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**ME &
THE BIOSPHERE**

50th Anniversary of UNESCO's MAB Programme

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Editorial by Günter Köck, Valerie Braun and Arne Arnberger

Austria is one of the first member states to become involved in the MAB programme. In 1973, just two years after the start of the MAB programme, the Austrian National MAB Committee was established at the Austrian Academy of Sciences (ÖAW), based on an agreement with the Federal Ministry of Science and Research and charged with the task of controlling and coordinating MAB research. From the start, the Committee was endowed with a separate research budget. This budget allows the Committee not just to identify research gaps, but to fill them with appropriate research projects. The National Committee monitors Austrian research, analyses research needs, formulates new research strategies and stimulates as well as funds research projects. Overall, the MAB National Committee has funded countless research projects in nearly five decades of its existence. In addition, the Committee has funded several activities of the MAB programme, e.g. the MAB Young Scientist Awards and the publication of three MAB Biannual Activity Reports (Website of the Austrian MAB National Committee: <http://www.biosphaerenparks.at/>).

Almost two years ago, the MAB Committee discussed possible activities to celebrate the 50th Anniversary of UNESCO's Man and the Biosphere (MAB) Programme in style. Given the MAB Committee's strong commitment to research in and for biosphere reserves (BRs), and not least because of the extensive expertise of the Austrian scientific community in mountain research, the decision quickly became clear: The Austrian MAB National Committee will organize and finance a special issue on *Biosphere Reserves in Mountain Regions* in the renowned scientific journal *eco.mont*. The call for proposals was very successful: the special issue contains 16 articles from four out of five MAB regions.

Several key messages can be derived from the articles. Some articles deal with long-term changes in the MAB programme and its World Biosphere Reserve Network (WNBR): Price et al. analyse the development of mountain research in the MAB programme over the 50 years of its existence, while Thomsen et al. look at the transformation of the BR network in the USA. Knaus et al. analyse the output of two decades of research in the Swiss Entlebuch BR. In the article by Jungmeier et al., a large number of authors deal with the historical development, the current status and the future perspective (especially in relation to the implementation of the SDGs) of BRs in Germany, Austria and Switzerland. These articles highlight the successful constant evolution and adaptation (e.g. Seville Strategy, Madrid Action Plan, Lima Action Plan) of the MAB programme over the last 50 years in response to changing global challenges. Residents and stakeholders seem to see many advantages in the existence of a BR and benefit from its ecosystem services (Eder & Arnberger; Pantic et al.). However, there are many local and global factors that alter and threaten BRs, including climate change, depopulation, over-tourism, illegal construction, land abandonment, and lack of legal support (Di Lonardo & Cinocca; Botha et al.; Huber et al.; Ibisch et al.; Mansilla-Quinones et al.; Odar et al.; Pantic et al.). BRs therefore need to adapt, require capacity building and need experienced management with sufficient financial and human resources to meet these challenges (Thompson et al.).

Residents certainly play a key role in the success of a BR. Some BRs have well-established participation processes and are well anchored and accepted regionally, while others have problems, for example, in terms of acceptance by indigenous people or youth involvement (Thompson et al.). BRs would do well to strive to better integrate previously marginalized / underrepresented groups (Thompson et al.). An important task for the future is certainly to invite more young people to participate in the implementation of BRs and so train the next generation of leaders (Mansilla-Quinones et al.; Odar et al.). Care must also be taken to ensure that local people develop a bond with their own BR (Eder & Arnberger; Mansilla-Quinones et al.) and identify with the MAB programme and its goals (Thompson et al.).

Scientific research will be a critical success factor in the future to support BR management and transformation processes (Knaus et al.). BRs are taking the lead in transformation, but adequately implementing all SDGs may overwhelm BR management (Jungmeier et al.). The articles in the special issue contain many best practices, references, and recommendations to ensure the long-term sustainability and successful management of BRs.

The Austrian MAB National Committee is pleased to present this *Special Issue on Biosphere Reserves in Mountain Regions* to the international MAB community on the occasion of the 50th anniversary of this outstanding programme. Last but not least, this issue should also be understood as a contribution to the re-launch of the *World Network of Mountain Biosphere Reserves*. The Austrian MAB Committee, as one of the longest existing national MAB committees, has contributed to the evolvement of this UNESCO flagship programme for almost 50 years and is committed to its continued support for the future.



United Nations
Educational, Scientific and
Cultural Organization



Austrian National Committee
of the Man and the
Biosphere Programme

50 Years of UNESCO's Man and the Biosphere Programme

In 2021, the Man and the Biosphere (MAB) Programme celebrates its 50th anniversary as a major UN programme combining nature preservation and sustainable development. MAB is an Intergovernmental Programme governed by the International Co-ordinating Council (MAB-ICC), and meets annually. It guarantees the link between civil society, including all stakeholders, and the governmental authorities which regulate the functioning of UNESCO. From its creation in 1971, the Programme was the first to care about the relationship between nature and human beings. The MAB Programme immediately developed the basis, within the natural and social sciences, for the rational, sustainable use and conservation of the biosphere's resources and for the improvement of the overall relationship between people and their environment. It aims in addition to implement activities that will enable people to better manage natural resources for their own wellbeing as well as for the good of the environment.

Just how the Programme works was decided by a series of World Congresses in 1985 in Minsk, 1995 in Seville, 2008 in Madrid, and 2016 in Lima. These congresses elaborated the Statutory Framework and several Action Plans. The most recent Statutory Documents of the Programme are the MAB-Strategy (2015–2025) and the Lima Action Plan (2016–2025), determining how the Programme would function for a decade, and providing a roadmap for the Programme and its World Network of Biosphere Reserves.

Today (2021), there are 727 UNESCO Biosphere Reserves (BRs) in 131 countries, including 22 transboundary sites and 2 intercontinental sites.

BRs involve local communities and all interested stakeholders in planning and management. They integrate three main functions:

- conservation of biodiversity and cultural diversity;
- economic development that is socio-culturally and environmentally sustainable;
- logistical support, underpinning development through research, monitoring, education and training.

These three functions are pursued through the BRs' three main zones (illustrated in the Figure 1):

- The Core Areas comprise a strictly protected zone that contributes to the conservation of landscapes, ecosystems, species and genetic variation;
- the Buffer Zones surround or adjoin the core area(s) and are used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training and education;
- the Transition Areas are areas where communities foster socio-culturally and ecologically sustainable human activities, including economic ones.

