzao Fashi (营造法式) from the Song Dynasty, the Yingzao Zeli (营造则例) from the Qing Dynasty, and the Yingzao Fayuan (营造法源), which was written by a Suzhou carpenter during the Republican period (see Ruitenbeek 1993).

In everyday Hindi usage,[5] the verb "to build" is widely translated as बनाना (*banānā*), which also means "to make". The terms घर बनाना (*ghar banānā*) and मकान बनाना (*makān banānā*) are both commonly used to denote the act of "building a house". A more formal and precise term for "building" is निर्माण करना (*nirmāṇ karanā*), which combines *nirmā* (to construct) and *karnā* (to do). *Nirmā* is derived from Sanskrit and is used in a similar way across most Indian languages. A less common colloquial term for housebuilding is *ghar bāndhnā*, with *bāndhnā* meaning to tie, fasten or bind. The related word *bandhan* means "bond" or "bonding" and is used in the same metaphoric sense as the English use "bonding" with regard to building relationships. This is similar to the Dravidian language terms *kattu* and *kettu* (*kattu*

2 The editors are thankful to Dorji Yangki and Karma Yeshey for their Dzongkha-English translation work on this concluding chapter. Both are native Bhutanese, Dorji Yangki is an architect and Karma Yeshey is employed at the Department of Culture, Kingdom of Bhutan.

3 The editors are thankful to Christian Jahoda, Tsering Drongshar, and Lobsang Yondan for their Tibetan-English translation work on this concluding chapter. Christian Jahoda is a senior researcher at the Institute for Social Anthropology, Austrian Academy of Sciences, where Tsering Drongshar and Lobsang Yongdan are both employed as researchers.

4 The editors are thankful to Shuyin Dong, Ruizhi Zhang, Yun Zhao, and Boyi Ding for their Chinese-English translation and proofreading work on this concluding chapter and Ruizhi Zhang for proofreading of the Chinese terms. All four are native Chinese, with connections to Vienna University of Technology. Shuyin Dong is a former PhD student, Ruizhi Zhang is currently a post-graduate student, and Yun Zhao and Boyi Ding are PhD students.

5 The editors are thankful to Chithprabha Kudlu for her Hindi-English translation work on this concluding chapter. She is native Indian and currently employed as a researcher at the Institute for Social Anthropology, Austrian Academy of Sciences. We are also grateful to Nina Mirnig and Dania Huber for their review of Sanskrit terms. Both are specialised in the field of Indology and are researchers at the Institute for the Cultural and Intellectual History of Asia, Austrian Academy of Sciences.

in Kannada and *kettuga* in Malayalam), which in the context of building a house has the meanings "to tie" in the verb form and "bond" or "binding" in the noun form. Larger buildings are widely referred to as *Bhavan* (from the Sanskrit term *bhavana*) or इमारत (*imārat*), which is related to the Persian word ترامع (*'emārat*) and is used in contemporary Urdu. These words are used to form two further compound terms for building a large house, palace or public building: इमारत निर्माण करना (*imārat nirmāṇ karnā*) and भवन निर्माण करना (*bhavan nirmāṇ karnā*).

The English verb "to build" has several abstract applications, such as building relationships or theories, as well as encompassing a whole set of practical activities relating to the making of built structures. The same general term applies to the building of a simple brick wall, a bridge, or a skyscraper. In contemporary construction industries around the world, all but the smallest building projects involve collaboration across numerous specialist fields—from teams of architects, surveyors, materials scientists, and engineers through to electricians, plumbers, painters, and manual labourers. The different social statuses, knowledge forms, and working practices of those involved make this a socially and technically complex field of activity (Pink et al. 2013). As Ingold notes, this industry assigns most of the creativity and skill involved in making buildings to architects and others engaged in the design process, while the "subsequent phase of construction adds up to little more than its realisation in the proverbial "bricks and mortar" of the built environment" (Ingold 2013: 47). The people physically assembling the components and finalising the buildings have been relegated to devalued positions, situated towards the bottom of large, hierarchically ordered teams (Sargent 2020). Thus, the meaning of building has expanded enormously in recent times to become an umbrella term covering many forms of knowledge and coordinated action, while the practical and multipurpose skills formerly associated with "the builder" have declined significantly in status and centrality.

Most of the builders discussed in this volume operate quite differently from those engaged in mainstream construction industries. Many of them, especially in rural areas, work on their own dwellings or those of kin and neighbours, either alone or in small teams, primarily depending on manual, craft-based techniques and locally sourced raw materials. They largely work without architects or detailed plans, relying instead on their accumulated knowledge of local architectural forms and styles, ongoing discussions, rough reckonings, and improvised solutions to emerging problems. Many are generalists, taking charge of various aspects and employing different techniques to complete projects. Several chapters also show how craft-centred builders can be highly specialised, working with a relatively limited array of materials and to an advanced technical level. For example, the *shilpakār* carpenters of the Kathmandu valley and the master woodworkers of Bhutan apply finely-honed skills to the making and maintenance of prominent religious edifices. They often work as part of large teams, although nowhere near as complex and stratified as those engaged in modern construction projects. Furthermore, we note the distinct ways such craftspeople identify themselves and transmit their knowledge, as well as particularities in how their work is organised, practiced, assessed, and valued. These aspects are discussed further in the latter parts of this chapter.

Suffice it to say here that we collectively approach building as a complex assemblage involving numerous heterogeneous components: people, relationships, and ideas as well as financial resources, raw materials, tools, and technical procedures. We also note that while building evidently takes place in specific spatiotemporal and sociocultural locations, the components being assembled often have diverse origins in space and time. A good example of this is the periodic reconstruction of Bhutanese *dzong* (Dujardin 2000, this volume), during which teams of craftspeople with varying origins, ages, forms of training and outlooks use both familiar and new materials to reconstruct or adapt structural forms or, more recently, to recreate classical decorative features in new media. Other examples of such heterogeneity include the incorporation of modified earth products into newly-built yet traditionally-styled houses in Ladakh (Norboo et al.),[6] or the way mobile cranes, growing household wealth and improved access to raw materials have enabled the use of larger wooden components for housebuilding in Drango (Wozniak). Craft-based building thus emerges from this book as a dynamic set of processes incorporating old and new elements drawn from various technical, material and social fields.

We make no attempt to define a singular ideal type of craft-based building or to present building crafts as entirely separate from other modes of construction. Indeed, the contributors are highly attentive to fields of interaction

6 Throughout this chapter, all in-text citations including names but not dates refer to chapters within this volume, e.g., (Norboo et al.). All external citations conform to the author's name + date convention, e.g., (Dujardin 2000).

and processes of transformation, to the way building cultures adapt to new economic and social conditions or are influenced by imported designs, materials, and methods. We learn, for example, how some craftspeople are engaging with conservationists, engineers, and researchers in various ways, while others compete or collaborate with modern construction industries (Harrison; Harrison and Ahmed; Tiwari et al.; Weise and Joshi). Taking craft-based forms of building seriously requires sober assessment of the multiple change processes that combine to shape craftwork and the buildings that emerge from it. Transformation and adaptation are thus understood as intrinsic properties of building craft traditions rather than as aberrations, impurities, or signs of fragility. The case studies also encourage us to question the implicit hierarchies of thought that separate processes of design from processes of making, automatically assume the primacy of "heads over hands", or sharply distinguish elite and religious from everyday modes of construction, issues to which we return in later sections.

BUILDINGS AND VALUE

Buildings, raw materials, structural components, and labour are all subject to valuations of various kinds, which influence craft traditions in ways that require careful consideration on the part of researchers. Most of the buildings discussed in this book are valued primarily for the functions they perform and the activities that take place within them, which may be deemed "use value". Use value is difficult to quantify or render comparative, as it depends on subjective evaluations that may vary markedly between individuals or groups, or between local and external perspectives. Usefulness also merges into other indices of value, for example, when buildings play important social roles. Village shrines, temples, and small votive structures are fundamental parts of daily religious, ritual, and social life for populations across the Tibetan plateau and the Himalayas (Huber 1999; Gutschow et al. 2003; Ramble 1999), so their value cannot be reduced to any simple utilitarian index. As well as fulfilling important religious and social functions, Tibetan Buddhist monasteries also provide homes for monks and nuns, which brings another form of value into the equation. Furthermore, many well-known religious buildings and pilgrimage sites attract large numbers of visitors from far afield. Their symbolic, religious, and historical values thus merge with their importance to local people and state governments as generators of income, showing how multiple indices of value intersect in different ways according to one's perspective (Adell et al. 2015).

An excellent example of such intersections is provided by the great *stupa* and temple complexes of the Kathmandu valley, whose multiplicity of meanings and depths of associated values are difficult to overstate. Their location, structure, and function index sacred geographies, Buddhist and Hindu conceptions of the universe and the place of humans within it, as well as the passage of time and the changing of the seasons (Gutschow 2011; Tiwari et al., this volume). They provide focal points for people engaging in religious festivals, pilgrimage activities, and daily ritual offerings. At the same time, the valley is a designated UNESCO World Heritage site, attracting many thousands of tourists every year from all over the world and contributing enormously to Nepal's tourism industry and thus to state coffers (Arai and Goto 2017; Weise and Joshi, this volume). These buildings can thus be seen to exist simultaneously in several "regimes of value" (Appadurai 1986; Murakami 2016; Myers 2001) whose relative primacy is very much a matter of perspective. As the chapters by Tiwari et al. and Weise and Joshi show, the values assigned to the tiered temples by the Nepali state or by modern construction firms differ markedly from those of the crafting castes and other groups, whose lives and livelihoods have been intertwined with the temples for generations and who maintain deep religious and ritual connections to them.

Economic value may appear a simpler and more readily comparable measure than use or symbolic value, as buildings and materials (theoretically) be bought, sold, exchanged, or rented. While financial assessments and transactions involving built structures do take place in our focal areas, it would be mistaken to assume that they correspond neatly with capitalist economic logic or a "property market" as it exists today in much of the Global North. In Ladakh, for example, farmhouses are enmeshed in kinship relations and are passed down through the generations along with farmland. The buying and selling of such houses is practically inconceivable, as they are not seen as alienable objects with monetary values. As urbanisation and rural depopulation continue apace, some farmhouses are falling into disrepair, yet few families would consider selling them even if buyers could be found.

Other regimes of value intervene, linked to long histories of kinship connection and ritual obligation, but also to awareness of possible future need. As Harrison and Ahmed (this volume) show, similar inability or unwillingness to sell disused houses can also be found in the urban milieu of Leh. They secured the first long-term lease in Ladakh for the Munshi House, which suggests that such arrangements fall outside of traditional ownership norms as well as showing how such norms are subject to change. The financial value of a building may, in some cases, be isolatable as a single measure, but it is often relative to other — far less readily quantifiable — reckonings of value.

Finally, buildings may be assigned various ecological values, as they are largely constructed from natural materials and occupy spaces within the environment that have other potential uses (Cordell et al. 2005). This results in new forms of comparative evaluation that assess costs, opportunity costs, and benefits in relation to concepts of settlement planning, resource management, and sustainability. The "life-cycle" approach takes such notions further by assigning ecological values to buildings at different phases of their existence, including the resources used in construction and the pollution this generates (Kotaji et al. 2003; Sharma at al. 2011). This further connects vernacular architecture to emerging global discourses and value regimes concerning sustainability and resilience.

Patterns of raw material demand, sourcing, transportation, and usage also illustrate the interplay of various measures of value. For example, the origins, prices, and uses of certain clays can signify the social status of a building's owner. Clay for making adobe or rammed earth walls can often be collected from fields surrounding a farmhouse, which requires labour but little financial input. However, transportation costs can be considerable when larger quantities of clay are required, or specific qualities or colours are needed. Across the Tibetan cultural area, different mineral colours are used for specific building parts, for example, black is used for window and door frames while yellow, white, and red are used for painting walls (Feiglstorfer 2014: 380ff.). Special types of clay may be transported over long distances at significant financial cost, such as those from the *markalak* quarries in Spituk, Ladakh, or others originating from sacred places (Feiglstorfer 2019; Feiglstorfer and Michette, this volume). The use of such clays highlights the status and wealth of the residents, thus expressing material as well as symbolic and social values. Norboo et al. (this volume) further show how additives and extra processing steps can transform ordinary clay from a ubiquitous, poor quality building material associated with poverty into a desirable component linked to high status and global design trends. Thus, clay exists simultaneously as an abundant, naturally occurring raw material and as a signifier of various values, beliefs, attitudes, symbolic meanings, and social hierarchies.

Similar variability surrounds other materials discussed in this book, such as timber in Drango (Wozniak) and Himachal Pradesh (Thakkar and Shah), *arga* in central Tibet (Feiglstorfer and Michette) or yak wool in western Ladakh (Ahmed). The case of concrete in Sikkim further shows how a single raw material can become entangled in complex webs of value linked to socioeconomic change and political integration, making it central to the way "development is conceived, politicised and enacted" across an entire region (McDuie-Ra and Chettri). Here, concrete buildings have come to be valued for their symbolic expression of modernity and progress, as well as for their affordability, extendibility, and the income that can be generated by renting them out, factors which now outweigh the values assigned to buildings made in traditional styles and materials.

Emerging from all this comes an understanding that the values assigned to buildings, components, and construction activities are multiple and fluid, varying according to one's perspective as well as changing over time. Particular constellations of value shape the construction activities that take place at certain places and times, linked to resource dynamics but also socioeconomic and cultural conditions, political projects, investment patterns, and popular aspirations. Building craft traditions operate within these shifting webs of value, adapting to changes within them and altering the built environment in the process, while themselves being subject to changing valuations, demands, and reckonings of cost and benefit.

BUILDINGS AS MATERIAL CULTURE

Crafts have significant immaterial dimensions, comprising accumulated experiences and embodied forms of knowledge and skill as well as social roles and relationships. At the same time, crafts operate through transformative physical practices involving particular relationships to materiality. Building craft traditions can thus be understood as the interface between these material and immaterial realms. This observation invites a brief foray into the field of material culture studies, to see how concepts and approaches developed there might contribute to analysis of the largely empirical material presented in this volume.

First of all, it is necessary to distance ourselves from the classical approaches to material culture that developed within archaeology and anthropology during the 19th and 20th centuries, and which implicitly or explicitly position all artefacts within unilinear models of evolution and progress. The authors in this volume avoid such normative and evolutionary framings, recognising that buildings have multiple values and significations while striving to understand processes of making firmly within their own spatiotemporal envelopes and webs of meaning. We accept that there is little to be gained by placing objects or their production methods within externally derived interpretive frameworks and value systems. Aspects of Marxist critiques of consumerism resonate here, focusing on the roles objects play in social structures and economic processes (Appadurai 1986; Douglas and Isherwood 1979; Miller 1987, 1998, 2005), as does the structuralist approach to the material world as a reflection of underlying cultural and symbolic systems (Baudrillard 1996; Carsten and Hugh-Jones 1995; Levi-Strauss 1988).

More recent work foregrounds the rapid flux and ephemerality of contemporary material life, which increasingly prevents stable or long-term connections to things (Buchli 2002; Miller 1998); a condition Lipovetsky (1994) refers to as "tragic lightness". Attention is being refocused away from material objects as discrete, permanent entities and towards processes of materialisation and dematerialisation. Completeness, durability and disintegration are no longer assumed to be non-negotiable empirical realities, but rather to be socially produced and culturally evaluated (Oldenziel 1996; Thompson 1994). Building craft traditions present an interesting case in that they intervene materially in processes of construction, decay, maintenance, repair, and modification. They allow for the creation or adaptation of objects that often have strong connections to the past and to notions of stability, yet are also profoundly touched by contemporary shifts towards mass production, genericness, and disposability. These observations resonate with Buchli's statement: "How things come to matter both physically and socially, how the terms of materiality are reconfigured to facilitate various forms of social inclusion and exclusion, are questions which become increasingly relevant. This is another way of understanding materiality not so much as physics but as cultural process" (Buchli 2002: 18).

By focusing on building as praxis and process rather than on buildings as objects in themselves, this volume frames a range of questions about durability, persistence and novelty, preservation and loss, heritage and identity, as well as processes of materialisation and decay. How are the terms of materiality within which building crafts operate being reconfigured in these regions? How are the values assigned to material objects being recalibrated and who is being excluded or included in the process? How does engagement in craft-based building shape subjectivities, experiences of empowerment or disenfranchisement, or understandings of tradition, modernity and change? While we are not in a position to answer any of these questions satisfactorily, they are good to think with and raising them underscores our collective interest in the roles buildings and building play in social and cultural processes, the way construction activities reflect shifting patterns of inclusion and exclusion, and the way these phenomena are expressed both through processes of making and through products made.

Processes of making enable both cultural production and social reproduction (Skibo and Schiffer 2009). They are essential components of all craftwork and indicative of the social backgrounds and technical achievements of those engaging in them. Individual acts of making form part of collective design sensibilities, which find expression in both public and private buildings and vary according to the social affiliation, economic background, and technical ability of those involved. The meaning inscribed into an object by a craftsperson connects its functional context to its symbolically representative connotations. The processes of making discussed in this book span fields that could be described as craft, art or utilitarian trade, although there is often no

sharp distinction drawn between these fields in our focal areas, or such distinctions have only emerged relatively recently (Könchog Tenzin 2010; Ronge 1978).

The emic approach to materiality taken in this volume attempts to understand craft and artisanal production from local, culturally specific, and non-Western perspectives. We recognise, for example, that certain cultural products convey religious content via a visual language that is targeted to a certain group of initiates but is also meaningful to the broader population, while remaining opaque to external observers. Artisans act as transmitters or conduits of this cultural content, as they materialise meaning and symbolism in a way that carries it to a wide audience. For example, the design of surfaces in compliance with the formal rules of Buddhist iconography correlates with the symbolic meanings that may be derived from them by ordinary people (Kalantari). Making *arga* floors is a technically demanding and labour-intensive activity whose products materially express elite status and religious symbolism (Feiglstorfer and Michette). Yet, at the same time, a broader range of meanings are invested in the process itself, which involve various socially situated understandings of the relationship between spatial location, material form, social function, and symbolic representation.

The way materials are processed as well as the symbolic, decorative, and functional uses to which they are put are all components of artisanal building, as expressed by the German term "Kunsthandwerk". In Bhutan, the formally recognised *zorig chusum* (13 traditional crafts) certainly involve creative and artistic forms of expression, but the meaning of *zo* (ability to make) and *rig* (knowledge or science) brings us firmly back to the making of useful things by hand. In cases where large or important buildings are being made or remade, the coordinated interplay of several different crafts and material practices results in numerous individual architectural details, which ultimately come together under a singular, overarching—yet often abstract and undocumented—design concept (Feiglstorfer 2011). Whether through the design and execution of mural paintings (Kalantari; Yeshey et al.) or through the planning and construction of complex buildings (Dujardin; Tiwari et al.; Weise and Joshi), this book shows how artistic flourishes and expressions are always materialised by craftspeople working with their hands, using combinations of both old and new materials and stylistic influences. It is through these acts of conception and materialisation that each object made is at once unique and part of much larger structural, social, and symbolic ensembles.

One of the main aims of this volume is to "render discursively legible groups, worlds, individuals, subjectivities and experiences that were otherwise outside of the discursive realm" (Buchli and Lucas 2001). In contrast to the reified, decontextualised, and "finished" objects of earlier material culture and art historical approaches, we see buildings as things-in-becoming (Ingold 2012), subject to continuous processes of construction, transformation, decay, and repair. The structures discussed here are approached, as far as possible, from within the conceptual frameworks of those involved in their construction and use, not as frozen moments in externally-imagined cultural worlds, while the building craft traditions involved are assumed to be dynamic, agentive, processual, and adaptive rather than discrete, static, simple, or brittle.