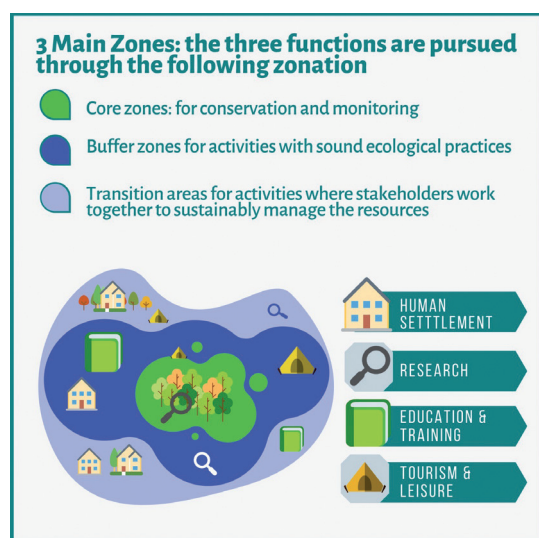


Figure 1 – The three functions pursued through the three zones of biosphere reserves. © UNESCO

The World Network of Biosphere Reserves includes representative areas of all major natural and semi-natural ecosystems, comprising more than 7 million km² in 131 countries. Their total surface area is almost the size of Australia. 5% of the world's terrestrial surface is protected by BRs; 1.5% is strictly protected as core areas. The core areas together amount to more than 1.3 million km², an area greater than that of Peru.

About 260 million people live in BRs worldwide, and BRs are present in every region of the world. They are sites of excellence for Sustainable Development through participatory dialogue, knowledge sharing, poverty reduction and enhanced capacities to cope with climate change. Brazil has the most extensive BR territory

(1 754 883 km²), and Costa Rica has the highest percentage of territory as BR (52.10%). Spain has the most BRs, with 53 sites; the highest mountain in the world, Mt. Everest (8 844 m), is located in the Qomolangma BR, China. The entire population of the highly endangered Sumatran Orangutan (6 600) lives in the Gunung Leuser BR, Indonesia. Without this BR, the entire population of one major mammal species would be endangered or disappear. The Tsá Tué, in Canada, is the first BR in the world to be designed and managed by its indigenous peoples, the Sahtuto'ine; the Gouritz Cluster BR, South Africa, is the only place in the World where three recognized biodiversity hotspots converge.

BRs are *laboratories for sustainable development*. Many projects, implemented partly or totally in concertation with the MAB Secretariat, underline the extreme richness and variety of approaches in BRs, and play a major role in helping to bridge the different needs of biodiversity conservation and sustainable development.

For example, the reforestation of the La Selle BR in Haiti is implemented by the local communities, aiming to restore the forest ecosystem in order for their fruits and other natural products to be harvested from the trees. The River Turtle Project in the Beni BR, in Bolivia, aims to restore the population of turtles as indicators for the health of the river ecosystem. The Plastic Reduction project in the Príncipe Island BR in São Tomé & Príncipe helped to bring about the total ban of plastic waste on the island and, at the same time, triggered the eradication of malaria there. The production of sustainable energy, and the introduction of electric transport and sustainable tourism in the island of Menorca's BR (Spain) is bringing about a radical change to transport on the island. And finally, the Great Apes Survival Project (GRASP) in Africa and Asia is being implemented in order to save great ape communities, some of which exist exclusively in BRs.

BRs are places where innovative ideas for sustainable development are tested and implemented. Local knowledge and scientific experience together, under the governance of all stakeholders, make BRs excellent places to implement the Sustainable Development Goals 2030, particularly (but not exclusively) goal 15 on *Life on Land*.

The MAB Programme has established many regional and thematic networks for better international, regional and inter-regional cooperation. In some cases, BRs have been established in former conflict areas, thus helping to fulfil the goals of *Science Diplomacy* and to enable neighbouring countries to overcome international conflicts.

Of utmost importance is the role of the MAB National Committees that coordinate the multitude of activities in individual countries, linking the sites with the World Network. For example, the Europe and North America region, the world's largest regional network, encompasses 40 countries and more than 330 sites. Another example is the Island and Coastal BR Network. Most of the world's population lives in coastal areas, and island and coastal populations will be the first to be faced directly with the challenges emanating from climate change, such as coastal erosion and sea-level rise. Therefore, there is a special ongoing project measuring the impact of climate change in coastal and island BRs. Other research projects, in mountain areas, measure the effects of global warming on glaciers, or focus on other impacts of global warming on the land and the respective communities.

International Cooperation Agencies use the World Network of Biosphere Reserves extensively. For example, the German Development Agency (GIZ) makes very targeted use of BRs and supports BRs outside Germany in bilateral cooperation, with investments of over 100 million euros per annum from its own financing mechanisms. Spain contributes generously to UNESCO projects, as do the Flemish government in Belgium, Austria, Korea and France. Often, UNESCO can use such extra-budgetary funds to implement projects that are not easy to finance even for a wealthy country like Germany. I will give you an example: UNESCO is currently organizing a costly (because multi-national) feasibility study (with a budget of over 6 million US dollars) for establishing a transnational BR in the Lake Chad region. The project includes all countries bordering Lake Chad: Chad, Cameroon, the Central African Republic, Niger and Nigeria – ecologically a highly significant region, and politically a sensitive one, where security can be precarious. The aim is to ensure the sustainable management of natural and cultural resources in this region, which is severely affected by climate change and overuse of resources, in order to reduce poverty in the long term and promote peaceful coexistence. UNESCO does not provide development aid, but it does strengthen cooperation worldwide. Our great strength is bringing together actors from very different regions of the world, such as Africa, Myanmar, Haiti and Bolivia. Especially in geopolitically highly sensitive (but all the more important) areas, we are able to act successfully with diplomatic tact and sensitivity – especially through the creation of BRs. In such contexts, UNESCO can provide a neutral platform.

So what is the agenda for the next 50 years of the MAB Programme and the biosphere reserves?

Worldwide, more than 60 countries still do not have BRs. These *white* spots on the world map of BRs include small island states in the Pacific or Caribbean, for example, as well as some states in Africa and other regions. In many cases, the political will is certainly there, but there is a lack of know-how and financial resources. Of course, even more financial support from richer nations for creating BRs in these countries would be desirable. But where the political will is not yet so strong, we need to demonstrate to people how much benefit they would derive personally from the creation of a BR. Because BRs demonstrably promote regional development.

The MAB Programme is also involving more young people globally. Through the MAB Youth Network and the MAB Youth Forums, UNESCO's MAB Programme engages with young people as actors of change, strength-

ening their presence in the governance of the MAB Programme at all levels, involving them in actions, in particular with communities in their own local BRs, and empowering them to make their voices heard in the global debate on biodiversity conservation and climate change. At the MAB Youth Forum, MAB Youth representatives raise issues concerning UNESCO, the MAB Programme, the World Network of Biosphere Reserves and their MAB National Committees. During the 2019 MAB Youth Forum, they decided to organize themselves into regional networks, each with its own action plan. These will be coordinated by nominated regional spokespersons, until the next MAB Youth Forum takes place. Regional focal points could also be given responsibility for organizing Regional MAB Youth Fora.