CRAFT

A brief account of how terms for "craft" and "craftspeople" are rendered in the languages of our focal regions grounds the discussion in local context and helps to think through some of the implications these terms hold. The most commonly used term for a craftsperson in Tibetan is བཟོ་པ་ (*bzo pa*), which literally translates as "people who make". Two other terms connect making to notions of embodied knowledge and skill: ལག་ཤེས་པ་ (*lag shes pa*; *lag pa* meaning "hand", *shes* meaning knowledge and *pa* meaning "person"), and ལག་རྩལ་པ་ (*lag rtsal pa*; *lag pa* meaning "hand", *rtsal* meaning "skill"). The combination of ལས་ (*las*) meaning "work" and རིག་ས་ (*rigs*) relating to diverse forms of knowledge) results in the term ལས་རིག་པ་ (*las rigs pa*), which specifies people engaged in various kinds of skilled work. These references to skilled forms of work and making by hand illustrate some fundamental characteristics of craft both within and beyond Tibetan cultural contexts.

In Dzongkha, the most widely used term for "craft" is ལག་བཟོ (*lag bzo*), which combines ལག (*lag*; meaning "hand") with བཟོ་ནི (*bzo ni*; to make). The main terms used to denote a craftsperson are ལག་ཤེས་པ (*lag shep*) and ལག་བཟོ་ཤེས་པ (*lag bzo shep*), which again connect to notions of embodied knowledge and manual dexterity as ཤེས་པ (*shep*) means "knowledge/skill". Finally, the term ལག་བཟོ་མཁས་པ (*lag bzo mkhasp*) carries connotations of expertise because མཁས་པ (*khep; mkhasp*) signifies a highly skilled practitioner, resulting in the notion of an expert at making things by hand.

In Chinese, craft is generally translated as 手艺 (*shou yi*), 工艺 (*gong yi*) and a craftsperson is referred to as 手艺人 (人 means person) (*shou yi ren*). Literally translated, 手艺 (*shou yi*) means "art done by hand" (手 (*shou*) meaning "hand" and 艺 (*yi*) meaning "art", which is distinct from "knowledge"). A 手艺人 (*shou yi ren*) is thus a person who has professional skills in making items such as embroidery, pottery and so on. A more formal term used for craftspeople is 匠人 (*jiang ren*), which reflects the social status and professional identity of craftspeople. The social status associated with 匠人 (*jiang ren*) is not high, being similar or lower to that of farmers. In some dynastic periods, it would rank not much higher than a servant. Compared to 匠人 (*jiang ren*), then, the term 手艺人 (*shou yi ren*) emphasises skill, but not professional identity or social status. Interestingly, 匠人 (*jiang ren*) is often used to refer to those involved in building crafts, while 手艺人 (*shou yi ren*) tends not to be used in this way. This suggests that construction-related crafts are defined in Chinese more as low-status professional fields than as skill-based artisanal activities. These terms reflect both the nature of craftwork — making by hand — and the social positioning and status of such work, both of which are central to our interests here.

In Hindi, the most widely used term for craft is कला (*kalā*), which also relates to art and skill. The word is of Sanskrit origin but is commonly used across many Indian languages, as well as forming a suffix denoting a wide range of crafts, such as *hastakalā* (handicrafts) and *śilpakalā* (sculpture). In some contexts, the term शिल्प (*śilpa*) is also used to refer to arts and crafts. The most common Hindi term for craftsperson is कारीगर (*kārīgar*) and for skilled craftwork कारीगरी (*kārīgarī*) is often used, both of which are borrowed from the Persian کارگر (*kârgar*). Sanskrit terms are widely used to refer to building crafts in Hindi and across many Indian languages, including वास्तुशास्त्र (*vāstuśāstra*) and वास्तुकला (*vāstukalā*). Vāstushāstra is derived from *vāstu* (building or residence) or *vās* (to reside) plus the suffix शास्त्र (*śāstra*), which signifies a branch of specialist knowledge or a learned discipline and is commonly used as an equivalent for "science", as well as referring to a treatise or book of knowledge. A further widely known term in this context is स्थपति (*sthapati*), which refers to specialists or masters in architecture and building construction.

In general English usage, the term "craft" refers to the skilful transformation of raw materials into useful and pleasing objects, primarily or entirely by hand. Beyond this broadest of definitions, however, craft becomes a complex and debated topic. This is due to the varying trajectories crafts have followed around the world, the different ways they have been approached in the academic realm, and the significant overlapping of the category with others such as art, design, science, technology, industry, and utilitarian trade (Adamson 2007, 2010; Greenhalgh 2002, 2009; Kikuchi 2015; Shiner 2012; Smith et al. 2014). Our aim here is to flesh out a working concept of building crafts that helps to frame and analyse the activities discussed in this volume. We make no attempt to arrive at singular, universal definitions of craft or craftspeople and see little benefit in getting tangled up in long-running and unresolvable debates over their categorisation.

We begin with the observation that crafts have long been marginalised or overlooked by scholars in mainstream social science and the humanities (Greiner and Pröpper 2016). Such neglect is difficult to understand given the ubiquity and importance of craft in human societies worldwide and throughout history. It is also disappointing given the great potential that crafts, craftspeople, and craftwork hold as windows through which many issues of contemporary import can be opened up to thoughtful and critical analysis. Studying craft allows for revealing connections to be drawn between culture, ethnicity, labour, production, and politics, among many other things (Wilkinson-Weber and DeNicola 2016). It can raise a host of pertinent questions about the relationships between "head and hand, thinking and grasping, knowing and making, belonging and producing" as well as the way "concepts of humanity, materiality and quality" are framed, mobilised and shaped over time (Greiner and Pröpper 2016: 212; Miller 2005).

The longest-running scholarly debate over craft concerns its relationship to the fields of fine art and design, largely revolving around questions of functionality, the transition from conception to execution, and the organisation of craftwork both internally and in relation to other realms (Adamson 2007; Greenhalgh 2002; Lees-Maffei and Sandino 2004; Risatti 2007). The origins of this debate lie in the separation of crafts, fine arts, and utilitarian trades into more-or-less distinct fields in Renaissance-era Europe, which significantly shaped the theorising of art and craft along Eurocentric lines. Challenges to this model mounted as observers documented a wide variety of craft forms across different parts of the world (Lucie-Smith 1981). The debate then gained renewed energy due to the revival of craft as both a professional and leisure activity in the contemporary Global North, and through growing recognition of its significant overlap with art and design (Marchand 2016, 2021; Parraman 2020).

This volume's focus on the Tibetan plateau and Himalayan regions allows us to sidestep much of this debate, concentrating instead on the constitution, positioning, and dynamics of skilful construction-related activities within sociocultural matrices in which craft has long been centrally important, yet where fine art and design have only recently emerged as distinct fields of study and practice (Feiglstorfer 2022; Könchog Tenzin 2010; Ronge 1978). The crafts discussed in this book are mostly connected to dwelling and everyday functionality, or to religious buildings associated with well-established design schemes and iconographic palettes. These factors render Eurocentric arguments over craft's relationship to fine art and design largely redundant, as the chapters by Kalantari and Yeshey et al. show particularly clearly.

CRAFT AND TECHNOLOGY

One core characteristic shared by all crafts is the use of particular tools and techniques to transform materials into useful objects, which implies significant overlaps with the study of technology. Recognising that both craft and technology are culturally constructed, socially constituted, and historically contingent opens up all kinds of productive questions concerning planning, design and production processes, knowledge, skill, and tool use, as well as patterns of change (Schiffer 2001; Smith et al. 2014). This shared interest in techniques and practices of making is bolstered by the recognition that the same theories and methods should apply to the study of technology regardless of the context (Schiffer 2001: 4). It also invites reflection upon why certain material techniques are employed in particular contexts while others are disregarded. Technological choices have deep social, economic, and cultural linkages as well as specifically technical aspects. They are never self-explanatory and rarely follow predictable developmental paths because: "Social logics and meanings permeate all techniques […] every technical system is continually evolving and is subject to a mixture of conservatism and change" (Lemonnier 1993: 22). Such an approach sees crafts as sociotechnical systems that continuously adapt in relation to broader patterns of change, yet also retain certain elements despite the availability of alternatives.

Several chapters in this volume speak directly to these issues, for example concerning the evolution of weaving technology and choice of tent fabrics in Ladakh (Ahmed), or the way the crafting communities of the Kathmandu valley improved the structural components used in tiered temple construction in response to constant environmental stresses and occasional seismic shocks (Tiwari et al.). Building crafts rely on the use of particular tools, so the introduction of diggers, cranes, power saws and so on can significantly alter both practices and products. As McDuie-Ra and Chettri demonstrate, the spread of relatively simple technol-

ogies such as portable cement mixers can have far-reaching effects on building cultures, in this case enabling particular modern construction forms while de-emphasising craft-based activities. Similarly, Dujardin's discussion of *horzhu* window frames illustrates how urbanisation and the drive toward efficiency maximisation can lead to the increasing use of machines and prefabricated components. Once the epitome of masterful Bhutanese carpentry, *horzhu* were formerly made at the site itself using traditional techniques and manual tools. They are now being quickly produced off-site using stencils and power tools before being transported to building sites for insertion, where they serve as pale imitations of original *horzhu* in pseudo-traditional urban facades. New technologies thus enable the shift from traditional, on-site processing methods to off-site industrial prefabrication, which contributes to differentiation in the field of construction and to changing understandings of time, space, and value.

Traditional processing of materials is mainly conducted by hand and is closely connected to particular places and communities. Industrial prefabrication has mass production and economic efficiency as its focus, which entails much looser connections to specific places and social groups. Whether a house is built by people from the same community or by teams of imported labourers, and whether it is made from locally-sourced materials or from prefabricated components significantly effects the social dynamics involved, as well as implying a different relationship between workers and the products of their work. Certain building crafts must take place in situ and do not lend themselves easily to mechanisation, such as *arga* roofing and mural painting. Others can be easily be replaced by mechanised prefabrication processes conducted in workshops or factories, such as certain elements of carpentry, masonry, and metalwork. This results in a growing distinction between manual and machine-processed craftwork as well as differing patterns and speeds of transformation in the demand for, organisation, and valuation of various building craft activities.

CRAFT, COGNITION AND SKILL

Craftwork offers rich source material for exploring relationships between knowledge, cognition, learning, skill, and practice (Keller 2001; Marchand 2001, 2003, 2007, 2009, 2010). Tim Ingold's work (1993, 2000, 2001, 2007) mounts a compelling case against dismissing craft as mundane or easily explained by approaching skilled practice as a dynamic system involving minds, bodies, tools, and materials interacting in a "richly structured environment" (2000:5). For Ingold, making objects by hand is never a simple or automatic process. Even though it may involve repetition, each act of making is unique, involving an "entire ensemble of tasks in their mutual interlocking" (Ingold 1993: 158). It requires continuous responses on behalf of the practitioner to variations in the raw materials, tools, and setting of the work, as well as the evolution of the particular job at hand. Ingold underscores the creativity of productive processes and the way that the knowledge and skills involved tend towards the cumulative and experiential rather than the discrete and abstract. The transmission of such kinds of knowledge-skill cannot depend solely on the learning of rules or formulas, but must involve the sensuous engagement of novices in "socially scaffolded contexts" that allow for trial and error, as well as the guided adaptation of skills to ever changing circumstances (Ingold 2001). Ingold further shows how craftwork holds the potential to challenge common academic dichotomies, such as between the making of symbolic items and the production of utilitarian objects (ibid.).

Several other authors have similarly highlighted the centrality of tacit knowledge and non-verbal images in the learning and execution of craft activities (Keller 2001; Marchand 2003, 2010). Together, such work contributes towards theorising craft as a complex realm of human activity that combines formal, abstract, tacit, and embodied forms of knowledge expressed in emergent fields of practice. It also suggests that studies of craft and craftwork have the potential to feed more meaningfully into social scientific approaches to education, learning, and apprenticeship (Coy 1989; Marchand 2001; Lave 2011). Although the case studies in this volume do not adopt the kind of fine-grained, microanalytical approach to craft learning and practice propagated by Ingold and Marchand, they do support an understanding of craft-based building as complex, emergent, and adaptive. Several chapters

show craftspeople working creatively, negotiating unforeseen problems and adapting working steps according to the ongoing progression of the work. We see much evidence of building craftspeople producing objects that are simultaneously functional, aesthetically pleasing, and symbolic, thus confounding the false dichotomy identified by Ingold. Several chapters also discuss the socially-scaffolded forms of knowledge transmission highlighted in this literature (Dujardin; Harrison; Thakkar and Shah; Wozniak; Yeshey et al.).

CRAFT AS "INDIGENOUS TECHNICAL KNOWLEDGE"

Many kinds of craftwork have been incorporated into the categories of "indigenous technical knowledge" or "local knowledge" over recent decades (Feiglstorfer 2022; Shaari and Rahman 2017; Van Wyk and Thurner 2022). On the one hand, such terms usefully enable shorthand reference to reasonably distinct forms of knowledge-practice that occupy particular social and cultural spaces, defining them in contrast to modern, globalised modes of scientific knowledge and technical activity. On the other hand, these concepts are difficult to define in neutral, objective terms and carry a broad range of discursive and practical implications (Ellen et al. 2000; Pottier et al. 2003). Questions over the parameters of "the local", who counts as "indigenous", or even "what is knowledge" are framed very differently in academic writings, government policies and grassroots organisations, leading to radically different ideas concerning how they should be mobilised (Adell et al. 2015; Corntassel 2003). Although the concept of indigenous technical knowledge does not feature explicitly in the contributions to this book, it is useful to remind us that as well as existing in embodied and material practices, building crafts are also political subjects and discursive tools that are open to various forms of representation, manipulation, and instrumentalisation both from without and within.

CRITICAL CRAFT

Taking such observations further, crafts and craftwork offer great potential as the basis for critically engaged analyses of social, political and economic dynamics across various timeframes and scales (Campbell 2020; Ko 2021; Lucie-Smith 1981). When approached critically in academic writings, craft has the potential to "transcend the colloquial, the mundane, and the local" and "push back against traditionalizing and marginalizing discourses" (Wilkinson-Weber and DeNicola 2016: 1). It can open up important questions about numerous contemporary issues such as evolving relationships between technology, materiality and markets, labour organisation and work practices, gender and human rights, tradition and innovation, urban and rural spaces, and social and environmental change at various scales.

Critical and comparative approaches are particularly helpful for understanding how patterns of change are manifesting in building craft traditions. The training and practice of craftspeople, as well as the uses to which their products are put, can reflect, reproduce, challenge or transform existing social structures and relations (Wilkinson-Weber and DeNicola 2016). Building always takes place within shifting social contexts and can involve more or less hierarchical or egalitarian relationships, both within working teams and between the workers and those commissioning their work. Rather than being downplayed or overlooked entirely, as they have been in much academic writing on related topics, we propose these as crucial issues for further investigation.

Most of the contributions to this volume at least touch upon questions of power, governance or inequality, while several engage more fully with the kinds of issues mentioned above. For example, both chapters focusing on the Kathmandu valley address intersections between craft, caste, and class in a context of rapid socioeconomic change. They show how government policies, conservation activities, and the mainstream construction industry are combining to undermine craftspeople's role in the maintenance of heritage buildings, as well as discussing the response of the crafting groups to their current predicaments. With concrete as the main protagonist, McDuie-Ra and Chettri's chapter dives deeply into political and economic influences on construction practices in Sikkim. Labour market dynamics, urban planning, and shifting governmental priorities feature prominently in the chapters by

Harrison, Harrison and Ahmed, and Norboo et al., while Dujardin, Thakkar and Shah, and Wozniak all show how planning and building codes, as well as state policies concerning natural resource management, interact with craft-based construction. These authors also highlight different levels of state support for formal training in craft-centred construction, from significant investment in college-based craft training in Bhutan to the complete absence of such opportunities in Nepal and eastern Tibet. Throughout the book we see numerous examples of how such factors interact with and shape building crafts, while the empirical data presented here offers a solid starting point from which critical analyses could be further developed in future.

To sum up how this volume frames building crafts, let us return to the local language terms outlined at the start of this section. The Tibetan, Dzongkha, Chinese, and Hindi terms for craft stress skilful use of the hands to produce useful and pleasing objects, differing levels of expertise, and particular occupational pathways that confer a certain social status. All of these are central to our collective conceptualisation of Tibetan and Himalayan building crafts. Beyond these basic characteristics, we approach building crafts as complex technical, material, and social processes that straddle the academic fields of technology, art, labour, industry, utilitarian trade, and indigenous knowledge. The crafts described in this volume thus require a broader, more flexible category than that given in most of the relevant literature. For example, we are obliged to cast our net much wider than Risatti (2007), who limits craft to the making of relatively small objects that either "contain, cover or support", or Greenhalgh (2002) and Adamson (2007, 2010), whose otherwise excellent analyses of contemporary craft have limited applicability beyond the Global North. Keeping this broad understanding of building crafts in mind, we now turn to consider how they connect the past to the present and how they relate to questions of identity, continuity, and change.

TRADITION

The terms "tradition" and "traditional" are widely used in academic and popular contexts to express notions of culture, identity, belonging, and connection to the past. They are employed in different ways both within and between local, national, and global discourses, often carrying heavy emotive and political loads, and have inspired a range of scholarly and real-world debates. As with "building" and "craft", we begin by briefly considering how these terms are rendered in the languages of our focal regions, before discussing how they are used in this volume. Again, our intention is not to propose any universal definition, but rather to establish how best to apply these terms to the analysis of the building crafts around which this book revolves.

In the Tibetan language, the term སྲོལ་རྒྱུན་ (*srol rgyun*) is perhaps the closest equivalent to the English word "tradition" (སྲོལ་ *srol* means "culture" or "custom" and རྒྱུན་ *rgyun* refers to "continuity" or "continuum"). Culture and custom are linked to particular localities through the term ཡུལ་སྲོལ་ (*yul srol*; as *yul* refers to a defined area and its population, such as a village. Notions of cultural rules come into the picture through the use of ལུགས་སྲོལ་ (*lugs srol*; *lugs* means "rules" and *srol* means "culture"), while ལམ་ལུགས་ (*lam lugs*) uses the metaphor of a pathway to express a similar concept (*lam* means "path" and *lugs* are "rules"). Bhutanese Dzongkha employs a similar pathway metaphor in the terms ལམ་སྲོལ (*lam srol*) and ལམ་ལུགས་སྲོལ (*lam lugs srol; lam* means "path", *srol* refers to "custom" and *lugs* to "rules"), which positions culture and norms as crucial links between past and present. Similar ideas are found in the Tibetan term སྔར་སྲོལ་ (*sngar srol*; *sngar* meaning "age-old" and *srol* meaning "tradition"), while Dzongkha also uses the terms ལམ་ལུགས (*lam lugs*) and ལུགས་སྲོལ (*lugs srol*) in a similar way to Tibetan.

In Chinese, the closest translation of the concept of tradition is 传统 (*chuan tong*), which literally means passing 传 (*chuan*) the orthodoxy 统 (*tong*) to the next generation. In former times, 传统 (*chuan tong*) referred to a kingdom or an ideology inherited from generation to generation. Its current usage referencing a broader notion of "tradition" is relatively recent, possibly arriving from Japan during the 19th century. In Hindi and many other Indian languages, the term परम्परा (*paramparā*) is used widely to refer to tradition. This ancient word can be found in all the classical Indian languages including Sanskrit, Pali, and Tamil.

Literally translated it means "one following another" and in popular usage refers to succession, lineage, and the uninterrupted passing on of teachings from master to disciple.

This brief review shows all four languages using one or more terms to signify customs, knowledge, and practices that have their origins in the past but continue to hold meaning and value in the present. The notion of transmission, of handing something down through the generations, is crucial, while metaphorical reference to pathways and rules accentuate the collective and normative aspects of this. We also get a sense of the subtleties and layers of meaning surrounding these multifaceted concepts. These complexities increase because the contributors to this volume reference both recognizable ensembles of design, form, style, and materials, as in "Bhutanese architectural traditions" or "traditional eastern Tibetan farmhouses", as well as the people who identify as members of particular "craft traditions". Our conceptual framework must therefore encompass the formal, practical, and material dimensions of tradition as well as its social and embodied aspects.