The MAB Programme communicates on social media, including via Twitter, Facebook and Instagram, and, of course, on the web. This allows not only the dissemination of communications from the MAB Secretariat but also direct contributions from countries, networks and individual BRs.

So, finally, I express my wish that within the decade of the Lima Action Plan, the MAB Programme and its World Network of Biosphere Reserves will get all countries on board with a least one Reserve per country, and that the Programme will have more and larger sites covering at least 10% of the Earth's terrestrial surface, including coastal areas and all islands which are close to the coast.

Thank you very much.

Dr. Miguel Clüsener-Godt, former Director, Division of Ecological and Earth Sciences, Secretary of the Man and the Biosphere (MAB) Programme, UNESCO.

Engaging the United States Network of Biosphere Reserves in a changing social-political context

Jennifer M. Thomsen, Kelly L. Cerialo, Sarah M. Gaines & Jeremy S. Dertien

Keywords: biosphere reserve, Champlain-Adirondack, diversity, governance

Abstract

The United States was an integral part of the early growth of UNESCO's Man and the Biosphere Programme (MAB), yet changing political and social contexts have impacted the relationship between the US and MAB. Poised at the start of a new period of activity, as the US reviews its strategy on its current and future engagement with MAB, it is critical to discuss the factors that have influenced the history of US involvement in the World Network of Biosphere Reserves (WNBR) and how the US will engage in the future. For the purpose of this article, the US Biosphere Network (USBN) refers to the current recently reinvigorated network of biosphere reserves in the US. As many of the USBN sites are partially or fully mountainous ecosystems, the renewed engagement of the USBN will contribute to the conservation of some of the nation's most prized mountain landscapes. This article provides an overview of the biosphere reserve concept and of US involvement with the intergovernmental programme. We discuss challenges facing the USBN, including relevancy and inclusion, political relations with UNESCO, and perceptions of zoning. We present examples of opportunities and strategies that have been implemented by the Champlain-Adirondack Biosphere Network in a mountain region, followed by conclusions on revising MAB in the US and globally for the next 50 years.

Introduction

In 1971, UNESCO established the Man and the Biosphere Programme (MAB) to integrate social and ecological dimensions of the landscape beyond traditional protected area boundaries (Ishwaran et al. 2008), the Biosphere Reserves (BRs) being one of a series of six programmes of implementation. In 2021, UNESCO's MAB is celebrating its 50th anniversary as an *"intergovernmental scientific programme that aims to establish a scientific basis for enhancing the relationship between people and their environments"* (UNESCO 2020). The hallmark of MAB, the World Network of Biosphere Reserves (WNBR), now numbering 727 sites in 131 countries, including 22 transboundary sites, is well established in its efforts for *"improving human livelihoods and safeguarding natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate and environmentally sustainable"* (UNESCO 2020).

The United States (US) was an integral part of the early growth of MAB, yet, as political and social contexts changed over time, so did the relationship between the US and MAB (Gilbert 2014). Mistrust of the United Nations and a politically polarized mistrust of science and environmental management by a substantial proportion of the US public, such as the one-third of the nation that denies human-caused climate change (Leiserowitz et al. 2019; Shear & Davenport 2020), have potentially contributed to low public awareness of MAB and the US Biosphere Network (USBN). For the purpose of this article, the USBN refers to the current network of BRs in the US. The omissions of the words *Man* and *Reserve* were intentional decisions by the US Biosphere Working Group and reflect the sentiments discussed in this article. As

the US reviews its strategy on its current and future engagement with MAB, it is critical to discuss the factors that have influenced the history of US involvement in the WNBR and how the US will engage in the future. As the majority of the sites in the USBN are partially or fully mountainous ecosystems, renewed engagement of the USBN will be especially important in the conservation of some of the nation's most prized mountain landscapes.

This article aims to address these issues by providing an overview of the BR concept and a brief history of the US involvement with the intergovernmental programme. We then discuss several challenges facing the USBN, including relevancy and inclusion, political turnover and relations with UNESCO, and perceptions of zoning. We present various opportunities and strategies that have been implemented by the Champlain-Adirondack Biosphere Network (CABN), and conclusions on revising the USBN and WNBR for the next 50 years.

History of US MAB Programme

Most US BRs received their designation between 1976 and 1980, with a historic high of 47 US BRs at the time of the most recent (2017) periodic review. The initial model for BRs was to preserve examples of unique ecosystems around the world, as reflected in the numerous experimental forests and biological research stations designated in the US as BRs in the early years of the programme. Prompted by a collaborative agreement between the US and Russia to jointly designate and research BRs (Franklin 1977), the WNBR expanded rapidly in the 1970s and 1980s in numerous countries. Later, the model evolved to include the current zonation system, which explicitly includes space for development activities, highlighting how MAB was

an early leader in sustainable development. Soon after the establishment of the UNESCO MAB programme, the US Department of State created a National Committee in 1974, with members coming primarily from federal and state agencies (Thomsen 2018). However, the US has had a tumultuous relationship with UNESCO: in 1974, US President Gerald Ford froze payments to UNESCO after it recognized the Palestinian Liberation Organization (Waxman 2017); and the US left UNESCO in 1983 under President Ronald Reagan.

In the mid-1990s, distrust of the United Nations within the US, along with the importance of private property and westward expansion underlying US national identity, led to the proposal of the American Sovereignty Protection Act to Congress in 1996–1997 (Shafer 2004). As Congress support waned, oversight of MAB in the US transitioned to the US Forest Service in 2000, although the agency was limited in its resources to support the programme (Thomsen 2018). The US MAB Programme was reinvigorated in 2002 with the establishment of the Biosphere Reserve Association and with the re-engagement of the US in UNESCO under President George W. Bush (UN News 2002; Thomsen 2018). However, in 2005, the US Forest Service ceased to oversee the MAB programme. At the same time, the USBN, challenged by a lack of capacity, largely became inactive until the State Department took the lead in overseeing the USBN in around 2013, and the US MAB National Committee was re-established in 2015.

UNESCO requires all members of the WNBR to carry out a periodic review to ensure that the BRs still meet the criteria for their designation. Many US BRs had never conducted a periodic review in their 40+ year histories. By 2017, 17 sites decided to withdraw from the WNBR, while two sites merged with other sites, either because they did not wish to participate in the periodic review or because they failed to meet BR criteria (Thomsen 2018). In response to a decision in 2011 of UNESCO's Executive Board to recognize Palestine as a Member State of the Organization, the US and Israel officially withdrew from UNESCO in January 2019. The State Department intends to stay engaged as a non-member observer state on *non-politicized* issues, including the protection of World Heritage sites, advocating for press freedoms and promoting scientific collaboration and education (US State Department 2017). Time will tell whether this period proves different from the previous withdrawal under President Reagan; however, the US is currently not engaged in decision-making leadership within UNESCO, and public awareness of UNESCO activities on the ground in the US is low.