Concepts of tradition have underpinned the disciplines of anthropology and sociology ever since their inception[7] and have remained particularly central to the former. These ideas have also played important roles in numerous other fields of study, notably history, archaeology, and art history. Along with other core concepts such as "culture" and "society", tradition has been the focus of extensive debate both within and between these disciplines, largely revolving around questions of authenticity and invention, how change should be accounted for, and the relationship between tradition and modernity. We have neither the space nor the inclination to review these debates in detail here, but draw upon selected aspects in order to help us better understand and analyse building craft traditions in our focal regions.

The contributions to this volume encourage rejection of earlier academic portrayals of tradition as bounded and static in favour of more open and flexible approaches, which accept that processes of incorporation, rejection, and rearrangement can exist within strong currents of continuity. We support those who have questioned the assumption that traditions must be ancient, stable, and conservative to be considered real or meaningful (Anderson 1983; Beiner 2007; Handler 1984; Hobsbawm and Ranger 1983), as there is much evidence of continual change and adaptation taking place in all the building crafts discussed here. Assessments of authenticity and value also emerge from the case studies as being very much dependent on the positioning and role of the actor or observer in question.

These points lead us to suggest that building craft traditions are perhaps better thought of as streams or currents than as something solid, fixed or permanent. They connect past and present, incorporate new elements and shed others along the way, but always flow forwards through time. This conceptualisation leaves space for multiplicity, debate, dynamism, and divergence, allowing traditions to change and still be considered valid and "alive" so long as there is sufficient participation and consensus to maintain the flow:

> The articulation of the constitutive elements of a tradition (its doctrines, modes of practice, identities, etc.) with each other and with the rest of society and culture is never fixed but always emergent. [...] The ongoing re-articulation between these elements is always a piecemeal process. The momentary stability of some elements allows others to be shifted, replaced, or imbued with a different meaning or function [...] Successive re-articulations succeed time and again in harmonising the tensions between local (conservative, unique) and global (progressive, shared) elements that continually threaten to pull any tradition apart. (Scheid 2007: 291)

Such conceptualisations of traditions as dynamic, fluid, and emergent resonate well with the general approach taken in this volume. Furthermore, by examining contested spaces of negotiation between older and newer elements in building cultures, the contributions challenge yet again the remarkably stubborn dichotomous opposition of tradition and modernity. While the term "modern" is frequently used by the contributors as shorthand for all that is contemporary and has super-local or global dimensions, and "traditional" to denote enduring, locally embedded, and culturally cherished aspects, these are always presented as interactive and overlapping elements rather than as radically opposed and mutually exclusive states. It is clear throughout this volume that building craft traditions maintain meaningful connections to the past, but operate very much within contemporary contexts in which components with varying origins are incorporated, mixed, rearranged, and juxtaposed.[8] We recall here Bruno Latour's critique of modernity's need to define itself in contrast to an imagined "archaic and stable past" and

7 See, for example, the foundational works of Max Weber, Emile Durkheim and Franz Boas.

8 See Sivaramakrishnan and Agarwal (2003).

his observation that modernist projects ostensibly aimed at separation and purification actually tend to result in endless hybrid forms (Latour 1993: 10). Dispensing with notions of purity, stability, and dichotomous opposition allows us to approach building craft traditions as emergent, living entities that combine old and new elements across multiple registers of thought, discourse, practice, materiality, and sociality.

CRAFT TRADITIONS IN FLUX

Highlighting the processual, adaptive, and integrative characteristics of building craft traditions opens analysis up to the effects that broad change processes, as well as shifts specific to the realm of construction, are having upon craftspeople and the built environment. The general picture across the Tibetan plateau and the Himalayas is one of declining demand for craft-based construction as new building materials become readily available, mainstream construction industries expand, and modern building forms and styles predominate. These developments are clearly causing a great deal of upheaval and uncertainty, leading many craftspeople to seek alternative livelihoods and some to predict the end of traditional modes of construction altogether. Indeed, most of the chapters describe craft traditions facing serious challenges or existential crises, with only Wozniak reporting improvements in terms of demand, working conditions, income, and social status. However, we also see numerous examples of resilience and adaptation as craftspeople adopt new materials, working patterns and practices, or organise themselves collectively to better meet the challenges they face (Dujardin; Weise and Joshi; Wozniak; Yeshey et al.). The contributions give us a general sense of the extent to which craft-based construction is struggling in different locations, but we also see various hybrid architectural forms emerging from the combination of traditional and modern materials, components, and methods. A significant proportion of this volume is dedicated to examining the challenges crafting communities are facing and documenting their responses to them, yet such issues also clearly demand further research as well as a range of policy, institutional, and ground-level interventions (Dujardin; Tiwari et al.; Weise and Joshi).

Building crafts have always been subject to change over time as labour and material costs rise and fall, political conditions change, migration patterns shift, new materials or technologies become available, and fashions wax and wane. However, many chapters show how craft traditions have become increasingly entangled with governance regimes and capitalist markets in recent times, contributing significantly to their transformation. For example, resource management regulations affect access to and prices of raw materials such as wood and stone, while mass cement and steel production consistently undercuts the prices of natural components. Building codes increasingly define which materials, methods and structural forms are legally acceptable and which are not, while bureaucrats and town planners rather than traditional authorities now decide which building types should go where. It is clear that research into building crafts must take these economic and governance regimes seriously as major drivers of transformation.

A large body of literature shows how new patterns of resource extraction as well as intensive agricultural, infrastructural, industrial, and tourism-related developments are reshaping landscapes, lives, and livelihoods across highland Asia (Aggarwal 2004; Cons and Eilenberg 2019; Horstmann et al. 2018; Guha 2001; McDuie-Ra and Chettri 2020; Sivaramakrishnan and Agarwal 2003; Yeh 2013; Yü and Michaud 2017). This is having a range of momentous and often highly destabilising effects, particularly for remote, marginalised, and minority communities, which urgently demand further study. However, while it is essential to build these dynamics into our analytical frameworks, we should not lose sight of the adaptive and agentive characteristics of craft traditions, nor assume that modern economic and governance regimes always represent a threat to them. Studies must carefully document and analyse these interactions, without shying away from critical positions yet also without being clouded by a priori assumptions concerning the impacts of state power or market forces.

The evidence presented here shows that building craft traditions involve material, practical, aesthetic, and symbolic elements with deep roots and enduring cultural significance, but does not suggest stasis or brittleness. We have seen how new materials, techniques, designs, and decorative elements can be incorporated without necessarily signifying rupture or decline. Innovations do not always require universal acceptance to be considered authentic or beneficial, and whether or not they gain widespread acceptance depends on

multiple factors both contemporary and historical.

Complex patterns of inertia and dynamism are particularly evident in the chapters by Dujardin and Wozniak, who note continual change as an intrinsic feature of Bhutanese and eastern Tibetan architectural traditions, while also highlighting a strong sense of continuity. Kalantari's description of the integrative, mimetic, and transmedial characteristics of early Western Tibetan temple decoration suggests a similar understanding emerging from the study of a much earlier period. At other points in the book, the limits of this understanding of tradition are explored, such as when Dujardin refers to craft traditions existing on "the cutting edge" of continuity and rupture, or when Norboo et al. question the extent to which building with modified earth materials represents the revival or redundancy of formerly important craft traditions. Gaining a deeper understanding of how building craft traditions experience and respond to change requires reflection upon their constitution and social organisation, as well as how identities are shaped and knowledge transmitted within them, issues to which we now turn.

IDENTITY, ORGANISATION AND TRANSMISSION

Characterising Tibetan and Himalayan building craft traditions requires us to account for the diverse ways that craftspeople identify and organise themselves, their differing levels of social status, skill, and engagement, and the various ways in which knowledge is transmitted, learned, and applied. The craftspeople discussed in this volume are organised in castes, families, and loose regional groupings as well as workshops and associations. Some are considered master craftspeople or skilled professionals and others part-time construction workers or simply householders, while the knowledge and skills they apply are learned through mediums ranging from casual study and long-term apprenticeship to formal college courses. Reflecting on similarities and contrasts across these fields allows us to further flesh out the concept of building craft traditions while also paying attention to its limits.

The chapter by Monisha Ahmed shows how crafts are fundamental to making human life possible in the remote and ecologically marginal areas occupied by nomadic pastoralists.[9] Virtually every member of the Changpa community engages regularly in the making and repair of tents. They learn the relevant craft techniques within their family units, alongside other crucial everyday skills such as animal husbandry. Their craftwork benefits their own household directly and is not remunerated in any way, so is not considered an income generating activity let alone a distinct "trade". Building crafts in nomadic communities are inextricably linked to dwelling and thus difficult to separate from the ensemble of components and practices this entails. Although there are rules and norms regulating craft practice — notably based on gender and age — there are no specific craft-based groupings or institutional arrangements, so craft confers no distinct sense of identity separate to that of the community as a whole. While this deep grounding of craft in everyday life marks it as somewhat different from other examples discussed in the book, it does not in any way imply something simpler, less valid or analytically important. The technologies and techniques involved demand the same methodological approach as in any other context (Ingold 2001; Schiffer 2001), while hierarchical orderings that would place nomadic craft practices "below" other forms must be firmly rejected.

Agricultural and urban communities evidently tend towards greater diversity in the way building crafts are organised and practiced. In many rural settings, house building and maintenance are bound up with dwelling in a similar way to how they are in nomadic communities. House owners in villages still work on their own homes with help from kin and neighbours, although formerly important community-level labour sharing systems are breaking down or are already obsolete in many places, so most workers must now be paid in cash (Dujardin; Thakkar and Shah; Wozniak; Friedl 1983).[10] We also see evidence of specialisation, as certain groups develop particular construction skills over time, gaining good reputations which lead them to be called upon to work for others. This allows them to further develop their skills and reputations and thus, cyclically, to gain more work. The *mistri* of Himachal Pradesh provide a good example of this. Alongside their varied social roles as ordinary villagers, *mistri* take

9 These findings are supported and amplified in another publication prepared within the same project as this volume (Feiglstorfer, Pfeifer and Drongshar 2024).

10 We also note the former prevalence of forced, corvee-style labour arrangements in pre-1959 Tibet, in Ladakh prior to Indian independence and in other areas, which often included significant amounts of construction work (Ronge 1978: 8; Schwieger 2019: 166).

the lead in all *kath-khuni* building projects, both applying and adding to knowledge accumulated over generations within family lineages (Bernier 1989; Dave et al. 2013; Thakkar and Shah, this volume; Singh 1999).

Such institutional forms confer a distinct identity to those involved and allow craft groups to persist over time, while also being flexible enough to adapt to changing conditions. In Drango (China), a particular convergence of factors has seen formerly part-time and community-based building craft activities become full-time trades around which livelihoods and professional identities are now constructed (Wozniak). In Ladakh, groups of craftspeople with particular skills are brought together from different communities to complete complex jobs as part of large and diverse teams (Harrison and Ahmed). This reflects an overall decline in the demand for craft-based construction work in the region, but also shows how the remaining craftspeople are becoming more specialised and how this is linked to their places of origin. Certain areas become renowned for certain crafts—masons from Doda, carpenters from Skurbuchan, painters from the Tibetan exile community—which encourages those involved to continue practicing particular skills and transmitting them to others, so as to meet what demand remains for their services. Connections between certain places and particular crafts are nothing new, as evidenced in Ladakh by the basket weavers of Chuchot and the potters of Likir (Kaplanian 1981: 73), but these linkages can grow stronger or weaker in relation to wider patterns of demand and availability. Together, these examples illustrate how both broad and construction-specific patterns of change are affecting the shape, organisation, and status of building craft traditions, yet still allow for distinct identities and roles to be retained by the concerned craftspeople so long as their skills remain in sufficient demand.

Prominent buildings such as monasteries, temples and *dzong* demand larger numbers of workers and higher levels of specialist skill than domestic architecture. The preservation of such buildings is ensured due to their religious, social, economic, and heritage value, which often allows for the mobilisation of considerable financial resources. These factors favour the development of more complex and clearly defined institutional forms. This is particularly evident in the Kathmandu valley, where certain occupational castes have been engaged in the construction and maintenance of tiered temples over many generations (Tiwari et al.; Weise and Joshi). Such caste-based groupings confer a strong sense of identity through the practice of their crafts, the propitiation of their own deities, and the practice of specific rituals, as well as by transmitting knowledge down through the generations. These chapters show how both the history and the current material condition of the tiered temples are intricately intertwined with the existence and activities of these groups. Although these connections have weakened considerably over recent decades, the temples remain important to the social status and identity of several caste and non-caste-based crafting groups. They continue to mobilise themselves around these links, using them to challenge disadvantageous government policies and counteract the growing dominance of modern construction firms. Both chapters argue for the strengthening of these institutional forms and connect their revitalisation directly to the long-term survival of the temples themselves. Both also argue for greater involvement of craftspeople in the heritage conservation sector, envisaging potential for clearer understanding between scientists, technical experts, and craftspeople which might be harnessed to better care for these unique buildings.

The construction and reconstruction of Bhutanese *dzong* relies on small groups of visionary master craftspeople, a larger number of skilled craftworkers, and a vast supporting cast of semi-skilled and unskilled labourers (Dujardin 1997, 2000b, this volume). In such a stratified milieu, the social status and identity of craftspeople are closely linked to their levels of experience, expertise, and engagement. Status accrues in part from one's family background and training, but mainly from accumulated proficiency and skill, as well as publicly recognised success in securing and completing projects over time. It is thus simultaneously a positional, technical, and socially negotiated form of status, which allows competent and skilful craftspeople to forge a sense of identity through repeated practice and the accumulated experience this brings.

From the 17th century onwards, Bhutan formalised and developed a specific "toolbox" of traditional crafts, known collectively as the *zorig chusum* or "13 traditional crafts", which encompasses all the major skills and materials used in the construction, upkeep, and decoration of buildings (Dujardin; Ison 1997; Yeshey et al.). Such state-supported institutionalisation has continued into the present day, with students enrolling in formal college programmes that teach specialised craft skills

using contemporary modes of instruction and assessment in place of master-disciple apprenticeships. This demonstrates the ongoing value assigned to craft traditions in Bhutanese society, which confers legitimacy and status to established practitioners and young students alike. As Dujardin notes, these institutions have become major sites in which the role of traditional skills is being renegotiated in contemporary Bhutan. They have strong potential to maintain the vibrancy and usefulness of these crafts into the future, but tread fine lines between facilitating continuity, embracing innovation, and slipping into decline.

The chapter by Yeshey et al. further shows how new organisational forms such as studios and workshops have emerged in this context to become important sites of craft production in contemporary Bhutan. Although they do not have the formal status and membership obligations of established craft guilds, studios and workshops work alongside the formal *zorig chusum* training system to provide an organisational basis for securing and conducting projects. They offer craftspeople a shared physical space in which work is practiced and ongoing training takes place, as well as a defined group around which a sense of common identity and purpose can be built, as discussed further in the following section.

The situation in Bhutan contrasts starkly with that in Tibetan areas of China, where once prominent craft guilds completely disappeared following the Chinese annexation. Various guilds developed in Lhasa from the 17th century onwards, with masons, carpenters and those working with earth brought together in the *do shing zokhang* (*rDo shing bzo khang*) or "builders' guild", which had around 500 members prior to its disbanding in 1959 (Alexander 2011: 61–63; Ronge 1978). This guild organised the training of apprentices and the supply of workers for the construction, maintenance, and renovation of monasteries, temples, and other prominent buildings (Thubten Yarphel 2013). As the chapters by Harrison and Wozniak show, no comparable organisations have risen up to replace such guilds, leaving craftspeople lacking institutional structures that could serve as loci for training and practice, or as the basis of a shared sense of identity, status, and purpose. Harrison's chapter stresses how scattered and weakened Tibetan building crafts were by the early 2000s, and suggests there is little scope for improvement under current political conditions. Wozniak argues that the recent house-building boom in Drango has revitalised carpentry and decorative painting in the region, making them attractive and lucrative trades, but shows also how the lack of appropriate formal training limits the scope for builders to adapt traditional housing forms to contemporary needs, while encouraging more individualistic and competitive modes of construction practice.

Another question raised in the introduction to this volume concerns relationships between different craft traditions and the way techniques, materials, structural forms, and stylistic details diffuse across space and over time. Although none of the contributions addresses this question directly, several touch upon related issues and contribute towards a better understanding of them.

For example, Kalantari's chapter illustrates the diverse cultural and stylistic influences that were brought together a 1000 years ago when the temple at Tabo was being constructed. Ahmed discusses the diffusion and adoption of various loom types in Ladakh and reflects on their effects. Feiglstorfer and Michette offer a wide-ranging account of the spread and adaptation of crushed stone flooring techniques, not only in Tibetan regions but across West Africa and the eastern Mediterranean. Yeshey et al. show how the adoption of marouflage supports for mural paintings in Bhutan depended on the mass production and regional trade of certain fabrics, while Dujardin shows how the periodic reconstruction of Bhutanese *dzong* propelled the widespread adoption of architectural innovations. These contributions and others besides[11] enable us to confidently state that building craft traditions have never existed in isolation and that localised exchanges, trans-regional trade, religious connections, and population mobility have all enabled flows and transfers of technique, material, and design over long periods of time. While many architectural features, built forms, and design sensibilities are certainly concentrated in particular areas and distinctive of them, it would be reductive and short-sighted to ignore the interactions that enable the diffusion of ideas and techniques, or to simply assume the indigenous origins of certain aspects of architecture and building craft.

To sum up, our framing concept of building craft traditions must be broad and flexible enough to include all these institutional forms, modes of training and practice, and forms of identity. We set out to explore commonalities, shared features, and comparable dynamics rather than to define precise and exclusive criteria for bounded categories. It is vital, there-

11 For example: Feiglstorfer, Pfeifer and Drongshar 2024.

fore, to pay close attention to the specificities of each case, but we also see value in placing these diverse traditions into a single descriptive category that focuses attention onto these undervalued and understudied groups. We are therefore left with a fairly broad descriptive term—Tibetan and Himalayan building craft traditions—which we feel applies adequately to all those involved in craft-based construction activities that mainly use local raw materials and maintain a strong grounding in architectural tradition. This concept is not only open to change, but actively theorises building craft traditions as processual and adaptive, anticipating continuous transformation in relation to broad currents of change as well as shifts directly linked to construction.

COMMUNITIES OF PRACTICE

The notion of "communities of practice" may help researchers to better appreciate how identity, transmission, status, and practice are organised in times of increasing social complexity and accelerating change. A community of practice was originally defined as "a system of relationships between people, activities, and the world; developing with time, and in relation to other tangential and overlapping communities of practice" (Lave and Wenger 1991: 98). This approach to the interactive dimensions of situated learning, knowledge, skill, and praxis was further developed by authors including Wenger (1998, 2000), Wenger et al. (2002), Brown and Duguid (1991, 1998), Roberts (2006) and Orr (1996). While communities of practice are primarily understood in terms of their facilitation of learning processes, they are also spaces within which meanings and identities are negotiated and produced, where feelings of community coherence are generated, and by which various practical and productive activities take on more or less shared orientations. Wenger (1998: 72–84; 2000: 227f.) identifies the main dimensions along which this occurs. Through *mutual engagement* and social interaction, norms, values and relationships are collectively established. Through a sense of *joint enterprise,* members are bound together in common purpose and shared activities. Over time, they produce *shared repertoires* of language, routines, practical activities, and artefact forms, as well as narratives about their identities. Finally, *alignment* involves the shaping and adaptation of localised activities in relation to wider systems and processes, increasing their visibility and effectiveness beyond the community in question. Communities of practice are never static or stable but evolve over time in relation to both external and internal factors, as well as being stratified according to age, expertise, and influence (Wenger et al. 2002; Roberts 2006). They are also situated within broader relations of hierarchy and power, which must be taken into account when adopting this approach.