Currently, the USBN consists of 28 BRs. Of these 28 sites, the core areas of 14 are managed by the National Park Service (NPS); the remaining 14 are managed by a mix of the NPS, US Forest Service, National Ocean and Atmospheric Administration, US Department of Agriculture, Nature Conservancy, universi-

ties, and other state and local entities. Some of the 28 sites have actively used their BR designation to achieve their landscape conservation goals and to coordinate stakeholder interests related to sustainable development. Meanwhile, other BRs that have additional designations (e.g. National Park, World Heritage Site) may not rely as heavily on the BR designation. Each of the sites in the USBN is unique, and they utilize their designation in diverse ways.

The NPS and the US MAB National Committee led the effort to conduct periodic reviews between 2016 to 2019. Over recent years, with the dissolution of this Committee as an advisory body to the US National Commission to UNESCO, a US Biosphere Working Group has been established that includes representatives from the active BRs in the USBN and others that work closely with those sites. In 2022, the Working Group is conducting a workshop for the USBN and has conducted several virtual meetings leading up to the workshop to support training, capacity and collaboration across the USBN. A Steering Committee was recently established that will provide leadership for the USBN and the Working Group. Through these efforts, the USBN is reinvigorating its activity and strategically planning for the future to overcome challenges and maximize opportunities.

USBN challenges

Relevancy and inclusion

UNESCO describes MAB as promoting “*innovative approaches to economic development that are socially and culturally appropriate and environmentally sustainable*” (UNESCO 2020). Further, BRs aim to be “*sites for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity*” (UNESCO 2020). We would like to underscore the following key terms in these statements: “*socially and culturally appropriate*” and “*interactions between social and ecological systems, including conflict prevention*”. Over the past 50 years, the US and the rest of the world have changed rapidly, both socially and environmentally (Steffen et al. 2011); they will continue this trajectory of change over the next 50 years as the US becomes more diverse (Frey 2019), and there is greater interaction between humans and the environment (Tilman & Clark 2014).

While MAB considers the roles and needs of humans holistically in its vision and mission, there is room for improvement for diversity and inclusion in the USBN. The environmental movement in the US has been dominated by white voices and perspectives, largely excluding or not acknowledging the diverse interactions between different ethnicities and the environment (Finney 2014; Zimring 2017). Similarly, the US Biosphere Working Group along with past oversight committees included but a limited number of other perspectives, especially those of marginalized groups, despite UNESCO's reference to be *socially*

and culturally appropriate. Many indigenous groups may view BRs as being similar to other protected areas that have a long history of displacing indigenous people and limiting their use of the land (Spence 1996; Jacoby 2014). Indigenous communities are impacted by BRs at the local level in diverse ways. For example, indigenous populations from a BR in Mexico experienced negative impacts due to BR regulations, which limited their hunting and gathering, and created perceptions of their being *illegitimate resource users*, while indigenous communities in a Bolivian BR perceived a lack of enforcement of logging regulations by outside settlers as a threat to their local livelihoods (Ruiz-Mallén et al. 2015, p. 102). Over the past year, the systemic racism that exists throughout US society has been brought to the forefront of our cultural public discourse (Medina 2020; Worland 2020). It is a critical element for the USBN to consider as it enters its next fifty years, in order to ensure that all stakeholders are integrated and engaged.

Gender is another element for MAB to consider in the context of a diverse and changing society. While MAB aims to be inclusive of all humans, the use of *Man* in the title is problematic, even if 50 years ago it was intended to denote *mankind*. In 2021, *Man* is not an acceptable word to indicate all people. Concerns have been raised about the programme's name and calls have been made to make it more inclusive, including at public fora such as the 3rd World Congress of Biosphere Reserves, Madrid, 2008 (Gaines, personal communications); yet, concerns exist that if the name is changed, the historical foundation of the MAB programme and its identity may be lost. Over the past fifty years, there have been major strides in the US and elsewhere to empower gender diversity and LGBTQ rights (CNN 2020). Despite the MAB programme being nominally inclusive of gender diversity, the name itself may deter or exclude many members of society – at the least making the programme appear archaic and exclusive. There are other recent examples of major sports teams and businesses changing their names and brands to be more socially relevant and appropriate (Taylor 2020). For the US context, where MAB is making strides to reinvigorate itself and be relevant to a public that is largely unfamiliar with the programme, any new name should be a particularly important signifier for the inclusivity of the programme.

Lastly, as MAB celebrates its fifty years as an established programme, there is a need to consider how age factors into the next generation of the USBN. Many of the foundational leaders of the historic US MAB programme and individual BRs are no longer actively involved. While these leaders provide institutional knowledge, there is a need to create a bridge and engage with young professionals and youth to ensure relevancy and long-term sustainability of the programme (Reed 2016). There has been great momentum for youth involvement in the climate change crisis and other environmental movements around the world

(Neuman & Chappell 2019; Sengupta 2019). However, due to minimal recognition of MAB among US citizens and a lack of funding to formalize a youth network, engaging young professionals has proven to be a challenge for USBN leaders. The MAB Programme established a Youth Forum in 2017 in Italy, and a subsequent Forum in 2019 in China to which the USBN sent a number of representatives. Additionally, the National Park Service, universities and non-profit organizations have created innovative educational opportunities across the USBN to engage young people aged 18–35 to support the UN's 17 sustainable development goals and MAB's core objectives. However, without a strong identity, MAB could eventually be phased out in the US as other large landscape and transboundary initiatives continue to emerge and establish themselves alongside our well-known national parks.

Limited capacity of USBN

When the US MAB Programme was established in 1974, it included several protected areas that were federally managed and did not require significant changes in operations and management (Franklin 1977). However, a UNESCO MAB Task Force also emphasized that *“The planning and establishment of biosphere reserves will require expert staff and, in some instances, considerable financial resources for buildings, communication and other facilities”* (UNESCO 1974, p. 36). Although the planning, establishment and periodic review of BRs require considerable financial resources and time, the day-to-day operations of most USBN sites are largely grassroots-driven, staffed by volunteers or partner organizations, and lack dedicated or consistent funding. This discrepancy between management expectations and the local reality creates considerable challenges in establishing and maintaining active and recognized BRs in the US.

Considering the political, social and financial context that the USBN faces at the federal level, numerous USBN sites have turned to local grassroots efforts, volunteer staff and locally sourced funds to remain active. For example, Mammoth Cave BR and Cascade Head BR have agreements with local and regional partners to increase the BRs' and their partners' capacities. This model of operation and governance structure create considerable obstacles in ensuring the long-term sustainability of the USBN, since participation and stakeholder engagement fluctuate because of inconsistent funding and the availability of non-paid volunteers.