There is considerable resonance between this concept and that of building craft traditions, but the communities of practice approach works particularly well in contexts where workshops, studios, craft centres, associations, and construction firms are the main institutional forms. In these settings, there is plenty to suggest mutual engagement, the development of shared linguistic and practical repertoires, and alignment in relation to wider discourses and processes. There is much evidence in the case studies of internal hierarchies of expertise and the influence of external power relations, as well as the continuous evolution of craft traditions over time. Applying a communities of practice approach might aid appreciation of the way carpenters' associations in Kathmandu operate both through and beyond caste, how they perpetuate a sense of shared identity and purpose, or organise their response to the challenges they face. Bhutanese studios and workshops can be seen as examples of craft traditions adapting their institutional forms, modes of training and practical work to contemporary conditions, while those Ladakhi builders integrating modified earth products into new structures could also be seen as a vestigial community of practice.

A communities of practice approach may also offer useful tools for analysing how gender roles are constituted in building craft traditions, as well as why and how they change. Gendered attributions of certain craft activities have deep social and cultural foundations, but are not consistent across all contexts and do not remain stable over time, particularly during periods of profound change. For example, the processing of *arga* was seen as female work in Tibetan-speaking areas until at least the 1950s. Changes in the availability of workers, shifts from community-level obligations and reciprocal relations to cash payment, as well as the new labour and property policies introduced by the communist regime all led to changes in how mutual engagement and joint enterprise were manifested, as well as in the shared repertoires through which craft activities were discussed and explained. The processing of *arga* became open to both genders,

united through their wish to earn money and survive through times of great upheaval.

Finally, we suggest that Pierre Bourdieu's (1977, 1990) concept of "habitus" might also prove helpful in framing future studies of building craft traditions. Habitus refers to socially engrained bodily habits, skills, and dispositions that are intrinsically linked to ethical frameworks, conceptions of the world, and understandings of one's role within it. Individuals acquire a particular habitus throughout their lives through reflexive interaction with their physical, social, and cultural context, as well as through their daily practices. This concept can illuminate the way those involved in building craft activities understand their social and technical roles, as well how their skills, abilities, and indeed their bodies, are shaped over time through the performance of these roles. As part of a larger theory of practice (Bourdieu 1990; Ortner 1984, 2006), it can also help us appreciate how craftspeople are both embedded within and constitutive of dynamic socioeconomic, cultural, technological, political, and historical contexts. They are constrained by social structures and norms, but also exercise agency as they improvise manoeuvres within these spaces, allowing for resistance, challenge, and reconfiguration. Craft-based building is by definition a transformative process, but at the same time as altering the built environment and affecting the experiences of its inhabitants, it constitutes a central aspect of the lives, bodies, and identities of the builders, and is thus both transformative and transforming.

To sum up, we see considerable potential for both communities of practice and theory of practice approaches to enrich understanding of building craft traditions. Practice theory and the notion of habitus focus attention at the level of the individual, while the communities of practice framework attends to collective forms of identity, organisation, and action. The latter approach works particularly well in contexts where formerly stable "traditional" modes of organisation are breaking down and being replaced with new institutional forms, which is indeed the case across much of the Tibetan plateau and the Himalayas. These approaches may also provide conceptual bridges to link studies of the larger scale organisation of craftspeople to the microanalysis of specific craft practices favoured by Ingold and Marchand.

VERNACULAR ARCHITECTURE AND BUILDING CRAFT TRADITIONS

We now move on to position this volume in relation to the sizable body of scholarly work concerning vernacular architecture (Asquith and Vellinga 2006; Caimi 2006; Foruzanmehr and Vellinga 2011; Ferrari 2018; Frey 2010; Oliver 1997, 2003; Vellinga 2011, 2010, 2005, 2006; Vellinga et al. 2007). This literature is highly pertinent to our concerns as it focuses on buildings constructed largely or entirely by their owners or local non-professionals, without detailed blueprints or plans and primarily using local knowledge forms, manual tools and natural raw materials. A brief review of this work reveals many areas of convergence and productive synergy with the current volume, as well as several aspects that demand critical reflection.

As Paul Oliver (2003) points out, the majority of global housing continues to correspond to the vernacular form, yet vernacular architecture still occupies a marginal position in mainstream architectural research and practice. In a discipline largely oriented towards the construction of exclusive, innovative buildings or the mass roll-out of generic forms, limited enthusiasm for low-cost buildings that require no input from architects or construction professionals is perhaps understandable. However, several authors highlight the short-sightedness of this view and the missed opportunities that result from it, given the ubiquity and importance of vernacular buildings across much of the world (Asquith and Vellinga 2006; Frey 2010).

When architectural scholars have engaged with the vernacular, some tend towards idealistic and romanticised representations which cloud accurate observation and preclude rigorous analysis. Recognising this, Oliver (2003: 14) calls for a new interdisciplinary approach that combines elements of architecture, anthropology, history, and other related fields, enabling complex relationships between locality, history, culture, design, function, and symbolism to be more adequately drawn out. This volume contributes strongly to such in-

terdisciplinary efforts and explores exactly these kinds of relationship, while striving to redress the problems resulting from oversight on the one hand and idealisation on the other.

The contributors recognise the crucial roles that vernacular structures continue to play across the Himalayas and Tibetan plateau in terms of dwelling, social life, cultural and religious practices, and local identities. At the same time, the authors all recognise the adaptive character of building craft traditions and accept the inevitability of change, placing transformation at the centre of their analyses. Whether stressing disappearance, revitalisation, hybridisation or some combination of these processes, the authors take vernacular architecture seriously and strive to place it accurately and unsentimentally in relation to broader patterns of change. We accept that people always strive to improve their quality of life and that this may lead them to reject vernacular dwellings, seeing houses made of concrete and steel as better adapted to contemporary lifestyles and lacking associations with backwardness and poverty. Equally, we remain convinced of the ongoing value of vernacular buildings for large swathes of the population, as well as curious about the numerous ways traditional built forms are being combined with new elements to produce hybrid forms.

As Lindsay Asquith and Marcel Vellinga (2006: 1) note, vernacular architecture is widely seen by state governments, planners and policymakers as being "from the past"; an obstacle to progress in urgent need of replacement with models more suited to modernist notions of how buildings should be conceived, constructed, and used. There is thus a major disjuncture between the prevalence and importance of vernacular forms "on the ground" across much of the world and the way they are represented and addressed in fields of governance and policymaking. It is clear that rural, marginalised, and ethnic minority populations are often the most reliant on vernacular housing forms across the Himalayas and the Tibetan plateau. These constituencies are often disenfranchised and excluded from political representation and policy processes, while state priorities tend to align more with the interests of the majority, urban populations and the forces of neoliberal capitalist development, in which the construction industry is a prominent player. This volume draws attention to these power relations and fields of contestation, contributing towards a clearer understanding of their dynamics while encouraging informed and constructive dialogue, if not reconciliation, across seemingly opposed positions.

McDuie-Ra and Chettri note how formerly marginal areas of Asia are increasingly being opened up for resource extraction, infrastructure projects, and tourism development, which can serve to accelerate the adoption of new building styles and the corresponding decline of vernacular architecture. The Chinese annexation of Tibet and the region's subsequent development path have had largely disastrous effects on indigenous architecture, particularly affecting religious buildings and Lhasa townhouses (Harrison; Alexander 2011; Yeh 2013). However, several chapters show how spaces can open up in which the restoration of prominent and religious buildings, construction of new vernacular houses, and revitalisation of craft skills are possible, suggesting that there may still be a future for building craft traditions in Tibetan areas of China and Himalayan India (Harrison; Harrison and Ahmed; Wozniak). Several other chapters illustrate how local preferences for housing often involve some combination of vernacular and modern forms and materials (Dujardin; Norboo et al.; Thakkar and Shah), which potentially opens up space for negotiation between local people and state planners over the kinds of houses that are built in future. Such negotiations must include the adaptation of building codes and regulations, which largely reflect modern construction modes and work against the use of traditional materials and techniques. As several chapters argue, reforming regulatory regimes and including vernacular elements in formal construction training would contribute significantly towards more inclusive, appropriate, and sustainable building cultures (Dujardin; Thakkar and Shah; Weise and Joshi; Wozniak).

This volume also encourages us to question the tendency in literature on vernacular architecture to underplay, or even overlook entirely, the crucial roles played by craftspeople and processes of making. By focusing on completed built forms, the processual nature of craft-based construction, the techniques and skills it employs, and the actual means by which it adapts to ecological and socioeconomic conditions is frequently obscured (Asquith and Vellinga 2006; Belz 2015, 2013; May 2010; Özkan 2006; Payne 2006; Waterson 1997). Although none of the case studies gathered here include fine-grained accounts of processes of making, such as those propagated by Ingold (2013) and Marchand (2010), they all

recognise the crucial roles played by craftspeople and their labours. This refocuses attention away from the "physical shells" of buildings (Özkan 2006) and onto the skills, practices, and social dynamics involved in their making, which in turn supports an understanding of building cultures as perpetually emergent at the convergence of material, technical, and socioeconomic processes.

The third area in which this book can contribute to this literature concerns the boundaries of the vernacular and its relationship to other architectural modes, particularly "elite" forms of building. The case studies support a broad distinction between the craftwork involved in functional, everyday activities such as building a farmhouse or weaving a tent shell and those involved in making, decorating or maintaining large religious buildings. It is clear, for example, that marouflage textile supports for wall paintings are limited to Bhutanese monasteries and temples, that maintaining the tiered temples of Kathmandu demands knowledge and skills of a different order to everyday building, and that the convergence of influences and practices described for historical Tabo could not have occurred without the patronage of wealthy and powerful rulers. Particular craft practices, skill levels, and materials often correspond to the social status of the client, or the cultural and religious significance of the building in question. However, the case studies also show considerable crossover between everyday and elite spheres, which mitigate against their stark separation. For example, Dujardin shows how Bhutanese craftspeople work on *dzong* renovation projects as well as private house construction, and how innovations and stylistic developments in the former field come to influence the latter. Feiglstorfer and Michette note that despite the concentration of *arga* roofs in religious buildings, the labour of large numbers of ordinary people is required to prepare them, so the process of making spans various status groups. Several other chapters illustrate how similar materials and techniques are employed in both elite and everyday settings, suggesting a continuum rather than distinct, bounded realms. It may indeed be time to widen the scope of "the vernacular" beyond small-scale domestic architecture to encompass all those buildings that serve as "'distinctive cultural expressions of people who live in or feel attached to a particular place or locality" (Vellinga 2006: 90) and to study them holistically and relationally rather than maintaining artificial and misleading divisions.

Finally, this volume provides an opportunity to address the recent upsurge in publications valorising vernacular architecture for its assumed environmental friendliness and cultural appropriateness. Vellinga refers to this as "the noble vernacular" approach and suggests that it can accentuate "reductionist, essentialist and romanticised representations" of this architectural mode, while also misrepresenting the concept of sustainability itself (Vellinga 2013: 570). Most of the studies in question focus on the thermal properties and climatic performance of buildings, arguing that vernacular homes outperform their modern equivalents in these respects (Cardinale et al. 2010; Dili et al. 2010; Engin et al. 2007). Several chapters in this volume support this general position, showing how traditional materials are considered to have better thermal properties than concrete in Himachal Pradesh, Ladakh, and Drango. However, the case studies also point to other aspects that need to be considered when assessing the ecological properties of particular architectural forms. The ecological implications of using local wood, stone or earth depend on the abundance or scarcity of the resources in question. Rising populations, growing cities, and improved infrastructural connections to distant markets are all putting pressure on natural resources, making it difficult to separate their use in vernacular building from broader patterns of demand and supply. While there is no doubt that the industrial production of cement, steel, and glass, as well as their transportation over long distances, produces large amounts of carbon dioxide and other kinds of harmful waste, this does not automatically equate to the inherent sustainability of local resource use. Furthermore, the combination of rising timber prices and restricted access rights can push such resources out of the reach of ordinary people, with major impacts on building decisions irrespective of local preference (Wozniak; Thakkar and Shah).

The "life cycle approach" to building (Kotaji et al. 2003; Sharma at al. 2011) generally considers the environmental impacts of buildings through all stages of their existence. It starts with those activities leading to the existence of a building—the commissioning, planning and construction phases—followed by its use, maintenance, buying, selling or repurposing, as well as various subsequent stages such as decay. We find this approach useful, but mainly by extending the concept beyond its initial concern with environmental pollution to encompass broader aspects relating to construction and post-construction processes. This

means that a building is not "finished", nor our interest in it exhausted, once initial construction is completed. As discussed above, concepts of completeness, durability, and disintegration are not universal facts but are rather socially produced and culturally evaluated (Buchli 2002; Oldenziel 1996; Thompson 1994). We thus consider local understandings of restoration, adaptation, maintenance, repurposing and reuse, disposal, recycling, and even the passive process of deterioration, as valid research topics and many of these are touched upon in this book.

Growing interest in the "circular economy" (Pearce and Turner 1990; McDonough and Braungart 2009) converges with "noble vernacular" approaches to open space in which the recycling and reuse of scarce building resources can be assessed. However, such analyses are often distorted by the tendency to essentialise building forms and set up a dichotomy between vernacular and modern architecture (Vellinga 2013: 572). The contributions to this volume largely avoid such a reductionist approach, describing instead a range of building modes that combine materials and features with various origins and properties. For example, Norboo et al. consider the problematic assumption that building with modified earth products is intrinsically more environmentally friendly than concrete, as well as having better thermal and structural properties. They argue that additives yield little added strength while making re-use impossible, thus adding limited value at the same time as undermining rather than revitalising Ladakhi building craft traditions. This example is one among several in this book that can be seen to support Vellinga's critical position concerning the "noble vernacular". There is much here to suggest promise in the notion of "learning from the vernacular" (Frey 2010) and considerable scope for applying such knowledge both to improving construction practices in situ and in other locations. This book contains several pointers in this direction, while a new research project currently being launched by Hubert Feiglstorfer is set to dive much more deeply into these issues.[12] Suffice to say here that detailed empirical research and sober analysis serve us far better than a priori assumptions and essentialised understandings of such complex, plural, and dynamic fields of human activity.

12 A European Research Council funded project entitled *Climate and Contemporary Transformations of Vernacular Architecture* will run from 2024 to 2028 at the Austrian Academy of Sciences.

CULTURAL HERITAGE, CONSERVATION, AND CRAFT

Differing notions of value lie at the centre of debates over the designation of buildings as cultural heritage and over policies and practices concerning their conservation. While we do not have the space here to address these issues in a comprehensive manner, it is worth drawing attention to some key aspects which carry significant implications for the treatment of buildings and the status of craftspeople in our focal regions. As discussed above, the way different groups assess the value of particular buildings is highly subjective and the outcomes of such assessments are closely linked to power and influence at local, national, and global levels. In high-level decision-making processes, values linked to notions of cultural heritage as well as economic criteria — notably tourism as a source of revenue — often triumph over the needs of local people for affordable housing or venues for social activities. Iconic buildings are routinely earmarked for funding and protection while less prominent buildings such as rural farmhouses or marketplaces are often neglected or disparaged. In certain cases, as epitomised in the recent history of Lhasa, large-scale changes to the built environment explicitly favour the preservation of landmark buildings and the development of new commercial sites, while simultaneously entire neighbourhoods of vernacular homes, shops, and workshops formerly used by ordinary Tibetan people are razed to the ground (Yeh 2013). This shows how political and social engineering agendas can be enacted under the guise of "urban development" and "cultural heritage protection".

Numerous interests become entangled in decisions over which buildings count as cultural heritage and which do not, ranging from state-led nation building and regional ethnic revitalisation projects to highly localised, needs based discourses (Bendix 2015). Locating the responsibility for such decisions at the "community level" overlooks both the power dynamics involved and the fact that "the notion of community has been aptly critiqued in scholarly debates about cultural heritage and cultural property" (Adell et al. 2015: 65; see also Tauschek 2010; Noyes 2006). Communities are often difficult to demarcate and can be

relatively homogeneous and cohesive or riven with divisions (Amit and Rapport 2002). This can lead to radically different priorities and user requirements within (let alone between) communities over which buildings should be conserved and which should be altered, repurposed, left to deteriorate, or demolished and replaced. Institutions charged with making or enforcing such decisions include governmental departments at local or national levels (Yeh 2013), as well as global organisations such as UNESCO. Such institutions confront multiple challenges when evaluating the criteria used to establish the terms, forms, and extent of protection (Brumann 2015). As well as being co-opted by larger political interests, as in the case of Lhasa mentioned above, such decisions can also contribute to processes of "musealisation" or "heritagisation" as romanticised, surrogate representations of objects and cultural practices reveal "social inequalities or the misrecognition of minority groups" in order to produce "the difference between special and common objects and practices" (Groth 2015: 66f.).

Ideas, discourses, and policies concerning cultural heritage at the global level, epitomised in the approach of UNESCO, tend to focus on restoring prominent buildings to an idealised state and then maintaining them in that condition, changing as little as possible (Krist 2016). This static model draws upon notions of architectural perfection and historical value strongly influenced by European cultural tropes traced back to the Renaissance and beyond. Although similar ideas have become widely adopted worldwide along with the spread of modernity and globalisation, they are far from universal and often contrast quite markedly with perspectives that emerge from other cultural configurations. For example, Tibetan Buddhist notions of the preservation of important buildings are animated more by the "idea of the prestige of the original, rather than of the physical form of the original" (Karlström 2005: 351). Buddhist structures such as temples and *stupa* are invested with meaning through consecration and repeated ritual, so their value is largely spiritually grounded rather than intrinsically tied to material form. It is quite common throughout the Tibetan cultural area for a new temple to be constructed in concrete right beside the decaying remnants of a much older temple, or for a community to favour the construction of a new *stupa* over the preservation of an ancient one. Furthermore, outsiders' assumptions of inherent stasis and conservatism in "traditional" architecture can lead to dynamism being misrepresented or overlooked entirely. Marc Dujardin clearly demonstrates how the periodic reconstruction of Bhutanese *dzong* enables new techniques, structural features, and aesthetics to be integrated into larger currents of architectural tradition, so they serve as "propelling monuments" rather than unchanging landmarks (Dujardin 2013, 2000, this volume).

None of this is to suggest that religious structures are not valued, or in many cases preserved in a good condition in the Tibetan cultural area. Indeed, their maintenance brings merit to those involved and their destruction is a serious moral and spiritual issue (Sharma 2017). However, the insights emerging from this volume lead us to question the universality of standardised, Global North-led approaches to cultural heritage and building preservation and to attend much more closely to the way ideas of continuity, change, and value are formed and expressed in different sociocultural contexts.

While built objects have long been the focus of debates over cultural heritage, recent decades have seen building-related knowledge, skills, and techniques also inspire questions of heritage protection. The preservation of *intangible* cultural heritage requires financial and institutional support not for buildings but for the knowledge, training, apprenticeship, and working activities of the craftspeople who make and maintain them. The UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO 2003) defines the legal and organisational parameters for such support, while most national governments have developed their own policies in this direction. However, as with the protection of buildings, the interpretation and application of such guidelines are matters of significant debate and subject to competing discourses, social interests, and political pressures (Adell et al. 2015). Decisions over which crafts are worthy of financial support are thus entangled with ethnicity, social class, status, and power, as well as questions of value and aesthetic judgement at global, national, and local scales (Wilkinson-Weber and DeNicola 2016). Despite a great deal of talk about community participation in heritage conservation circles over recent decades, real policy and decision-making processes remain the preserve of global elites (Brumann 2015). The results of such processes tend to favour those with formal training and who work with prominent buildings of elite and/or touristic interest,

while largely overlooking those working in remote or marginal areas with buildings used by "ordinary" people.