Zoning and reserves

Effective zoning of areas where there are conflicting land uses, as in buffer areas, is recognized as critical to protect biodiversity and to ensure the preservation of a protected area (Rotich 2012; Gao et al. 2019). Although it has been nearly a century since the US Supreme Court affirmed that zoning was a valid use of governmental powers (Jacobs 1998), it is another regulatory power viewed sceptically by some sectors of the

general public in the US, as a governmental overreach on private property rights (Thomsen 2018). The lack of zoning or regional planning in private and public land areas can lead to increased habitat fragmentation, environmental contamination of sensitive habitats, and a decrease in human health (Hansen et al. 2005). Thus, effective zoning of private lands for biodiversity conservation is difficult to implement in many regions of the country, especially rural settings (Sargent et al. 1991), which has consequences on USBN sites' ability to promote sustainable development initiatives.

In the process of conducting periodic reviews of the 47 US BRs between 2016 and 2019, a process led by the National Park Service, many discussions took place regarding the functional reality and the zonation model of BRs in the context of sensitivity to private property rights in the US along with distrust of international interference. In many cases, sites fulfilled the functions of BRs without meeting the requirement of mapped concentric core, buffer and transition zones, representing increasingly more developed use. For example, in the case of the Apalachicola BR, protected land that is federally designated (through the US Forest Service) comprises the core area but is situated across the road from private property that has commercial forestry and development, with no buffer in between (P. Mangan, personal communication, September 4, 2020). This zonation was unacceptable to the Advisory Committee of the MAB Programme. Eventually, Apalachicola found a compromise, by establishing a buffer zone within the protected area designated by the US Forest Service.

Many US BRs did not reach this kind of compromise for meeting zonation requirements, and some of the original BRs were withdrawn because of such requirements as well as because of extended dormancy. Rather than viewing it as a setback, the US MAB National Committee viewed the voluntary withdrawal of 19 non-active sites as important progress towards an engaged functional network (Smith & Greschko 2017). Other examples of US adaptations of the international zoning framework as well as of the MAB terminology exist. Two sites, Mammoth Cave Biosphere Region and Congaree Biosphere Region, have replaced the term Reserve with Region, to avoid restrictive or exclusionary connotations of *Reserve*, while maintaining their place-based identity and purpose with *Region*. Similarly, some US sites also adapted the MAB zoning terminology while maintaining the principles of the zones, selecting *Area of Managed Use* for *Buffer Zone* and *Area of Partnership and Collaboration* for *Transition Zone*. In its periodic review submissions to MAB, the USBN uses the standard MAB naming conventions in describing zones, while locally it uses varied terminology to adapt to local socio-political conditions.

Despite the challenges outlined in the previous sections, many units in the USBN have adopted innovative strategies to overcome challenges and maximize opportunities. The Champlain-Adirondack Biosphere

Network (CABN) offers a case study to illustrate some of these strategies in a mountainous ecosystem.

Case study: how the Champlain-Adirondack Biosphere Network navigated challenges and maximized opportunities

Case background

Established in 1989, the Champlain-Adirondack Biosphere Network (CABN) is a mountainous trans-boundary USBN site encompassing 3 990 000 ha in north central New York state and northwestern Vermont (Bibles 1995). The CABN includes the Adirondack State Park (2.4 million ha; in New York), Camel's Hump Mountain and Mount Mansfield State Natural Areas (3 704 ha; both in Vermont), and a portion of the Green Mountain National Forest (7 462 ha; also in Vermont). Since CABN was established, it has faced significant challenges related to zoning, land sovereignty, lack of engagement, and governance capacity. When CABN received the UNESCO designation in 1989, the situation became politically fraught as very few local communities and government officials were aware that the region had been nominated by the US Department of State for BR status (Houseal 2016). Once citizens and local officials learned of the designation in the early 1990s, there was significant opposition, particularly on the New York side, stemming from fears that the United Nations would implement additional zoning restrictions and land use regulations on top of the existing regulations imposed by local land use management agencies (Houseal 2016). As a result, CABN failed to launch. It was listed as *inactive* by UNESCO in 1995, and remained inactive until it was notified that it might be de-listed if a periodic review was not completed in 2016 (Houseal 2016). In 2016, CABN submitted the periodic review and convened a group of key officials from New York and Vermont, together with directors of Canada's Frontenac Arch Biosphere Network (FABN), to assess the feasibility of reinvigorating CABN's biosphere status. From 2016 to 2020, CABN formed a Steering Committee, developed a Strategic Plan, and began a phased approach to engage the local community, with a more inclusive strategy that aimed to counter the restrictive narrative that had prohibited CABN from gaining stakeholder buy-in when it received the designation.

As the CABN shifted out of dormancy, the Steering Committee aimed to establish CABN as a *network of networks* that promoted bioregional strategies to bridge the gap between New York and Vermont, and to support organizations in the biosphere which were actively addressing the United Nation's Sustainable Development Goals. The Committee also saw an opportunity to act as an aggregator and connector of interdisciplinary research and projects across the region to link otherwise disparate efforts. Furthermore, relaunching CABN presented a unique opportunity for thought leaders in the region to bring

competing stakeholder interests to the table and to develop bioregional solutions to complex issues such as climate change. Three strategic partnerships facilitated the growth and reactivation of the CABN: 1) a Twinning Agreement with the FABN in Ontario, Canada; 2) bioregional collaborations with the Lake Champlain Basin Program, and 3) youth leadership mentoring to support sustainable communities.

Partnering with the Frontenac Arch Biosphere Network

In an effort to overcome their politically fraught past and to create a new image, CABN leaders turned to neighbouring FABN in Brockville, Ontario to understand best practices in stakeholder engagement, messaging, and how to use the designation to address competing stakeholder interests. In October 2019, CABN and FABN formalized their international partnership by signing a *Twinning Agreement* that focused on supporting UNESCO BR core objectives with a bioregional approach in the US and Canada. CABN and FABN have a strong sense of shared place, with numerous ecological, cultural, social and economic connections with each other. In particular, they are linked by their common position on the geological formation known as the Frontenac Axis, and on the Great Lakes and Saint Lawrence River Watershed.

In order to dispel negative connotations associated with the word *reserve* and to communicate a more inclusive collaboration of partnerships, the Frontenac Arch Biosphere Reserve changed its name to *biosphere network*. After consulting with FABN, UNESCO and their Steering Committee, CABN followed suit in 2019 and officially changed its name to the Champlain-Adirondack Biosphere Network, to create a more inclusive message and to more accurately reflect the mission of CABN.

Engaging with indigenous populations and diverse partners for bioregional thinking

CABN and FABN also sought increased engagement and reconciliation with indigenous peoples. The Twinning Agreement seeks to incorporate indigenous people's traditional ecological knowledge into management actions. In October 2019, FABN partnered with the Indigenous Environmental Institute at Trent University, Ontario Nature, Plenty Canada and the Walpole Island Land Trust to host a three-day event to share insights into, and strategies addressing, the interconnected crises of climate change and biodiversity loss. Over 100 leaders from Indigenous and non-Indigenous communities attended the event to support collaboration and resilience in an era of climate change.

The partnership with Lake Champlain Basin Program (LCBP) had a significant role in CABN's engagement at the bioregional scale by including Indigenous partners. LCBP works in collaboration with government agencies from Vermont, New York and Québec,

non-profit organizations and local communities to support bioregional strategies for healthy ecosystems and communities of the Lake Champlain watershed. It oversees the Champlain Valley National Heritage Partnership (CVNHP), most of which is in the CABN and includes the ancestral home of the Iroquois and Algonquin peoples. The CVNHP provides an opportunity for CABN to promote, preserve and interpret the history of this region and to highlight the traditional ecological knowledge that shaped its landscape. LCBP and CVNHP's guidance and support have allowed CABN to establish a network of networks around the Lake Champlain Basin and to further strengthen their transboundary collaborations.

Mentoring the next generation of biosphere leaders

The size and scope of the CABN provided a unique opportunity for educators and practitioners in the region to mentor the next generation of leaders. Recognizing the growing need to engage young people in this effort, educators from several universities in the CABN launched youth leadership mentoring programmes that focus on BR studies and sustainable development. Paul Smith's College's Protected Landscapes and Community Sustainability Program launched an interdisciplinary programme that also involves CABN, Appenino Tosco Emiliano BR (Italy), Cape West Coast BR (South Africa), and Dreamcatchers Tourism South Africa. This initiative gives undergraduate students the opportunity to study sustainable tourism in BRs in Italy or South Africa, and to assess how local governments implement the United Nation's Sustainable Development Goals. The international collaboration helps to empower the next generation of WNBRL leaders through hands-on experiential learning projects that can be adapted to a variety of landscapes and cultures.

In 2020, the State University of New York's School of Environmental Science and Forestry (SUNY-ESF) launched a Center for UNESCO BR Studies to educate and engage college students in local and international MAB initiatives (Carter 2020). The primary objectives of the centre are (1) to support CABN operations; (2) to organize collaborative education and research activities; (3) to analyse the operations of international UNESCO-designated BRs to determine best practices, and (4) to support the interdisciplinary study of BRs at SUNY-ESF. These innovative programmes serve as a model for youth engagement and education in BRs worldwide.

Conclusions and recommendations

The USBN has evolved over recent decades, influenced by a variety of social, political and environmental factors. While the USBN has made strides in achieving UNESCO's MAB goals over the past fifty years, it has also been faced with challenges that will

influence USBN going into the future. Many of the challenges outlined in this article are not specific to the US and should be considered by the WNBR. The CABN case study offers an example of how a unit in the USBN adapted to these challenges; however, there are numerous other examples from USBN and WNBR. The following recommendations outline some key strategies and considerations for the USBN. Many of them are actively under discussion, and are also relevant to the WNBR.

1. Rename the MAB programme with a more gender-inclusive title. Reflecting the current focus of the programme, the name could be the *UNESCO Biosphere Programme*.
2. Replace *Biosphere*, *Reserve* and *Zone* in individual site names with more regionally appropriate, locally acceptable, terms that align with land use while still maintaining the sites' functionality.
3. Develop inclusive approaches to bring under-represented groups and indigenous communities to discussions about resource management at the local level of the BR, and at the national level for strategic planning and policy development.
4. Ensure that youth and young professionals are included at the centre of decision making and that their active engagement is maintained.
5. Continue to engage with educational institutions at the heart of the USBN as an inclusive thinking and learning network.
6. Develop a community of practice across BRs through workshops and virtual meetings within countries and across WNBR regional networks.
7. Re-image USBN to reflect the relevance and necessity of BRs in addressing complex social-ecological challenges such as climate change, and encourage the use of biospheres as long-term research sites. Develop a database of key research and information related to the WNBR to synthesize social science, natural science and traditional ecological knowledge. Reinforce existing connections to research networks such as the Long-Term Ecological Research sites and Local and Indigenous Knowledge Systems.
8. Assess how USBN complements other designations such as National Park, World Heritage Site and large landscape initiatives, to better align goals and actions.
9. Create a governance structure of key representatives from individual units, federal and state agencies and other key groups to maintain institutional knowledge and support over time. Develop an interactive portal to enhance capacity, establish best practices, and inform sound governance as a nested approach for the USBN, regional MAB networks, and the WNBR.

UNESCO's MAB programme served as a catalyst for thinking beyond the traditional protected area model and emphasizing the integrated nature of land-

scapes as social-ecological systems. While the WNBR still maintains a unique niche in sustainable development and conservation, there are numerous examples around the world of sustainable large-landscape conservation approaches (Keeley et al. 2019). Our society is constantly changing along with the environment; thus, it is critical for the WNBR to consider the challenges and opportunities outlined in this article if it is to remain relevant, inclusive and resilient. It is our hope that this article will generate meaningful discussion within the USBN and the international MAB community, and encourage being proactive rather than reactive to changes that transcend political and institutional boundaries. Many of the issues discussed in this article are not unique to the US: they should be considered for the WNBR as a whole.

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Pärke, Parks and Reservate – biosphere reserves in Austria, Germany and Switzerland on their way towards Biosphere 4.0?

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Abstract

The biosphere reserve (BR), as conceived by UNESCO, is a permanent intervention towards sustainable development. With 727 BRs in 131 countries (Österreichisches MAB-Nationalkomitee 2021), this means interventions in highly diverse environmental, economic, socio-cultural and institutional contexts. With the MAB Strategy 2015–2025, the Lima Declaration 2016 and the Lima Action Plan 2016–2025, UNESCO BRs should develop fully into model regions for the implementation of the Sustainable Development Goals 2015–2030 (SDGs) (United Nations 2015). Because of their varied contexts, the UNESCO World Network of Biosphere Reserves consists of different, but globally self-similar, *fractal* institutions.

In this article we emphasize the understanding, implementation and management of BRs in Germany, Austria and Switzerland. These three European democracies are examples of federally structured states with comparatively wealthy economies as well as high political stability. Respect for property rights, regional acceptance, decentralized decision-making, and micro- and macro-economic considerations have always played decisive roles in the development of BRs in the DACH countries. We aim to identify, analyse and discuss the distinct characteristics and peculiarities of BRs in this area. We investigate how the framework conditions of sustainability, as presented in the concept of BRs, are perceived, discussed and implemented.