Several contributions to this volume address the issues outlined above and propose remedial measures to the problems they identify. The two chapters concerning the tiered temples of the Kathmandu valley show how both mainstream heritage conservation activities and government policies have sidelined traditional craft groups over recent decades, leading to inappropriate or harmful interventions. They argue that state policies concerning heritage conservation and post-disaster reconstruction in Nepal result in further neglect of craftspeople in favour of modern construction firms, contributing not only to ineffective building work but also to declining status, job security, income, and cohesion among the craftspeople. This situation holds both immediate and long-term implications for the condition (or even the survival) of the tiered temples themselves, as well as the craft groups linked to them. Both chapters point to the decline of regular maintenance and material renewal by specialised craftspeople as major factors in the weakening of the tiered temples, and both propose actions that could be taken to reverse the current spiral of decline. Some initial steps are being taken by the craftspeople themselves, but a great deal remains to be done both by the government and conservation organisations to enable much more significant involvement of skilled craftspeople in future and thus to simultaneously maintain these craft traditions and the temples themselves. Similar questions over the role of traditional craftspeople in the maintenance of prominent buildings emerge from Feiglstorfer and Michette's chapter on *arga,* primarily concerning Tibetan contexts but touching also the *banco* architecture of West Africa, notably that of Djenne in Mali.

Education and vocational training are also fields in which building craft traditions can either be weakened or strengthened, with significant effects for craftspeople, heritage conservation efforts, and vernacular architecture more broadly. The state support offered to traditional craft training in Bhutan contrasts with its total absence in Tibetan areas of China and in Nepal, with corresponding effects on the nature and quality of conservation interventions. The lack of attention to traditional materials and techniques in formal college courses in construction, engineering, and planning is an obvious weakness right across our focal regions, especially considering the high proportion of vernacular buildings that remain in use. All the contributors agree that including such traditional elements in mainstream training courses would be hugely beneficial for craftspeople, for conservation efforts, and for the built environment itself, but whether such moves take place depends on political will, social pressure, and investment in each location.

Overall, this volume recognises the deep intertwining of vernacular architectural forms with craft-centred knowledge, practice, and institutions. This gives rise to a collective call for much greater involvement of traditional craftspeople in heritage conservation policies and activities. The needs of the moment extend from establishing more open platforms for exchanging knowledge between craftspeople and modern technical disciplines, through the adaptation of policies for commissioning conservation work and the inclusion of craft skills in formal training programmes, to the meaningful involvement of existing craft groups in maintenance and conservation activities. Furthermore, building craft traditions still play key roles in constructing, maintaining, and adapting less prominent buildings across these regions, from farmhouses to village shrines. There is a strong argument to be made that these buildings merit greater attention and protection in the face of increasingly generic, mass-produced construction trends, and that vernacular forms can be combined with new patterns of use, new structural components, and new style trends in ways that can contribute significantly to meeting the need for housing and other built forms both now and into the future.

TENTATIVE CONCLUSIONS AND AVENUES FOR FURTHER RESEARCH

As the first edited volume to focus explicitly on building craft traditions in Tibetan and Himalayan regions, this book makes an original contribution to the academic literature, but also holds relevance for applied fields such as heritage conservation, the construction industry, and state planning and policymaking processes. As well as amply illustrating the ongoing importance of vernacular architectural forms in these regions, it demonstrates their deep interdependence with the craftspeople involved in their construction and maintenance, suggesting that future discussion of the former should be contingent upon sound understanding of the latter.

Far from being tourist traps or museum pieces, most of the buildings discussed here are currently being lived in, worked in, or used as venues for valued social, religious or ritual activities. Their meanings and values are fluid and multiple, shaped by particular intersections of social, cultural, economic, and political projects and processes. Like the buildings, the craftspeople involved in their construction are understood, represented, and valued in various ways, depending on local particularities and the positioning of the observer. However, because processes of making and the makers themselves tend to be overshadowed by scholarly focus on objects made (Ingold 2013), and because both crafts and vernacular architecture have long been marginalised in mainstream literature, their histories, identities, and practices have remained largely obscure. This volume brings the craftspeople and their traditions out of the wings and makes a strong case for keeping them centre stage in future discussions relating to the built environment in these regions. The book also raises critical questions concerning the devaluing (and potential for revalorisation) of makers and processes of making, the way crafts intersect with or diverge from broader processes of social change, and the relationship between individual craft practices and larger structural, aesthetic, and symbolic patterns.

Perhaps the clearest conclusion to be drawn from the book is that vernacular architecture and building craft traditions are facing significant challenges as the 21st century progresses, but there are many signs of resilience and adaptation. We have seen evidence of craft groups organising themselves in new ways to meet these challenges, adapting their skills and working practices to better suit the new circumstances, or even experiencing periods of growth and revitalisation. Further research is called for to better understand the factors causing the decline of craft-based building, especially in relation to state planning policies, building codes, resource use regulations, and training opportunities, but also concerning the shifting lifestyles, attitudes, and aspirations of local populations. It is necessary also to study in greater detail how adaptation actually takes place, both in terms of hybrid forms of construction practice that combine old and new materials, techniques and styles, and in terms of interaction between the craftspeople and modern construction, conservation, and heritage industries.

This leads us to argue that rather than being conceived of as bounded, static and conservative, building craft traditions are, and have always been, dynamic entities that involve ongoing processes of exchange and integration while also maintaining strong currents of continuity. These characteristics are evident in the integrative, mimetic, and transmedial practices involved in Western Tibetan temple decoration over 1000 years ago, in the evolution of tiered temple construction in the Kathmandu valley, in the spread of various crushed-stone flooring techniques, in the propelling effects of Bhutanese *dzong* reconstruction, and in contemporary house building practices in Ladakh and Drango. Transformation, integration, and adaptation must therefore be understood as intrinsic properties of building craft traditions rather than being assumed a priori to be aberrations or weaknesses. More research is certainly needed to assess the ways in which materials, techniques, and styles diffuse across time and space, to investigate the causes and directions of change, and to establish the extent to which particular traditions remain vibrant and distinct or are indeed facing catastrophic decline. If such research does not proceed from an understanding of building crafts as complex, dynamic, and adaptive it risks reductive conclusions that would further misrepresent and obscure these traditions rather than opening them up to accurate and nuanced analysis.

These observations encourage some concluding reflections on the characterisation of building craft traditions that emerges from this book, as well as on appropriate ways to approach the study of them. While the diversity of cases discussed here does not support

any tightly-defined categorisation or precise typology, we do see considerable descriptive and analytical value in loosely grouping these traditions and practices together. There are sufficient shared features and common dynamics to delineate a reasonably well-defined field of study, which provides useful foundations upon which future research can build. Collective recognition that craft-based building exists as a complex assemblage involving numerous heterogeneous components has led us towards a holistic approach, but this should not devalue or preclude tightly-focused research into specific components of such assemblages. Fine-grained research can certainly yield valuable insights, but should not lose sight of the many other factors at play and comparative analytical work will always be needed to contextualise and position focused research findings within the larger fields in which building crafts operate.

This volume demonstrates the value of studying craft knowledge and practice, as well as challenging some of the assumptions that have distorted existing approaches to this field. There is ample evidence here that craft-based building is far from simple, repetitive or automatic. Even seemingly straightforward tasks involve creativity and the continuous engagement of practitioners as they attend to variations in the materials, tools, and the evolution of the task at hand (Ingold 1993, 2001). This is especially pertinent given the challenging conditions in our focal regions, where terrain is often uneven and unstable, climatic conditions are often severe and raw materials and tools frequently suboptimal, yet where wellbeing and even survival can depend on the quality and durability of crafted structures. We have seen how some craftspeople operate effectively with relatively modest skill levels within the domestic sphere, while others reach high levels of mastery over particular materials, techniques, and tools, primarily in religious contexts. We have also seen how all of these craftspeople work within complex and shifting social settings, where relationships and interactions shape their activities in important ways. These examples highlight the value of building crafts from diverse everyday activities of householders to the highest levels of technical proficiency, as well as showing how their fields of practice extend far beyond material, technical, and productive realms.

Taken together, the contributions encourage us to challenge the common conceptual separation between craft, art, utilitarian trade, and technology, showing these to be Eurocentric, minority world constructs with limited relevance to the areas in focus. Processes of conception, design, making, and maintenance are in many cases carried out by the same people, or are divided up quite differently to Western contexts. This volume encourages us to reject the marginalisation of these crafts and the assumption that they carry lesser value compared to fine art and design, text-based forms of knowledge or Western models of expertise, while striving to avoid romantic, preservationist or paternalistic positions. We therefore question the hierarchies of thought that position design above making and assume the dominance of "heads over hands", arguing instead that building craftspeople and their traditions are equally valid and representative of contemporary society and culture as architects, fine artists or professionals working in other fields. They are engaged in complex, skilful, and useful practices, they mediate between social, material, and symbolic realms as well as between past, present and future. Their activities both reflect and transform the world around them. Studying building craft traditions allows us to tackle or even dissolve the dichotomies that have emerged between material/technical and social/functional/symbolic phenomena, and to apprehend broader processes of transformation from socially situated, emic perspectives. There is great potential here for further research to be conducted along the microanalytical and phenomenological lines laid out by Trevor Marchand (2003, 2007, 2010) and Tim Ingold (1995, 2007, 2013), which would not only document these craft practices much more thoroughly, but also connect them to wider theoretical questions concerning cognition and skill as well as processes of making, transmission, and learning. Linguistic studies of the terms used for materials, components, tools, and techniques would also be valuable to better understand these processes in emic terms, as well as how they diffuse and change across time and space.

Finally, we propose that vernacular architecture and the craftspeople engaged in its construction and maintenance have the potential to play much greater roles in the "real world" than they are currently being cast in. We have seen how crucial skilled craftspeople are to the continued survival of the tiered temples of Kathmandu and the *dzong* of Bhutan, as well as to the revitalisation of Leh Old Town. These examples make a forceful argument for the increased involvement of craftspeople in other heritage conservation projects. Such engagement could bring craftspeople into closer

interaction with technical experts trained in modern disciplines such as heritage conservation, engineering, and materials science, but must avoid instrumentalism, paternalism, and extractive approaches in favour of mutual respect, recognition and collaborative learning (Dujardin; Tiwari et al.; Weise and Joshi; see also Schacher 2008; Schacher and Quaisar 2009).

Despite the general shift towards generic buildings constructed from modern materials, vernacular dwellings remain important sources of housing across our focal regions (Feiglstorfer 2014, 2022; Herrle and Wozniak 2017; Hughes 2000, 2007) and beyond (Asquith and Vellinga 2016; Oliver 2003), particularly but by no means exclusively in rural, economically marginal, and ethnic minority areas. Rather than being ignored by profit-focused construction industries or written-off by policymakers as too costly, inappropriate, hazardous or unsustainable, concerted efforts should be made to properly investigate their potential role in meeting current and future housing needs, whether in "traditional" or a range of hybrid forms. Connected to this comes an array of pressing questions over the relative climatic, seismic, and fire-related performance of vernacular buildings compared to their modern counterparts, as well as over their ecological sustainability and suitability to contemporary lifestyles. Again, there is huge potential for craftspeople to participate in both research and applied interventions that could contribute towards answering these questions accurately and without resorting to reductive "noble vernacular" tropes (Vellinga 2013). Such work might fruitfully involve life-cycle, materials science, engineering, resource management, and ethnographic approaches, to name but a few. As in the heritage conservation field discussed above, for such collaborations to truly work craftspeople must be involved as key actors and important knowledge-holders with valid insights and applied contributions to make, not merely as sources of information to be extracted and integrated into other interpretive or applied frameworks, or co-opted for agendas that ultimately work against their interests.

Overall, it is clear that the building craft traditions of the Tibetan plateau and the Himalayas are facing a highly uncertain future. While continued demand for craft-based construction and maintenance services in many locations, combined with the resilience and adaptability of the craftspeople themselves, may well enable some traditions to effectively revitalise and others to at least survive in more-or-less recognisable forms, it appears likely that some traditions will not be able to meet the challenges that lie ahead. This volume has taken some initial steps towards making these crafts and craftspeople more visible, to placing them historically and to better understanding how they operate in the present day. All the authors involved hope that it will inspire further research and applied attention to these craft traditions in the future, which might go some way towards mitigating the difficulties currently being encountered.

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E

List of Figures

Fig. B-1 Completing work on a rebuilt stupa with Sang Yak Drak nunnery in the background (Central Tibet, PRC). **13**
Source: John Harrison (2000).

Fig. B-2 Master carpenter teaching. **14**
Master carpenter Laxmi Bhakta Rajchal proudly teaching his grandchildren the traditional craft of wood carving in Kathmandu, Nepal.
Source: Anie Joshi (2020).

Fig. B-3 Cluster of ancient buildings in Kanji village, Ladakh. **15**
Source: Martina Oeter (2011).

Fig. B-4 A black hair tent in Changthang, Union Territory of Ladakh, India. **17**
Source: Monisha Ahmed (2006).

Fig. B-5 Temple in Gavas village. **19**
A living testament to the ingenuity and skill of the craftspeople who built it using traditional *kath-khuni* building techniques.
Source: Mansi Shah (2012).

Fig. B-6 RHP *rabsel* window frame. **20**
Erecting the *rabsel* window frame for the prototype improved traditional farmhouse at Paro, Bhutan (Rural Housing Project). All the components were assembled and tested onsite, fitting together perfectly without the use of nails or screws. Here, monks are preparing to ritually commission the *rabsel* before the last section of the timber framework can be lifted into position.
Source: Marc Dujardin (1989).

Fig. B-7 Timber logs ready for house construction, with one partially constructed and one newly completed house in the background, Drango, PRC. **22**
Source: Anna Wozniak (2016).

Fig. B-8 A contemporary construction site in Thimphu, Bhutan. **23**
Components of Bhutan's outstanding timber architecture are cheaply copied and incorporated into new buildings as functionless, formalistic additions, entirely omitting traditional craftsmanship and its toolbox of the 13 traditional crafts.
Source: André Loeckx (2013).

Fig. B-9 Rammed earth construction site in Choglamsar, Ladakh. **24**
Source: Gawa Norboo (2021).

Fig. B-10 A rare glimpse of Mount Khangchendzonga through the forest of concrete and steel. **26**
Source: Karchoong Diyali (2021).

Fig. B-11 The renovated LAMO Centre (Munshi House) seen from the south, Leh, Ladakh. **27**
Source: John Harrison (2010).

Fig. B-12 Final ceremony before the installation of the *sogshing* (Tree of Life) into the stupa at Sang Yak Drak nunnery near Lhasa, PRC. .. **29**
Source: John Harrison (1999).

Fig. B-13 The main beams are set into position during the reconstruction of Kashthamandap, Kathmandu. **29**
Source: Sudarshan Raj Tiwari (2019).

Fig. B-14 Carpenter Gopal Krishna Silpakar restoring the salvaged deity image from the pavilion balcony during the reconstruction of the Kasthamandap, Nepal. **31**
Source: Anie Joshi (2021).

Fig. B-15 Intricately decorated pillars and window frames illustrate the enormous amount of craft skill and labour power involved in the reconstruction of Punakha Dzong. **32**
Source: Calum Blaikie (2009).

Fig. B-16 The craft skills required to make *arga* roofs remains widespread across much of the Tibetan cultural area. **33**
Source: Hubert Feiglstorfer (2019).

Fig. B-17 Bodhisattva image showing details of cloths and jewellery, Tabo *gtsug lag khang* (ambulatory), 11th century. **35**
Source: Hubert Feiglstorfer (2019).

Fig. B-18 Canvas patches have been put to diverse use in Bhutanese wall painting. Here, at Menchuna, painted canvas patches were used to repair or modify existing wall paintings on earthen plaster. **36**
Source: Karma Yeshey (2021).

Fig. 1-1 Tibetan (Ladakhi) nomads in the Rupshu highlands, 1911/12. . . . . . **47**
A yak hair tent in Rupshu, eastern Ladakh. On the right is a backstrap loom stretched on the ground beside the woman seated in the centre.
Source: Otto Honigmann (1911/12), courtesy Museum Fünf Kontinente, Munich.

Fig. 1-2 Changpa women weaving on backstrap looms. **47**
The woman on the left is making a pile-faced rug, while the woman on the right is weaving woollen fabric (*snam bu*) used to make robes for men and women.
Source: Monisha Ahmed (2006).

Fig. 1-3 Changpa man weaving on a fixed-heddle loom. **47**
He is making a strip for a saddlebag using goat hair.
Source: Monisha Ahmed (1994).

Fig. 1-4 Pack animals carrying a variety of saddlebags approach the campsite of Debring in Rupshu, eastern Changthang. **48**
Source: Rupert Wilmot (1934), courtesy Roger Bates and Nicky Harman.

Fig. 1-5 View of the Changthang from the Taglang La pass, which lies at an altitude of 5,360 m. **48**
Source: Monisha Ahmed (2016).

Fig. 1-6 Sheep and goats grazing near the Debring campsite, which lies below the Taglang La pass at an altitude of 4,200–4,600 m. **49**
Source: Tsering Wangchuk Fargo (2016).

Fig. 1-7 The Changpa moving camp. **49**
Wooden tent poles are visible on the backs of the yaks (centre), who are also carrying one half of a yak hair tent. Yaks usually travel in the front, followed by the horses. The sheep and goats leave earlier for the high pastures and re-join the others at the new campsite that evening.
Source: Monisha Ahmed (2006).

Fig. 1-8 A 1930s view of women gathered in Leh bazaar wearing capes made from goatskin (*slog pa*). **50**
Source: Rupert Wilmot (1934), Courtesy Roger Bates and Nicky Harman

Fig. 1-9 Feet of Avalokiteshvara at Mulbekh. **51**
Male and female devotees at the feet of the deep-relief carving of Avalokiteshvara at Mulbekh. While the women, on the right, are shown wearing half-saris, the male figure on the left is wearing a robe and hat reminiscent of those worn by men in Ladakh today.
Source: Monisha Ahmed (2015).

Fig. 1-10 Rock carvings at Dras. **51**
A group of four stone carvings near the village of Dras in Kargil District showing the Buddhist deities Maitreya and Avalokiteshvara, with smaller designs of a lotus flower and a *stupa*.
Source: Monisha Ahmed (2012).

Fig. 1-11 Horseman, Dras. **51**
On the reverse of the Avalokiteshvara block is this figure of a horseman. Although badly worn down, it is possible to discern the man's attire of a short jacket over trousers.
Source: Monisha Ahmed (2012).

Fig. 1-12 Changpa horse race. **52**
Changpa men on horseback, participating in a race. Their trousers are visible under their long woollen robes.
Source: Monisha Ahmed (2006).

Fig. 1-13 Cave painting, Saspol. **53**
Tantipa, the weaver, weaving on a foot-loom. This detail is from a 14th century painting at a cave in Saspol showing the 84 Mahāsiddhas.
Source: Monisha Ahmed (2009).

Fig. 1-14 Weaver on a foot loom. **54**
Similar foot looms are used by male weavers in villages in many parts of Ladakh.
Source: Monisha Ahmed (2009).

Fig. 1-15 Laying the warp. **55**
Laying the warp for a saddle-bag. The striped pattern is the *yud*, which is read from right to left and shows "one sheep eye, one brown line".
Source: Monisha Ahmed (2006).

Fig. 1-16 Man's blanket, *chal li*. **56**
A man's blanket (*chal li*) is made from yak and goat hair. The repeat patterns on each strip are the weaver's *yud*, indicating his patrilineage.
Source: Monisha Ahmed (2016).

Fig. 1-17 The black tent. **56**
The black tent is woven in strips from goat and yak hair, which are later stitched side-by-side. The black yak tails on opposite sides of the tent are said to indicate descendance from Rupshu's original families.
Source: Monisha Ahmed (2016).

Fig. 1-18 Inside of a tent. **57**
The inside of a black tent, showing the two main poles on either side with the ridge pole extending between them. In the centre is the stove and above it, on the right, is the altar. The stone wall, behind the woman, is covered with sheep and yak wool blankets.
Source: Tsering Wangchuk Fargo (2016).

Fig. 1-19 Tent strips. **59**
Left: The seams of the tent strips, stitched side-by-side, are visible across the body of this tent.
Source: Monisha Ahmed (2013).

Fig. 1-20 Tent site before pitching. **59**
Top right: The inside area of the tent, demarcated by the stone wall running around the four sides, is known as the *tsher sa*. The large vertical stone on the left marks the position for the door, the two standing in the centre mark where the stove will be positioned, and the platform on the right is for the altar.
Source: Monisha Ahmed (2006).