As a basis for our analysis, we use a sample of 18 peer-reviewed publications, which were published collectively as a book on BRs in the DACH countries (Borsdorf et al. 2020). The individual publications present overviews, case studies and in-depth investigations in the three countries. All authors were invited to participate in a meta-text analysis. This was conducted in the form of a survey, a transdisciplinary workshop with a reflective design using a virtual whiteboard, and a concluding feedback loop. The results of the qualitative exploration are interpreted against the background of international comparisons and recent scholarly discussions. Based on the assumption that different types of ambiguities and conflicts are inherently a key element of the BR concept, we conclude that the DACH countries may have found specific ways to deal with and overcome these differences.

Introduction

Biosphere reserves in Germany, Austria and Switzerland in a global context

The biosphere reserves (BRs) of the UNESCO World Network of Biosphere Reserves (WNBR) can be seen as learning sites in which innovative approaches for sustainable development are implemented in co-operation with various stakeholders and their specific ecological, economic and social interests. After the introduction of the MAB programme in 1970 / 1971, the establishment of the WNBR in 1976, a fundamental adaptation of the programme in 1995 (Seville Strategy) and the Madrid Action Plan in 2005, the concept underwent a further major revision with the Lima Action Plan in 2016. The main innovation was the consistent orientation of the BR concept towards the UN goals for global sustainable development (Sustainable Development Goals [SDGs]) (see Figure 4; see also UNESCO 1996, 2009, 2015a, 2015b, 2016a, 2016b; United Nations 2015).

Germany currently has 16, Austria four and Switzerland two UNESCO-designated BRs, see Figure 1. Zonation of BRs is crucial in conceptualizing their conservation functions. Therefore, all BRs must have a zoning plan (core area, buffer zone and transition area; see Braun et al. 2020).

Biosphere reserves and the changing conceptions of sustainability

The term *sustainability* is subject to constant changes of meaning (see Grober 2010), as seen in Figure 2. In the DACH (acronym for Deutschland (Germany, Austria and Confoederation Helvetica (Switzerland)) countries, the concept of sustainability has existed since the Middle Ages, although it was limited to individual natural resources: early forest and pasture regulations in the Alpine region allowed the long-term use of the corresponding resources. *Sustainability* in the sense of the sustainable use of renewable natural resources is often attributed to Hans Carl von Carlowitz and his book *Sylvicultura Oeconomica* (Carlowitz 1713).

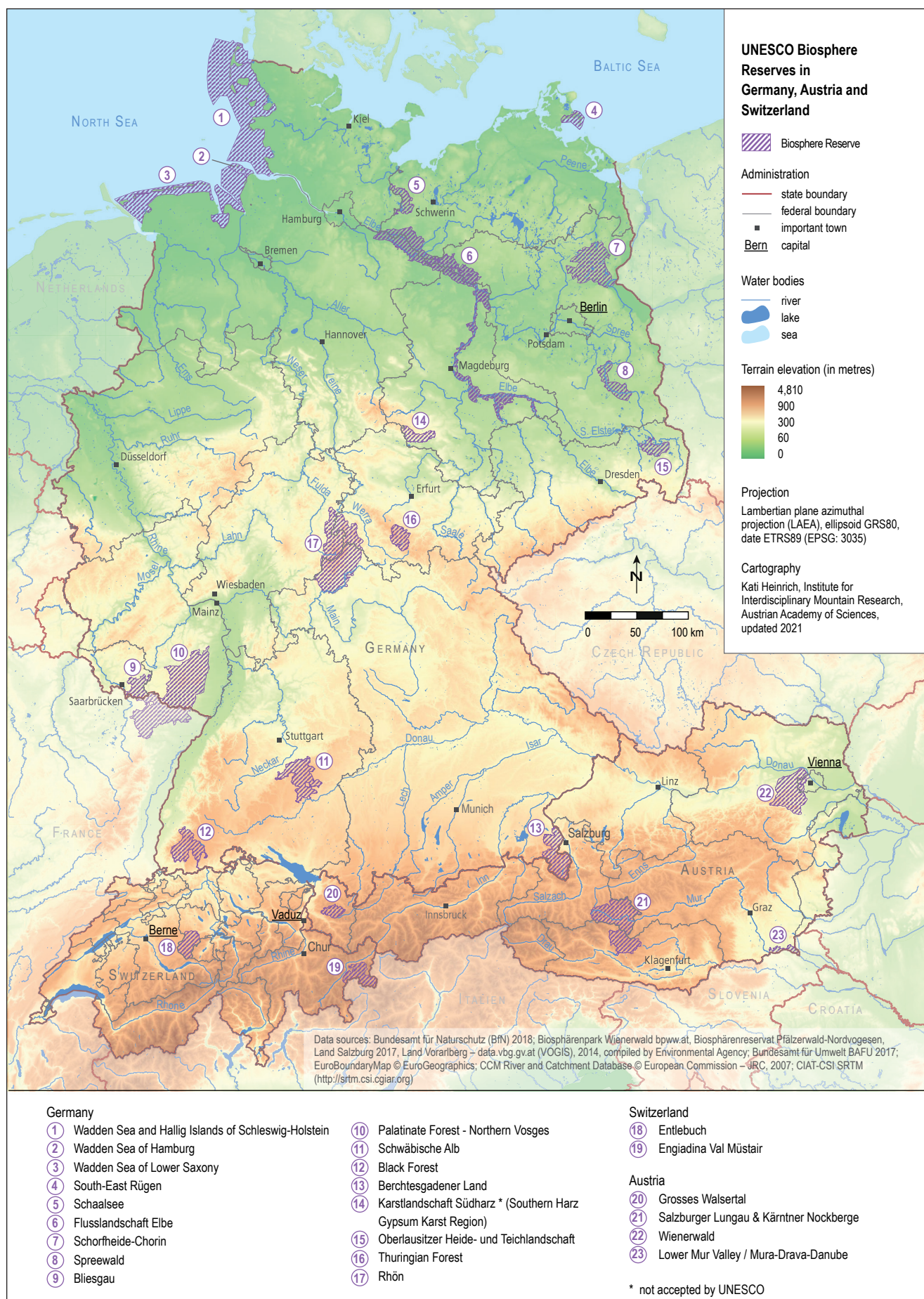


Figure 1 – Map of the BRs in the DACH region.