Fig. 1-21 Shelves in the tent. **59**
Bottom right: On the left of the altar, three shelves are built into the wall which are used to store dry or perishable food items. Here, Tashi Zangmo is putting on her turquoise-studded headdress (*pad rag*) as she prepares to move camp.
Source: Monisha Ahmed (2006).

Fig. 1-22 White tent. **60**
A white tent, seen from the back.
Source: Tsering Wangchuk Fargo (2016).

Fig. 1-23 Tent with a black roof. **60**
A white tent with a black roof woven from goat and yak hair, with two more white tents visible in the distance. Most Changpa use vehicles to move camp in the present day.
Source: Monisha Ahmed (2007).

Fig. 1-24 More white tents at campsite. **61**
Morning at the Debring campsite, where there are more white tents visible than black.
Source: Monisha Ahmed (2016).

Fig. 1-25 Tashi Zangmo with Saddlebags. **62**
Tashi Zangmo rests against her saddlebags as she packs up her family's belongings before the camp moves. The bags contain personal possessions such as clothes and shoes.
Source: Monisha Ahmed (2006).

Fig. 1-26 The white tent is pitched beside the pen on its left. **63**
In the foreground, men are combing pashmina from their goats.
Source: Monisha Ahmed (2005).

Fig. 1-27 Rolling up the tent. **65**
Once the tent has been taken down and folded, it is rolled up along with the tent poles.
Source: Monisha Ahmed (2006).

Fig. 1-28 Erecting the tent. **65**
Once a new campsite is reached, the tent is quickly erected. It is stretched over the tent walls, the poles are put in and then moved out to create the right height.
Source: Monisha Ahmed (2006).

Fig. 1-29 White tents on the Changthang. **67**
Bottom left: Today, more white than black tents are visible at Changpa campsites.
Source: Monisha Ahmed (2005).

Fig. 1-30 Tent "restaurants". **67**
Bottom right: White tents can have several uses, such as this restaurant along National Highway 1 where tourists can stop and rest.
Source: Tsering Wangchuk Fargo (2016).

Fig. 1-31 New design for a tent, Leh. **68**
New tent design introduced by the Administration of the Union Territory of Ladakh.
Source: Morup Stanzin (2022).

Fig. 2-1 *Kath-khuni* construction in different scales in Himachal Pradesh. **74**
Top left: Darbargadh in Sainj; top centre: Tower temple in Balag, and top right: small standalone granaries in Chitkul. Bottom left: House in Sarahan; bottom right: Double storey house in Gavas village.
Source: *Prathaa: Kath-khuni architecture of Himachal Pradesh* (2011).

Fig. 2-2 Shows step-by-step construction of a *kath-khuni* house in Kalpa (Kinnaur region). **80**
The house was built around 1922 and is still inhabited by the owner (Shaam Sharan Negi), 99 years after its construction. It sits on a stepped platform and has two floors. The ground floor is used as storage space, while the two rooms on the upper floors are used as everyday living and cooking space. The drawing highlights the spatial configuration and construction details.
Source: Documented by R. Bhushan (2016), drawings compiled and re-produced by V. Undaviya.

Fig. 2-3 Fieldwork and interactions with craftspeople. **82**
Top: Craftsmen working on temple construction in Devidhar village in 2011, which was started three years ealier. Bottom: Craftsman in Devidhar village showing us the house he constructed and materials that were obtained from nearby areas.
Source: *Prathaa: Kath-khuni architecture of Himachal Pradesh* (2011).

Fig. 2-4 Various construction details and assemblies, mostly made with hand tools such as adze, vice, saw, and hand drill. **85**
Even though these features are fashioned using limited and simple tools, they display remarkable complexity, knowledge of materials, and artisanal ingenuity. Each of these components exhibits functionality and richness in execution. The details include the wall assembly, door and window details, floor, staircase and roof construction, all achieved with different joinery systems but maintaining a thematic unity.
Source: Documented by R. Bhushan (2016), with drawings compiled and re-produced by V. Undaviya.

Fig. 2-5 New constructions. **86**
Top: This panoramic image of Chitkul village shows the majority of houses topped with metal sheet roofing that no longer blend with the context and entails the disappearance of many activities associated with slate roofing. Bottom left: House in Sarahan showing post and beam construction in brick and concrete; bottom centre: House in Kamru with brick and concrete beams and finished with the effect of stone and wood; bottom right: House in Chitkul village showing concrete blocks and wooden frame.
Source: *Prathaa: Kath-khuni architecture of Himachal Pradesh* (2011).

Fig. 2-6 Hybrid productions. **88**
Top left: House in Chitkul, walls with concrete blocks and wooden beams, partially finished with mud and cow-dung plaster and metal sheet roof; top right: House in Chitkul built with concrete blocks with other components of a typical *kath-khuni* house. Bottom left: Single storey structure in Chitkul with alternate courses of concrete blocks and wooden beams; bottom right: house in Gawas comprising a composite structure with concrete columns and wooden beams, with the core of the house having alternate courses of brick and wood, finished with a pent-and-gable slate stone roof.
Source: *Prathaa: Kath-khuni architecture of Himachal Pradesh* (2011).

Fig. 2-7 Extensions, amalgamations, and continuation. **90**
Top: Sohan lal house in Chachogi village in Naggar, with extended spaces built on old *kath-khuni* structure, addition of new materials and techniques such as *dhajji diwari*. Bottom: Vedram house. A local *kath-khuni* house flanked by new rooms in brick-and-wood and metal sheet roofing. The interior spaces are finished with wooden panelling.
Source: North (2021).

Fig. 3-1 Paro Dzong. **97**
View to Paro Dzong and its *ta-dzong* (watch tower) which serves as the National Museum.
Source: Marc Dujardin (1987).

Fig. 3-2 Throngsa Dzong. **98**
A lateral view of Throngsa Dzong and its *ta-dzong* (upper right), as seen when approaching the district township of Throngsa from western Bhutan.
Source: Marc Dujardin (1987).

Fig. 3-3 Synoptic sketch of *Lha Tsen Lu Ragsum*. **99**
Synoptic sketch mapping spatial and cultural relationships between the Bhutanese landscape, the three-tiered universe (*Lha Tsen Lu Ragsum*) and the vertical, tripartite division of the traditional farmhouse.
Source: Marc Dujardin (2000a).

Fig. 3-4 Abe House, Skurbuchan, Ladakh (India). **100**
A typical Ladakhi *rabsel* window frame embedded into the massive walls of the house. The *rabsel* not only allows maximum light in the room behind, but also demonstrates social importance. The window frame is accentuated by its projecting lintel and plinth, as well as its peculiar two-tiered window frame pattern.
Source: John Harrison (2012).

Fig. 3-5 Profiling *horzhu*. **101**
Details of the timber profiling and proportions of a typical trefoil arched window frame (*horzhu*). Measurements and drawings were prepared for the construction of the Begana House.
Source: Marc Dujardin (1991).

Fig. 3-6 A typical *horzu rabsel*. **102**
Top left: A three-storied farmhouse in the valley of Paro, western Bhutan. The three-layered row of arched windows (*horzhu*), forming the elaborated timber frame (*rabsel*) is typical of this district (*dzongkhag*).
Source: Marc Dujardin (1987).

Fig. 3-7 *Horzu* imitation city. **102**
Bottom right: Cosmetic imitations of Bhutan's ornamental timber architecture are set into masonry and reinforced concrete buildings in the capital, Thimphu. The apartment block painted in yellow combines standardised window frames in timber with mimetic cornice elements cast in concrete. Despite strict facade control regulations, the prescribed typical trefoil window pattern has been omitted.
Source: Marc Dujardin (2013).

Fig. 3-8 *Horzu* Timphu. **102**
Bottom left: Superficial "traditional" timber features match the modernising trends of urban architecture. The refurbished facade of this hotel in Thimphu uses mere stencils to redesign the *rabsel go-cham* and *horzhu* patterns.
Source: Marc Dujardin (2013).

Fig. 3-9 Painted facades. **103**
Traditional craftsmanship has been almost entirely erased from the urban construction industry. Forced to make this dull building in cement concrete look more "traditional", the builders subjected it to a cosmetic make-over. The only traditional craftsmanship involved was the paintwork, for which the artisan had to operate out of his comfort zone in terms of tactile materials, textures, and proportions.
Source: Marc Dujardin (1986).

Fig. 3-10 A *dzong* authority. **105**
Zorig chipchhab Dasho Parpa Oezer, the third King's highest-ranked master builder (*zorig lopon*), shown at the site of the reconstruction of the Tashichoedzong in Thimphu, for which he was highly commended. The two tiger cubs at his feet certainly contribute to expressing his authority as a most exceptional craftsman.
Source: Formal photographer of the palace, Wang Studio, Thimphu.

Fig. 3-11 *Zorig Lopon* Dasho Khandro. **105**
Dasho Khandro, the *zorig lopon* commended for the reconstruction of Punakha Dzong in the late 1980s, who was patronised by the fourth King of Bhutan. Here he is supervising the construction of one of his private, modern buildings in Thimphu, which includes *boego payab* window frames, the simplified version of the traditional *payab gochu*.
Source: Marc Dujardin (1990).

Fig. 3-12 Begana site drawing. **106**
Site layout plan of Sangay Dorji's house at Begana. Many such small village settlements comprise little more than a few farmhouses and a temple (*lhakhang*).
Source: Marc Dujardin (1991).

Fig. 3-13 Anthropometric scales. **107**
Anthropometric scales are used in traditional building construction. Lacking written sources at the time of research, these terms were phonetically recorded and varied from region to region.
Source: Marc Dujardin (1991).

Fig. 3-14 Begana craftspeople. **108**
Owner and patron Sangay Dorji (fourth from left, with glasses) proudly posing at the construction site of his house in Begana. The processes of making involved — from foundations to rooftop — were measured and mapped by the author on an almost daily basis.
Source: Marc Dujardin (1991).

Fig. 3-15 Display of the toolbox owned by the head carpenter at the Begana house. **109**
The basic set of hand tools used for carpentry and wood carving by *shing zope*, *shing zo* and *shing zo lagshep*. The terms were phonetically recorded.
Source: Marc Dujardin (1991).

Fig. 3-16 Begana House: Front elevation east. **111**
Front elevation of the Begana House, depicting the symmetrical, load-bearing *rabsel go-cham* timber frame on the top floor. To mark the planned shop on the ground floor, note the adapted *boego payab* window frame with stretched arches, which differs from the two-layered *horgo payab* without *shamig* (side panels) on the other side of the main entrance door (*go*).
Source: Marc Dujardin (1991), original ink drawing at a scale of 1:20.

Fig. 3-17 Adapted *boego payab* shop window frame, Begana. **112**
Right (next page): Photographs and an exploded view of the adapted *Byelgo payab* timber window frame. All such timber window and door frames are load-bearing structural components around which rammed earth (pisé) or stone (*do*) walls are mounted.
Source: Marc Dujardin (1991), original ink drawing at a scale of 1:5.

Fig. 3-18 Side elevation (south) of the Begana house. **113**
Note the extended, load-bearing *rabsel go-cham* timber frame on the first floor, with two different yet proportionate *horzhu* window openings, and the elaborated load-bearing *horgo payab* window frame underneath, around which a stone wall was built.
Source: Marc Dujardin (1991), original ink drawing at scale of 1:20.

Fig. 3-19 Exploded view of the *rabsel* timber framework. **114**
This view of the *rabsel go-cham* structure reveals the nailless timber jointing framework, which is prefabricated and tested at ground level before being erected at an auspicious moment, following an astrologer's advice.
Source: Marc Dujardin (1991), original ink drawing at scale of 1:5.

Fig. 3-20 Side elevation (north) of the Begana house, depicting the shorter *rabsel go-cham* timber frame. **115**
The architectural dominance of the *rabsel* facade is achieved by aligning the adjacent projected *horgo payab* with *shamig*. Centrally positioned underneath is an elaborated version of a load-bearing *boego payab* window frame.
Source: Marc Dujardin (1991), original ink drawing at a scale of 1:20.

Fig. 3-21 Exploded view of the *boego payab* window frame. **116**
Often situated on the ground floor of farmhouses, this elaborated version with *pem-chutsi* profiling can be seen as an example of cityfication whereby the ground floor no longer serves as a stable for cattle.
Source: Marc Dujardin (1991), original ink drawing at a scale of 1:5.

Fig. 3-22 Begana house cross-section. **117**
Cross-section of the Begana house, showing how the horizontal parts of the *rabsel* structure serve as guides for the sliding window shutters in wood. Window frames, embedded in the superstructure, are usually fitted with hinged wooden panels. The choice of dressed stonework instead of rammed earth was prompted by the local availability of stone boulders, which were (non-traditionally) bound by cement mortar. Note also the "lean-to" roof construction, which is more commonly observed in the region of Wangduephodrang.
Source: Marc Dujardin (1991), original ink drawing at a scale 1:20.

Fig. 3-23 Begana house front. **119**
Revisiting the house of Sangay Dorji in 2013. The left picture shows the "shophouse", transferred and inhabited by his eldest daughter. He and his wife now live in a shack up the hill, overlooking the house.
Source: Marc Dujardin (2013).

Fig. 3-24 Begana house rear facade. **119**
The right picture shows the major architectural changes to the building, such as the reversal of the roof design by placing the lean-to roof at the back instead of the front, accommodating a separate sanitation unit and kitchen above. The traditional roof shingles held down by boulders (Fig. 3-22) have been replaced by corrugated iron sheets, as commonly observed throughout rural and urbanised settlements.
Source: Marc Dujardin (2013).

Fig. 3-25 Kurje Lhakhang. **120**
The frontal facade of the Kurje Lhakhang, completed in the mid 1980s. The traditional toolbox of the *zorig chusum* was extended by introducing concrete casting and sculpting.
Source: Marc Dujardin (1987).

Fig. 3-26 Machen Lhakhang. **121**
The facade of the Machen Lhakhang, one of the major reconstructions conducted at Punakha Dzong in the late 1980s. Built by the same craftsmen who built the Kurje Lhakhang, one does not need an experts' eye to see the resemblance between the two edifices. Balanced with the finest dressed stone (*do*), the timber architecture comprises most, if not all, of the traditional window types and patterns.
Source: Marc Dujardin (1989).

Fig. 3-27 Punakha Dzong. **122**
The totally reconstructed Punakha Dzong is a setter of architectural trends for decades to come. Until its reconstruction, a horizontally stretched building complex was dominated by one single structure, namely the *utse*. Nowadays, the *utse*, Machen Lhakhang and *kunre* (assembly hall) seem to sprout from the massive basement and tower over the valley.
Source: Marc Dujardin (2013).

Fig. 3-28 Punakha *dzongchung*. **122**
The *dzongchung*, rebuilt on its original site opposite the main entrance of Punakha Dzong. From an architectural perspective, the reconstructed *dzongchung* is yet another sign of Bhutan's artisanal mastery, continuously striving for cultural uniqueness and national connectedness yet without cutting itself off from deliberate forms of technical innovation.
Source: Marc Dujardin (2013).

Fig. 3-29 Rukubji village in 1987. ..... **124**
Top image: Lateral picture of the village as viewed from the national highway in 1987. To the right, the village temple (*lhakhang*) looks much like a solitary farmhouse. Features showing its religious function (*khemar*) were applied on the rear of the building only. The core of the village cluster comprises two to three-storey farmhouses, with stabling for cattle on the ground floor. The gabled roofs are topped with loose wooden shingles (*shingleps*), held down by sticks and boulders.
Source: Marc Dujardin (1987).

Fig. 3-30 Rukubji village in 2013. ..... **124**
Bottom image: Taken from the same viewpoint, this picture shows the architectural expression of a true temple building. Most of the rebuilt farmhouses now omit ground-floor stables, transforming Rukubji into a strongly citified village in terms of construction techniques, building materials, and usage patterns. The concept of the traditional farmhouse is being put under pressure and building culture in Rukubji is heading towards an irreversible rupture. If the distinct architectural figures of village and city continue to blur at this pace, this trend could herald the end of Bhutan's archetypical expression of its traditional tripartite world view (*Lha Tsen Lu Ragsum*).
Source: Marc Dujardin (2013).

Fig. 3-31 Rural Housing Project, elevations. **126**
Original elevations of the first improved traditional two-storey farmhouse. The proposed innovations originate from various directives aimed at making rural dwellings safer, healthier, and more economical, while keeping the best of Bhutan's unique architecture, building traditions and craftwork.
Source: Marc Dujardin (1987).

Fig. 3-32 Rural Housing Project, plans. **127**
Floor plans.
Source: Marc Dujardin (1987).

Fig. 3-33 Rural Housing Project, scale models. **128**
This model of the proposed design was built by the author at 1:20 scale. Several technical innovations could be demonstrated by taking this scale model apart.
Source: Marc Dujardin (1987).

Fig. 3-34 Rural Housing Project, demonstration tools. **129**
This collection of demonstration tools were designed and built by the author in close collaboration with his assistant project architect, S.T. Nadik, and the technical staff of the Department of Works and Housing. Whenever technical innovations were not possible to view in the 1:20 scale model, 1:1 models were built to demonstrate improved timber frames and jointing. The concept and building of passive solar heating and food drying devices is credited to Andreas Bahmann, a Swiss expert from Helvetas-Bhutan.
Source: Marc Dujardin (1987).

Fig. 3-35 Rural Housing Project, Royal command. **130**
These pictures, dating from 1987, show Druk Gyalpo Jigme Singye Wangchuk, Fourth King of Bhutan and Lyonpo C. Dorji, Chairman of the Planning Commission, RGOB, introducing the Rural Housing Demonstration Project by means of a full truck-load of scale models and plans.
Source: Kuensel (1987), with permission of the Palace.

Fig. 3-36 Idem. **130**
Source: Kuensel (1987), with permission of the Palace.

Fig. 3-37 Rural Housing Project, prototype. **131**
A guided tour of the completed prototype at Wangduephodrang in 1990. After the completion of the first prototype at Lungtenphug (near Thimphu) in 1988, the team was instructed to design and construct a range of larger buildings.
Source: Marc Dujardin (1990).

Fig. 3-38 Revisiting the RHP prototype at Wangduephodrang in 2013. ..... **131**
Regardless of the reconstruction of the attached sanitation unit in rammed earth instead of timber and the replacement of the timber roof shingles with corrugated metal sheets, the prototype seemed to have held up well against time and environmental factors, including seismic events. The prototype is currently rented out as a residential dwelling.
Source: Marc Dujardin (2013).

Fig. 3-39 Thimphu Central Post Office. **134**
Front and side elevations taken during the completion of the new Thimphu Central Post Office in 1989. Although the design was formally approved by the Royal Government, this public building became the subject of controversy surrounding the *rabsel* and cornice features, which were wrongly and insensitively copied to proportion from Bhutan's traditional timber architecture.
Source: Marc Dujardin (1989).

Fig. 3-40 Thimphu Central Post Office — contested cornice. **134**
Close-up of a totally overhauled design scheme that reduced the functionality, craftwork and aesthetics of Bhutan's traditional timber architecture to the level of mimetic pastiche. From stenciled *horzhu* windows hidden by the reflection of glass and disproportionate cornices and side panels (*shamig*) to non-functional wooden imitations of the projecting supports (*gyetsa*) of a *gomang rabsel* window frame, this building heralded a move towards the rupture of traditional Bhutanese building culture.
Source: Marc Dujardin (1989).

Fig. 3-41 Maseland copy/paste. **136**
Traditional timber cornices as documented and drawn in the late 1980s by Jos Maseland as part of the NUDC-UNCHS documentation project of Bhutanese Architecture, later published as a book in 1993.
Source: Maseland (1993: 197).

Fig. 3-42 Central Town Planning drawing — cornices for cement concrete. **137**
The beginning of disproportionate detailing of traditional timber cornices, designed to be cast in cement concrete. This drawing was uncritically copied by Jos Maseland and published as if it were "traditional". The top pattern was simply reinvented by the CTP technical assistant without any sense of rigour.
Source: Public Works Department, ROGOB (1983).

Fig. 3-43 Private company building, Thimphu, between Yandren Lam and Tarayana bus stop. **138**
This picture is representative of the contemporary architecture of the city — derailed architecture from design to materialisation. Compared to the design of the controversial Thimphu General Post Office, this building is painful to behold for anyone who experienced Bhutanese architecture prior to the 1990s.
Source: André Loeckx (2013).

Fig. 3-44 Wangdi ruins — entrance. **140**
Picture of the main entrance to the fire-ravaged Wangdue Phodrang Dzong.
Source: Marc Dujardin (2013).

Fig. 3-45 Wangdi ruins — internal view. **140**
The Wangdue Phodrang Dzong ruins viewed from within. Considering the innovative construction technology and building materials that were applied during reconstruction (2014–2022), this may well be the last time that the remains of Bhutanese monumental architecture consists merely of stone, rammed earth and wood ashes.
Source: Marc Dujardin (2013).

Fig. 3-46 Master carpenter Dorji. **141**
Perhaps Bhutan's most skilled master builder, *shing zowpon* Dorji, pictured at the construction site of Wangdue Phodrang Dzong in 2021.
Source: Chayku and Jigme Wangchuk — Bhutan Broadcasting Service (2021).

Fig. 3-47 Reconstructed Wangdue Phodrang Dzong in 2022. ..... **144**
Source: Elien Van Dille (2022).

Fig. 4-1 China's Forest Cover. **151**
Source: Shi et al. (2011).

Fig. 4-2 House built in 1998 in Shkupi (Chin.: Gubi) Village, Drango (Chin.: Luhuo Xian), Ganzi Tibetan Autonomous Prefecture, Sichuan. **157**
Source: Anna Wozniak (2018).

Fig. 4-3 House built in 2014 near Shkupi Village, Drango, Ganzi Tibetan Autonomous Prefecture, Sichuan. **157**
Source: Anna Wozniak (2018).

Fig. 4-4 Upper floor plan of a house built in 1998 in Shkupi Village, Drango. **158**
Source: Anna Wozniak (2019).

Fig. 4-5 Upper floor plan of a house built in 2014 in Shkupi Village, Drango. **158**
Source: Anna Wozniak (2019).

Fig. 4-6 Completed timber structure of residential dwelling north of Shkupi Village, Drango. **159**
Source: Anna Wozniak (2016).

Fig. 4-7 Carpenter preparing timber beams for the assembly of a house in Nyechu Valley (Chin.: Niqu Qu) southeast of Khanyang (Chin.: Kaniang Xiang), Drango. **159**
Source: Anna Wozniak (2016).

Fig. 4-8 Mobile crane unloading timber logs for house construction north of Shindo Town (Chin.: Xindu Zhen), Drango. **159**
Source: Anna Wozniak (2016).

Fig. 4-9 Band saw assembled for the time of construction on a building site in Nyechu Valley (Chin.: Niqu Qu) southeast of Khanyang (Chin.: Kaniang Xiang), Drango. **160**
Source: Anna Wozniak (2016).

Fig. 4-10 Assembly plan (structural design) of a house on a building site in Nyechu Valley (Chin.: Niqu Qu) southeast of Khanyang (Chin.: Kaniang Xiang), Drango. **160**
Source: Anna Wozniak (2016).

Fig. 4-11 Elaborately painted details on timber structure of a house interior in Skupi Village, Drango. **161**
Source: Anna Wozniak (2016).

Fig. 4-12 Idem. **161**
Source: Anna Wozniak (2016).

Fig. 4-13 Details of Buddhist symbols and motifs painted on timber elements of a house interior in Skupi Village, Drango. **161**
Source: Anna Wozniak (2016).

Fig. 5-1 Top: Ancient cluster of houses with a stone foundation and upper storeys made of adobe in Kanji, Ladakh. **176**
Source: Alexandra Skedzuhn-Safir (2011).

Fig. 5-2 Bottom right: An example of rammed earth employed in Wanla in the former fort (approx. 13th century). **176**
Source: Alexandra Skedzuhn-Safir (2014).

Fig. 5-3 Bottom left: The monastery of Namgyal Tsemo in Leh district (16th century) was constructed in rammed earth. **176**
Source: Gawa Norboo (2021).

Fig. 5-4 Cluster of ancient houses in Alchi Village, Ladakh. **180**
Source: Alexandra Skedzuhn-Safir (2011).

Fig. 5-5 High quality clay quarry near the Monastery of Spituk. **182**
Source: Christine Bläuer (2010).

Fig. 5-6 Interviewee C prefers the use of rammed earth over adobe for its compressive strength. **184**
Source: Gawa Norboo (2021).

Fig. 5-7 Idem. **184**
Source: Gawa Norboo (2021).

Fig. 5-8 In this example of a private house of respondent D, wishes for modern living and personal aesthetic ideas are combined with elements of traditional building. **185**
Source: Gawa Norboo (2021).

Fig. 5-9 Idem. **185**
Source: Gawa Norboo (2021).

Fig. 5-10 Interviewee E strives to preserve the traditional building style and materials by installing unaltered adobe, but he combines this with aesthetic ideas of modern living. **185**
Source: Gawa Norboo (2021).

Fig. 5-11 Detail of the privately owned house built in on-site produced adobe by interviewee A. **185**
Source: Gawa Norboo (2021).

Fig. 5-12 Detail of an interior of a guest house by interviewee B built in rammed earth. **185**
Source: Gawa Norboo (2021).

Fig. 5-13 A construction in Leh where CSEB is employed. **186**
Source: Gawa Norboo (2021).

Fig. 6-1 View of Gangtok from the ropeway. **193**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-2 Vernacular roof on Namchi plaza, completed 2011. ..... **196**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-3 Concrete Pheasant: the state bird of Sikkim. **197**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-4 Tibetan style plaque at Namchi. **197**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-5 Government Building Under Construction, Gangtok. **197**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-6 Concrete buildings in Chungthang. **200**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-7 Char Dham Tourist Complex. **201**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-8 Hotel Under Construction, Namchi. **202**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-9 Concrete Buddhist religious motif on a rock, North Sikkim. **203**
Source: Tashi Chopel (2022).

Fig. 6-10 Hydropower Dam in Progress, South Sikkim. **205**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-11 Mist rising over Deorali, Gangtok. **206**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-12 Mangan town in North Sikkim, one of the fastest growing towns in the state. **207**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 6-13 Carpark access ramps near the secretariat, Gangtok. **208**
Source: Duncan McDuie-Ra and Mona Chettri (2020).

Fig. 7-1 View of Leh Old Town from the south showing the palace, Guru Lhakhang, Lonpo House, and Munshi House (centre left, below). **215**
Source: John Harrison (2003).

Fig. 7-2 Survey drawing of the Munshi House. **216**
South front, with ruined Gyaoo House at left.
Source: John Harrison (2003).

Fig. 7-3 Looking down on Munshi and Gyaoo houses from the palace. **217**
Source: John Harrison (2003).

Fig. 7-4 Munshi House from the east, showing the room traces of the lost Kalön House and the rammed earth city wall. **217**
Source: John Harrison (2003).

Fig. 7-5 Survey sketch displaying the north-south section through the Munshi House. **218**
Source: John Harrison (2003).

Fig. 7-6 The interior of the Rabsal Room. **219**
It was richly decorated with painted wall patterns, carved and painted beams, pillars and screens, and plaster modelling on the capitals. The room had severe structural problems however, with subsidence of pillars and beams, and movement and cracks in the east wall, caused by inadequate foundations below, and collapsed in 2007.
Source: John Harrison (2007).

Fig. 7-7 Birds-eye view of LAMO centre from southwest. **220**
Source: John Harrison (2009).

Fig. 7-8 Door into the Rabsal Room. **222**
Source: Monisha Ahmed (2007).

Fig. 7-9 Ladakhi and Doda workforce on site, 2007. ..... **223**
Source: John Harrison (2007).

Fig. 7-10 Re-assembly of the timber structural and decorative elements in the Rabsal Room in 2007. ..... **224**
The inner screen with its painted beam and brackets, the central beam and two pillars, and the window screen leading onto the balcony. Using the photographic survey made before the collapse, the small painted wooden panels were refitted between the brackets above the beams. Remarkably only two panels out of 180 were lost in the collapse.
Source: John Harrison (2007).

Fig. 7-11 A new capital (left) replaced an original broken by structural movement before the collapse. New floorboards laid by Bihari carpenters in the Rabsal Room. **224**
Source: John Harrison (2007).

Fig. 7-12 Salvaged *burtse* re-laid in the courtyard parapet. **225**
Source: John Harrison (2007).

Fig. 7-13 Gyaoo staircase was built around a recycled beam from the lower floor. **225**
Source: John Harrison (2007).

Fig. 7-14 Repairing and reassembling the salvaged pieces of the balcony screen. **225**
Source: John Harrison (2008).

Fig. 7-15 Painting the rebuilt east wall of the Rabsal Room to match the original decoration. **226**
Source: John Harrison (2008).

Fig. 7-16 New bricks being made from the earth on site to match the old brick size. **226**
Source: John Harrison (2008).

Fig. 7-17 Materials for the mud roof: earth (*kalak*) river sand, *markalak*, straw. **226**
Source: John Harrison (2008).

Fig. 7-18 Slate (*yamang*) being split and cut for parapet tops: Doda mason Mansoor experimenting with a bolster chisel brought from England. **227**
Source: John Harrison (2008).

Fig. 7-19 New *chotsek* moulding being carved by Kanji *mistri* Sonam Wangchuk to match an existing damaged section. **227**
Source: John Harrison (2008).

Fig. 7-20 New capital (*kaju*) cut from salvaged timber by Skurbuchan *mistri* Bulu. **227**
Source: John Harrison (2008).

Fig. 7-21 Bituminous roofing felt laid as a waterproofing membrane around roof edges. **227**
Source: Deldan Angmo (2008).

Fig. 7-22 Glass and plastic bottles have been recycled and set in the base layer of earth to reduce the weight, and also improve the thermal insulation of the roof. **228**
Source: John Harrison (2008).

Fig. 7-23 New *rabsal* conservatory on south front of Gyaoo to trap solar energy. **228**
Source: John Harrison (2008).

Fig. 7-24 Acrylic sheet from a vehicle repair shop for glazing the skylights in the courtyard. **229**
Source: John Harrison (2009).

Fig. 7-25 View of a contemporary art exhibition by emerging Ladakhi artists, 2015. ..... **229**
Source: LAMO Visual Archive (2010).

Fig. 7-26 Opening of first contemporary art exhibition in Leh "Among these Mountains — Nine Contemporary Art-ists in Ladakh". **230**
Source: LAMO Visual Archive (2014).

Fig. 7-27 'Your Dream Home — Old Town Leh', detail of a site-specific installation by Baptist Coelho. **230**
Source: LAMO Visual Archive (2013).

Fig. 7-28 LAMO in 2012, with the completed entrance courtyard and terraces. **232**
Source: John Harrison (2012).

Fig. 7-29 South front of the completed LAMO building. **233**
Source: John Harrison (2010).

Fig. 8-1 View of Sang yak drak nunnery, built around the Padmasambhava cave at the base of the cliff. **238**
Source: John Harrison (1999).

Fig. 8-2 Drawing by the master builder Tenzin for construction of the *chörten* at Sang yak drak. **239**
From the proportions in the written text, he derived two sets of metric dimensions for two different sizes of *stupa*. The heavy red figures are my re-calculations of the original proportions.
Source: John Harrison (1999).

Fig. 8-3 The Lhasa book on design by Rongtha Lobsang Damchö Gyatso (first pages). **240**
Source: John Harrison (2022).

Fig. 8-4 The eight *stupas*. **241**
In this woodblock print from a Sumpa Khenpo text, the Changchub *stupa* is second from the left.
Source: Dorjee (1996: 18).

Fig. 8-5 Bottom right: The surviving stone *stupa* base on the site below the nunnery. **241**
Source: John Harrison (1999).

Fig. 8-6 Bottom left: Master builder and monks consulting the calendar for an auspicious starting date. **241**
Source: John Harrison (1999).

Fig. 8-7 Right: The stone base of the *stupa* under construction. **242**
Source: John Harrison (1999).

Fig. 8-8 Left: Construction of the lion throne. **242**
Source: John Harrison (1999).

Fig. 8-9 Drawing by Tenzin showing the internal structure of the *stupa*, with the wooden beams closing off the compartments containing the ritual offerings. **243**
Source: John Harrison (1999).

Fig. 8-10 Site notes: Tenzin's information on internal cavity dimensions and *sogshing* requirements. **243**
Source: John Harrison (1999).

Fig. 8-11 Cutaway section drawing showing the *stupa* structure and internal compartments for offerings. **243**
Source: John Harrison (2022).

Fig. 8-12 Masonry construction continuing on the steps and dome. **244**
Source: John Harrison (1999).

Fig. 8-13 Working from the drawings, a full-size template of the spire is made to establish the diameters of the 13 wheels. **244**
Source: John Harrison (1999).

Fig. 8-14 The carpenters' traditional tools: adze, square, frame saw and jack plane. **244**
Source: John Harrison (1999).

Fig. 8-15 Gluing the wooden sections of the spire. **245**
Source: John Harrison (1999).

Fig. 8-16 Adzing the wooden sections of the spire. **245**
Source: John Harrison (1999).

Fig. 8-17 Painting the completed *sogshing* cut from a juniper tree. **245**
Source: John Harrison (1999).

Fig. 8-18 Idem. **245**
Source: John Harrison (1999).

Fig. 8-19 The finished *sogshing* is wrapped in ceremonial scarves and rolls of paper prayers. **246**
Source: John Harrison (1999).

Fig. 8-20 The *sogshing* is carried up onto the *stupa* and lowered into the central cavity. **246**
Source: John Harrison (1999).

Fig. 8-21 The volumes of the scriptures are carried round the *stupa* by the nuns and then packed inside the cavity around the *sogshing*. **246**
Source: John Harrison (1999).

Fig. 8-22 Finishing the *arga* and whitewashing the masonry. **246**
Source: John Harrison (1999).

Fig. 8-23 The completed *stupa* below the nunnery at Sangyak Drak. **247**
Source: John Harrison (1999).

Fig. 9-1 The rediscovered corner joint of cornice tie beam of Kashthamandap. **251**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-2 The 5th century CE *Metha* of the Kasthamandap (Lower right). **253**
Source: Sudarshan Raj Tiwari (2022).

Fig. 9-3 Temples of Nepal Valley. **254**
Source: Sudarshan Raj Tiwari (2013).

Fig. 9-4 The first bricks go back on the mud mortar on the foundations of the Kasthamandap. **262**
Source: Sudarshan Raj Tiwari (2018).

Fig. 9-5 Masons set the new timber uprights and ties in the quoin wall. **263**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-6 Idem. **263**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-7 Mortise and tenon joint between post, bracket, and beam. **264**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-8 Idem. **264**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-9 Timber joinery used against pull force. **264**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-10 Stages in the making of a cornice joint. **265**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-11 Idem. **265**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-12 Architects and craftspeople working together. **265**
Source: Sudarshan Raj Tiwari (2019).

Fig. 9-13 Sanctum plan of the Nyatapola temple, showing its five-bayed, timber-framed colonnade. **266**
Source: Bhaktapur Municipality (2020).

Fig. 9-14 North-South section of the Nyatapola. **267**
Source: Bhaktapur Municipality (2020).

Fig. 9-15 The elevation of the palace, showing the inserted timber posts. **268**
Source: Bhaktapur Municipality (2020).

Fig. 9-16 Working on the 55 Windows Palace renovation. **269**
Source: Sudarshan Raj Tiwari (2004).

Fig. 9-17 Idem. **269**
Source: Sudarshan Raj Tiwari (2003).

Fig. 9-18 Working on the 55 Windows Palace renovation. **269**
Source: Sudarshan Raj Tiwari (2002).

Fig. 9-19 Repair of post. **269**
Source: Sudarshan Raj Tiwari (2004).

Fig. 9-20 Panchamukhi Hanuman Temple. **270**
Source: Department of Archaeology (2015).

Fig. 9-21 Panchamukhi Hanuman Temple. **270**
Source: Sudarshan Raj Tiwari (2016).

Fig. 9-22 Adding length to the strut. **271**
Source: Sudarshan Raj Tiwari (2016).

Fig. 9-23 Joinery in wall plates. **271**
Source: M. M. Byanjankar (2005).

Fig. 9-24 Adding length to the strut. **272**
Source: Sudarshan Raj Tiwari (2016).

Fig. 9-25 Idem. **272**
Source: Sudarshan Raj Tiwari (2016).

Fig. 10-1 A collapsed monument after the 2015 Gorkha Earthquake within the Hanuman Dhoka Durbar Square, part of the Kathmandu Valley World Heritage property. **283**
Source: Kai Weise (2015).

Fig. 10-2 The remains of the Maju Dega Temple at Hanuman Dhoka, Kathmandu, after it collapsed during the 2015 Gorkha Earthquake. **283**
Source: Kai Weise (2015).

Fig. 10-3 The remains of the Dasavatar (left) and Maju Dega (right) temples at Hanuman Dhoka Durbar Square in Kathmandu that collapsed during the 2015 Gorkha Earthquake. **283**
Source: Kai Weise (2015).

Fig. 10-4 Laxmi Bhakta Rajchal, the head carpenter, working on linking the old bracket to the new post during the reconstruction of the Kasthamandap. **284**
Source: Kai Weise (2019).

Fig. 10-5 Head Carpenter Laxmi Bhakta Rajchal (centre) and head mason Tulsu Ram Makhasya (right) with provincial MP Rajesh Shakya (left) during the *Lukha Puja* (door ritual) at the Kasthamandap. **287**
Source: Kai Weise (2022).

Fig. 10-6 Tulsi Ram Makhasya laying bricks in mud mortar during the reconstruction of the Kasthamandap. **288**
Source: Kai Weise (2022).

Fig. 10-7 Wood carvers replicating the timber brackets of the main posts for the reconstruction the Kasthamandap. **289**
Source: Kai Weise (2022).

Fig. 10-8 Left: The local community of Bungamati redoing the work of the contractors on the foundations of the Machhendranath Temple. **291**
Source: Kai Weise (2017).

Fig. 10-9 Right: A wood carver using his skills to carve a deity in clay for the replication of a terracotta element for the Machhendranath Temple in Bungamati. **291**
Source: Kai Weise (2022).

Fig. 10-10 The use of steel nails and wooden pegs as *chukul* used to hold the timber rafter in a post- earthquake reconstruction. **292**
Source: Anie Joshi (2017).

Fig. 10-11 The craftspeople of the Kasthamandap reconstruction project having a traditional *bhoj* (feast) in Bhaktapur. **293**
Source: Kai Weise (2022).

Fig. 10-12 Retired craftspeople are interviewed at a meeting of the Shilpakar Samaj in Bhaktapur. **293**
Source: Kai Weise (2018).

Fig. 10-13 A gathering of the Shilpakar Samaj in Bhaktapur. **293**
Source: Kai Weise (2018).

Fig. 10-14 Laxmi Bhakta Rajchal proudly displays a photo in his workshop in Bhaktapur of him getting a medal from the President of Nepal. **295**
Source: Kai Weise (2019).

Fig. 10-15 Three generations of carpenters: master carpenter Laxmi Bhakta Rajchal (right), his son Krishna Prasad Rajchal (centre), and grandson Krijesh Rajchal (left). **296**
Source: Anie Joshi (2020).

Fig. 10-16 A woman carving decorative patterns on a timber post. **297**
Source: Kai Weise (2019).

Fig. 10-17 Dovetail joints are used to join smaller wooden sections together. **298**
Source: Anie Joshi (2019).

Fig. 10-18 Scarf joints are used to join the pieces of beams and also rafters. **298**
Source: Anie Joshi (2020).

Fig. 10-19 Goose-neck lap joints are used to join two pieces of timber beam together. **298**
Source: Anie Joshi (2019).

Fig. 10-20 Interview with master carpenter Laxmi Bhakta Rajchal. **300**
Source: Kai Weise (2022).

Fig. 10-21 Gopal Krishna Shilpakar carving the decorative friezes for the corner pavilions of the Kasthamandap. **302**
Source: Kai Weise (2021).

Fig. 11-1 Map of the Himalayan region marking regions of contemporary and historical use of *arga*. **308**
Light gray areas have little or no *arga* usage, while the dark gray areas still use *arga* today.
Source: Hubert Feiglstorfer (2021).

Fig. 11-2 Weathered *arga* roof of the Serkhang, which is a *lhakhang* in Basgo, Ladakh (India). **309**
Source: Hubert Feiglstorfer (2010).

Fig. 11-3 Two examples of a variety of different *arga* floors at Samye monastery. **312**
Source: Hubert Feiglstorfer (2019).

Fig. 11-4 Idem. **312**
Source: Hubert Feiglstorfer (2019).

Fig. 11-5 Yellowish-brown *arga* deposits below the access path to the Phugtal Monastery, see red frame. **313**
Source: Hubert Feiglstorfer (2005).

Fig. 11-6 A mirror-like appearance of an *arga* floor in Gongkar Monastery. **314**
Source: Lama Norbu (2021).

Fig. 11-7 *Arga* floor in the *dukhang* at the Khorchag Jokhang. **314**
In a final work, stone inlays were pressed into the *arga* surface.
Source: Hubert Feiglstorfer (2010).

Fig. 11-8 Top: White *arga* used at Gongkar Monastery, quarried at Gyangtse. **316**
Source: Lama Norbu (2021).

Fig. 11-9 Bottom left: Red *arga* used at the Potala, quarried in Yangpachan, about 90 km away from Lhasa. **316**
Source: Lama Norbu (2021).

Fig. 11-10 Bottom right: Sieved white *arga*, or *arshib*, used at Gongkar Monastery. **316**
Source: Lama Norbu (2021).

Fig. 11-11 Ramming the *arga* with *bogdo* on the roof of the Gyüme Dratsang in Lhasa. **318**
Source: Hubert Feiglstorfer (2015).

Fig. 11-12 Rounded parapets after having been beaten with a *bärdo*, at Gongkar Monastery. **319**
Source: Lama Norbu (2019).

Fig. 11-13 Repairing a crack in the *arga* roof by using a *bogdo*. **319**
Source: Hubert Feiglstorfer (2019).

Fig. 11-14 Repair of a material defect in a wall plaster at the Dorje Drag monastery. **321**
Source: Hubert Feiglstorfer (2019).

Fig. 11-15 1st century CE Roman aqueduct at Italica made from *opus signinum* according to hydraulic lime mortar recipe specified by Vitruvius. **325**
Source: Fernando Delgado Béjar / Wikimedia Commons (2005), CC BY-SA 3.0.

Fig. 11-16 *Opus Signinum* layer in modern archaeological understanding (above layer of tufa) taken from the Roman aqueduct from Mons to Frejus (1st century CE). **325**
Source: Michel Royon / Wikimedia Commons (2007), CC BY-SA 2.5.

Fig. 11-17 Roman terrazzo floor at Herculaneum. **326**
Source: AlMare / Wikimedia Commons (2002), CC BY-SA 2.5.

Fig. 11-18 Modern terrazzo floor in the 19th century Oudenbosch Basilica. **326**
Source: Rijksdienst voor het Cultureel Erfgoed / Wikimedia Commons (1994), CC BY-SA 4.0.

Fig. 11-19 Small conglomerates of flat earth roofed structures remain in towns like Wadi Musa, Jordan (left), but most have fallen into disuse and disrepair (centre) because of lack of maintenance and heavy water damage to their roofs (right). **328**
Source: Moayad Alrwajfah (2022).

Fig. 11-20 Photo of Palmyra, Syria probably dating from early-mid 20th century showing stone roof-rollers stored on flat earth roofs. **329**
Source: unknown.

Fig. 11-21 Annual *crépissage* of the Great Mosque at Djenné. **331**
Source: Sophie Ravier / UN Photo (2015), CC BY-NC-SA 2.0.

Fig. 12-1 Replica of Khorchag "Silver Brothers", Western Tibet, 16th century, Pritzker collection. **343**
Source: Khoklov & Laurent (2020: Fig. 1).

Fig. 12-2 Sutra cover, Ming Dynasty silk with alternating rows of peonies with characteristic divided leaves and lotus flowers, 16th century. **343**
Source: Metropolitan Museum of Art (MET, NY, access. nr. 2011.221.27), Purchase, Friends of Asian Art Gifts, in honor of James C.Y. Watt (2011).

Fig. 12-3 Tabo *gtsug lag khang*, ceiling, sanctum. **346**
Source: Christiane Kalantari (2015).

Fig. 12-4 Left: Tabo *gtsug lag khang*, ceiling above the sanctum. **348**
Source: Christiane Kalantari (2009).

Fig. 12-5 Right: Idem. **348**
Source: Christiane Kalantari (2009).

Fig. 12-6 Tabo *gtsug lag khang*, Bodhisattva image, transition zone to the sanctum. **349**
Paintings from the foundation phase, ca. 1000.
Source: Christiane Kalantari (2009).

Fig. 12-7 Khartse, Bodhisattva Vajrasattva **349**
Source: Tsering Gyalpo (2006).

Fig. 12-8 Kashmir, Martand temple, roundels on pilaster **350**
Source: Pal (1992: 9-13, Fig. 6).

Fig. 12-9 Sogdian silk fragment showing roundels with pheasants, 680–900 CE, silk weft-faced compound twill (samite). **350**
Source: Los Anges County Museum of Art (LACMA, M.2007.32.2. Online: https://collections.lacma.org/node/213022).

Fig. 12-10 Avantisvamin temple, Kashmir, detail of a pilaster ornament. **350**
Source: Christiane Kalantari (2004).

Fig. 12-11 Buddha, Dankhar monastery collection (Spiti), from Gilgit in Greater Kashmir, 8th century. **351**
Cast-metal alloy (brass) with copper and silver inlay, with inscription (added later) giving the name and title of the royal preceptor from the Guge kingdom, Lha bla ma Zhi ba 'od.
Source Linrothe (2014: 4).

Fig. 12-12 Tabo *gtsug lag khang*, sanctum's ceiling. **351**
Figural motifs combined with illusionistic patchwork imitation.
Source: Christiane Kalantari (2015).

Fig. 12-13 Tabo, ceiling design, sanctum. **352**
Meandering lotus scrolls emitting humans and aquatic creatures.
Source: Christiane Kalantari (2015).

Fig. 12-14 MS cover, Jain, 1125, Gujarat, *kīrtimukha* emanating meandering lotus vine. **353**
Source: Pal (1995: 198).

Fig. 12-15 Khorchag, Ngari, TAR, China, ca. 1000. ..... **353**
Wooden portal, geometric patterns such as connected roundels and flower rosettes, used to organise and frame scenes or figures in different media.
See also: Gyalpo et al. (2015: Fig. 99).
Source: Christiane Kalantari (2010).

Fig. 12-16 Tabo, fragment of a wooden portal in the monastery's museum, perhaps from the foundation phase around 1000. ..... **353**
Source: Christiane Kalantari (2009).

Fig. 12-17 Cotton cloth, Gujarat for the Indonesian market, ca. 14th century. **355**
Source: Metropolitan Museum of Art (MET, NY, 2011: access. no.: 2005.407).

Fig. 12-18 Above: Tabo *gtsug lag khang*, *'du khang*. **355**
Length of cloth showing stings of stylised vases, flowers and conches, symbolizing purity and abundance.
Source: Hubert Feiglstorfer (2019).

Fig. 12-19 Dungkar cave temple, early 13th century. **355**
Ceiling with strings of stylised vases and flowers and overlapping circles known as cash/coin motif.
Source: Christiane Kalantari (2009).

Fig. 12-20 Idem. **355**
See also: Kalantari (2016b: Fig. 158).
Source: Christiane Kalantari (2009).

Fig. 12-21 Liao (907–1125) silk damask, China, 11th century. **356**
Crossing cycles known as cash motif.
Source: China National Silk Museum (CNSM, Hangzhou, China).

Fig. 12-22 Tabo *gtsug lag khang, 'du khang*. **356**
Ceiling ornament.
Source: Christiane Kalantari (2015).

Fig. 12-23 Left: Buddha, Kashmir, ca. 700. ..... **357**
Inlay in copper and silver, with references of imported material culture form Sogdiana and Persia.
Source: Norton Simon Museum (accession no. F.1972.48.2.S).

Fig. 12-24 Khartse Avalokiteśvara (transferred by Rinchen Zangpo from Kashmir, early 11th century). **357**
Source: Tsering Gyalpo (2012).

Fig. 12-25 Right: Tabo *gtsug lag khang, 'du khang*. **357**
Ceiling ornament.
Source: Hubert Feiglstorfer (2019).

Fig. 12-26 Bodhisattva, possibly Avalokitesvara. **358**
Source: Asia Society, NY, Mr. and Mrs. John D. Rockefeller 3rd Collection, 1979.45 .

Fig. 12-27 Left: Gujarati cloth from Eastern Indonesia, ca. 1340–1380, block-printed, batik and mordant dyes on cotton. **358**
Source: V&A Museum, London, Image ID 2006AT8154.

Fig. 12-28 Tabo *gtsug lag khang*, ambulatory. **359**
Wall-painting, detail of the attire of a Bodhisattva.
Source: Christiane Kalantari (2015).

Fig. 12-29 Tabo *gtsug lag khang, 'du khang*. **359**
Buddha's life, Maya asking Śuddhodana for austerity.
Source: Christiane Kalantari (2015).

Fig. 12-30 Indian cotton, block-printed with resist, and dyed blue, Gujarat 10th–13th century. **359**
Source: Ashmolean Museum (EA1990.130).

Fig. 12-31 Dungkar, cave temple, ca. 1200. ..... **359**
Life of the Buddha in a Tibetan setting, King Śuddhodana in local attire presenting the Buddha-to-Be to the hermit Asita.
Source: Christiane Kalantari (2010).

Fig. 12-32 Village ladies dressed in festive attire at Khorchag Monastery on occasion of a *Cham* dance. **360**
Note the cape with *thikma* patterns (left).
Source: Christiane Kalantari (2010).

Fig. 12-33 Idem. **360**
Source: Christiane Kalantari (2010).

Fig. 12-34 Right: Dolpo, manuscript, detail of devotees. **361**
Source: Heller (2009: 132).

Fig. 12-35 Left: Nako, Translator's temple, Buddha. **361**
Source: Christiane Kalantari (2005).

Fig. 12-36 Tabo *gtsug lag khang*. **362**
Bodhisattvas in the ambulatory, details.
Source: Hubert Feiglstorfer (2019).

Fig. 12-37 Idem. **362**
Source: Hubert Feiglstorfer (2019).

Fig. 12-38 Alchi, Sumtsek. **363**
Tower with princely couple, image on the *dhoti* of monumental Bodhisattva.
Source: Goepper (1996: 49).

Fig. 12-39 Lhasa Jokhang, roof. **365**
Craftwomanship of tailoring paraphernalia for the temple.
Source: Christiane Kalantari (2010).

Fig. 12-40 Idem. **365**
Source: Christiane Kalantari (2010).

Fig. 12-41 Idem. **365**
Source: Christiane Kalantari (2010).

Fig. 13-1 Schematic representation of the layers of a typical marouflage wall painting in Bhutan. **373**
Coming towards the surface these are as follows: primary support (e.g., rubble wall), secondary support (e.g., earthen plaster), sealant and adhesives (not shown), tertiary support (e.g., canvas), ground/priming layer(s), paint layers. In many instances there may be an older scheme of painting underneath the tertiary support (not shown).
Source: Lan Pu (2021).

Fig. 13-2 Tango Monastery. **374**
Detail of late 17th century wall paintings in the second floor north shrine with arrow indicating location of sample (a). Sample prepared as a polished cross-section showing the stratigraphy of the painting (b). Visible in this sample are the fine earth plaster (secondary support), sealant, ground layer, preparatory paint layer, and the bulking layer for gilding, mordant, gold leaf, and paint/glaze layers (Pu 2016: 59). Not visible are underlying layers i.e. rubble wall (primary support), and coarse plaster layer (secondary support).
Source: Lan Pu (2015), © Courtauld Institute of Art (CIA)/Department of Culture, Bhutan (DoC)/Lan Pu. Image ref: TNG15_2N_Nyi_S38_5582.

Fig. 13-3 An earlier painting on plaster was revealed at Dumtseg Lhakhang, ground floor internal circumambulatory, surrounded by later marouflage. **377**
Note that the painting on plaster is likely to have been subject to restoration (repainting) in 2017–2019.
Source: Karma Yeshey (2021), © DoC/Karma Yeshey.

Fig. 13-4 A fragmentary piece of marouflage from the 1F west chapel at Tango Monastery. **378**
Grey earthen plaster (secondary support) and earlier yellow painting were exposed from the lost surrounding area. The painted canvas was adhered to the pre-existing plain yellow paint; losses on the canvas reveal the similarly coloured additional yellow ground used to prepare the canvas before painting.
Source: Lan Pu (2017), © CIA/DoC/Lan Pu.

Fig. 13-5 Strips of canvas were attached to the wall at the 2F east chapel in Tango, covering structural cracks and preparing a smooth surface for in situ painting. **379**
Canvas strips are absent from this photo as they were detached from the wall in 2014.
Source: Lan Pu (2015), © CIA/DoC/Lan Pu.

Fig. 13-6 A separate canvas patch attached to the painted wall at Dumtseg external circumambulatory (ground floor) was used to seal a window opening (left). **379**
The shape of the canvas patch and concealed window, based on the pattern of dirt deposition, is marked in the diagram (right).
Source: Karma Yeshey (2021) and Lan Pu (2021), Photo: © DoC/Karma Yeshey. Diagram: © Lan Pu 2021.

Fig. 13-7 A portrait of Shabdrung Rinpoche found on the south wall of the side chapel at Menchuna. **380**
The portrait was made on a canvas patch and cut to the shape of the design. The canvas patch was attached to the wall and replaced an old, unidentified figure from the existing scheme. The edge of the seat of the old figure remains visible, behind Shabdrung Rinpoche's proper right seat back. To his proper left the background has been repainted (on plaster), potentially concealing other parts of the underlying figure.
Source: Karma Yeshey (2021) and Lan Pu (2021). Photo © DoC/Karma Yeshey. Diagram © Lan Pu 2021.

Fig. 13-8 A portrait of the mother of Khandro Sonam Pelden making an offering of milk to Khandro Sonam Pelden. **380**
The figure is executed on a patch of canvas closely fitting her shape. The inscription to the right appears to cross over the small patch onto the rest of the painting. The daughter of Khandro Sonam Pelden can be partially seen on the right (hands holding basket of fruit) and is painted on the main canvas patch.
Source: Sonam Chophel (2.7.2017), CC BY-NC 4.0.

Fig. 13-9 Additional dado border decoration found on the inner wall of Dumtseg ground floor external circumambulatory. **381**
Syllables on separate canvas patches with different colours were assembled to form the complete mantra of Avalokiteshvara.
Source: Karma Yeshey (2021), © DoC/Karma Yeshey.

Fig. 13-10 Dumtseg first floor. **381**
The outer wall (left side of image) was executed on large canvases and maximises the use of the available space, taking into account architectural features such as window openings.
Source: Karma Yeshey (2021), © DoC/Karma Yeshey.

Fig. 13-11 Iconographic cut-to-shape marouflage attached to the wall during the adhering process followed by in situ painting with landscape to integrate canvas patches into a holistic pictorial scheme. **382**
An example identified in the 2F east corridor (south-east wall) at Tango. The canvases were detached in 2014, leaving behind landscape elements on the wall and the silhouette of previous canvas pieces.
Source: Lan Pu (2017), © CIA/DoC/Lan Pu.

Fig. 13-12 The bottom edge of the large canvas is visible in the lower part of the image, on top of which, the offering bowl on the left, the stylised trees in the middle, and the group of flowers were added as separate canvas patches (west wall of the 2F east corridor at Tango). **383**
The tiny yellow and red paint remains on the edge of the large canvas (between the trees and flowers) is most likely a remnant of an object, evidence for resizing during installation.
Source: CIA/DoC (2013).

Fig. 13-13 A small crane painted on a separate canvas patch and attached to the landscape of a larger marouflage scheme, on the west wall of the 2F east corridor at Tango. **383**
Along with three other surviving canvas patches at the bottom edge of the main canvas (Fig. 13-12), this points towards an inventive solution to installing a pre-painted canvas that was mismatched in size with the installation space.
Source: Lan Pu (2021) and CIA/DoC (2013). Photo © CIA/DoC, 2013. Diagram: © Lan Pu 2021.

Fig. 13-14 Dumtse 1F, inner wall. **384**
Overlapping canvas patches in the form of a grid of strips and multiple large pictorial canvases with roughly cut edges. The strips are first laid out with large gaps left between them (vertical over horizontal). The large pictorial patches are then glued into those spaces, overlapping with the narrow strips.
Source: Karma Yeshey (2021) and Lan Pu (2021). Photo © DoC/Karma Yeshey. Diagram © Lan Pu 2021.

Fig. 13-15 Dumtse 1F, inner wall. **384**
Overlapping canvas patches in the form of a grid of strips and multiple large pictorial canvases with roughly cut edges. The top left patch is partially concealed by the bottom left patch as evident by the texture of the raised gilding on the throne visible through the covering canvas.
Source: Karma Yeshey (2021), © DoC/Karma Yeshey.

Fig. 13-16 Studio of Shri Yoebar painting workshop showing partly completed marouflage wall paintings commissioned for Kunzang Shedrub Choling Retreat Centre, Zhemgang. **387**
Once the canvas is cut and stitched to the required proportions, the canvas is made taut by stitching the edges on a wooden frame (shown). Some artists use staple guns to bind the edges of the canvas to the frame rather than stitching.
Source: Karma Yeshey (2021).

Fig. 13-17 Top: Stencil and pouncing materials (pigment tied in a loose bag) used by trainees at the National Institute of Zorig Chusum. **388**
Source: Karma Yeshey (2021).

Fig. 13-18 Right: Stencil and pouncing technique at Shri Yoebar painting workshop, used by one of the artists interviewed, to transfer drawings onto the canvas. **388**
In this case the pouncing has been reinforced by drawing a solid outline.
Source: Karma Yeshey (2021).

Fig. 13-19 Painting in progress at Kheng Thinley Arts. **389**
The Master painter sets out the broad outline of the painting, the placementing of figures, and decorative elements with certain tasks delegated to junior members of the workshop. At this stage we can see some preparatory drawings, the blocking in of areas of colour and gradients as well as the application of areas of raised gilding.
Source: Karma Yeshey (2021).



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Made in Europe

This edited volume takes an original approach to the rich architectural heritage of the Himalayas and Tibetan plateau by focusing on the people, skills, materials, and processes involved in constructing and maintaining it. By placing building craft traditions centre stage, the book complements existing literature on the history, design, and symbolism of buildings, while also encouraging new perspectives. Drawing upon architecture, anthropology, sociology, material science, art history, and conservation, the contributions offer a multidisciplinary picture of craft-based construction as a technical and social endeavour. Encompassing a broad range of locations, social contexts, building types, materials, and techniques, the book shows craft-based building to be a complex phenomenon grounded in tradition yet expressed in emergent fields and communities of practice. The book examines the many challenges that building craft traditions are facing in the present day, as well as the resilience, creativity, and adaptability with which craftspeople are responding to them. As the first of its kind, the volume makes a timely contribution to the study of the architectures and societies of these regions and will be of interest to students and seasoned scholars alike, as well as to those in applied fields such as architecture, construction, planning, conservation, and policymaking.

Hubert Feiglstorfer
is a Senior Researcher at the Institute for Social Anthropology (ISA) at the Austrian Academy of Sciences (OeAW).

Calum Blaikie
is a Researcher at the Institute for Social Anthropology (ISA) at the Austrian Academy of Sciences (OeAW).