The increasing use of raw materials and fossil fuels in the 20th century led to the recreation of forest stands, but at the same time made the finiteness of certain resources visible. The roots of a globalized environmental movement can be identified in the scientific discourses of the 1960s (e.g. Rachel Carson's *Silent spring*; Carson 1962). The photo of planet Earth taken by Apollo 8 on 24 December 1968 (Figure 3) has become one of the most powerful iconic images of the 20th century (Harari 2015). Visualizing and symbolizing the beauty and vulnerability of the planet, the photograph may have had a significant impact on scholarly discussions of the early 1970s. This decade was formative for diverse concepts of nature conservation: the MAB programme (1970/1971), the United Nations Environment Programme (1972), the Ramsar Convention as the first international nature conservation agreement (1971), the adoption of the World Heritage Convention (1972), and even the first European Year of Nature Conservation (1970) all took place practically simultaneously shortly after the picture was taken. In 1970, Bavaria was the first state to establish a State Ministry for Regional Development and Environmental Affairs. It was not only the first environmental ministry in Germany, but also the first anywhere in the world (Merkel 2010). When in 1972 the scientists around Denis Meadows published the results of their simulation project on the use of resources under the title *Limits to growth* (Meadows et al. 1972), they sharpened awareness of the finiteness of natural resources and of the urgent need for an international environmental policy.

The SDGs of the 21st century, with their focus on justice or equity, introduce an ethically-based concept of sustainability that goes beyond scientific methods and discourses (Figure 2 & 4). While a concept of sustainability that focuses on needs, stocks, yields and limits raises technical, scientific and economic questions, justice raises complex moral, ethical and philosophical questions. The SDGs focus on equity (e.g., between countries of the Global North and the Global South, between generations, between different social groups, across social constructs of gender and race). In more than 60 of the 178 targets of the SDGs, equity is addressed explicitly; in many others, it is addressed indirectly. This is a significant expansion of the concept of sustainability towards global ethical and philosophical questions (Borsdorf & Jungmeier 2020). Overall, in both scientific and political discourse, it can be seen that the notion and definition of sustainability have gradually expanded. In addition, the term has gained an *imperative, ethical-appellative charge* (Heintel & Krainer 2014).

State of research and recent discourses

Initially, the MAB programme, which started as an international interdisciplinary research programme, and the resulting BRs were a science-driven programme (Nguyen et al. 2011). Many MAB National

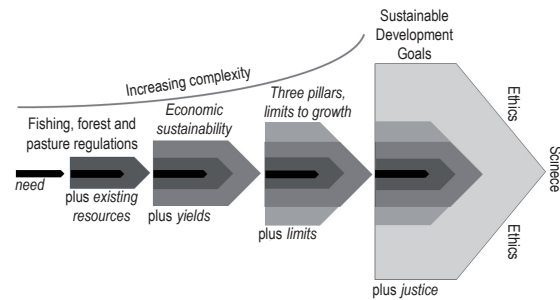


Figure 2 – SDGs as an ethical concept. Extension of the term sustainability in practical, scientific and ethical discourse (Borsdorf & Jungmeier 2020, adapted).

Committees / Focal Points are still anchored in scientific disciplines, and are thus well rooted in academia. Furthermore, regular reflection, evaluation and adaptation, which were later conceptualized as adaptive management (Dudley et al. 2000), have a clear focus on scientific principles.

Accompanying research for the development of individual BRs as well as of the WNBR is a constituent element of the BR concept (see e.g. Moreira-Muñoz & Borsdorf 2014). In recent years, numerous case studies have been published that refer to specific sites (e.g. Coy & Weixlbaumer 2009; Farghaly et al. 2016; Kratzer 2018; Rumpolt et al. 2016; Schmitz et al. 2017; Speelman et al. 2014; Mayer et al. 2018; Carius & Job 2019), or to supraregional or international developments (e.g. Hammer et al. 2016; Popelier & Vaessen 2014; Roth 2017; Sacchetti & Campbell 2017; Stoll-Kleemann & Welp 2008). The approaches, methods and tools of governance and management are under permanent scientific review and modification. These include the development of robust and meaningful monitoring systems (e.g. Buer et al. 2013; Jungmeier et al. 2011, 2013; Runst & Stoll-Kleemann 2020), and the acceptance by, and participation of, the population (e.g. German Commission for UNESCO 2015; Huber & Arnberger 2016; Rumpolt 2009; von Lindern et al. 2020; Wallner & Wiesmann 2009). Specific management issues include MIDAS (Multi Internationally Designated Sites; Schaaf & Clamote Rodrigues 2016), transboundary management (Taggart-Hodge & Schoon 2016), effective zoning systems (Wattendorf et al. 2017), and questions related to the Anthropocene (Egner & Jungmeier 2018). BRs trigger scholarly debates on social innovation and entrepreneurship (e.g. Francis 2009; Bergstrand et al. 2011; Knaus et al. 2017; The Scottish Government 2015; Sacchetti & Campbell 2017; Job et al. 2013; Kraus et al. 2014), and on conceptual and basic considerations, such as size of core areas or functions (Deutscher Rat für Landschaftspflege 2010; Egner & Jungmeier 2018; Jiménez et al. 2017; Köck & Arnberger 2017; Mose & Weixlbaumer 2012; Pichler-Koban & Jungmeier 2015; Pichler-Koban & Jungmeier 2017; Stoll-Kleemann & O'Riordan 2018; Plieninger et al. 2016; Pütz & Job 2016). New developments in re-



Figure 3 – Earthrise. Iconic picture of the 20th century, mankind's first view of their own planet. Image courtesy of the Earth Science and Remote Sensing Unit, NASA Johnson Space Center. Photo ID AS11-44-6550, taken 1968 by Apollo 11. © Earth Science and Remote Sensing Unit, NASA Johnson Space Center, <https://eol.jsc.nasa.gov>

search (e.g. Bela et al. 2016; Grasser et al. 2016; Petridis et al. 2017), education (Herrero 2017; Mammadova 2017), and integration and inclusion (e.g. Höglhammer et al. 2015) have also become visible.

Research questions, approaches and methods

In the context of 50 years of the MAB programme, we wish to focus on the development, current state and future perspective of BRs in the DACH countries. An assessment of the situation aims to contribute to international discussion. The research addresses the following questions related to BRs in the DACH countries:

- Past (P1): What are significant milestones in the historical development?
- Past (P2): What significant developments have been initiated by the BRs?
- The situation today (T1): What are the special features and characteristics of BRs?
- The situation today (T2): What are the particular strengths and weaknesses of BRs?
- Future (F1): What are the burning issues for the future of BRs?
- Future (F2): To which societal questions should BRs contribute in a distinctive way in order to shape the future?

The research project shall contribute equally to regional, national and international reflection. In particular, it will aim: (1) to initiate or support discussion among the BRs' management committees and stakeholders of the concepts of sustainability, justice or equity, and SDGs; (2) to support the BRs' management in implementing the SDGs through concrete

recommendations and applied research questions; (3) to promote scientific discourses about issues relevant for the further development of the BR concept and of BRs in practice.

The research was conducted over a period of three years (2018–2020). In the first step, the current or very recent situation, discussions and developments of BRs in DACH were assessed. In preparation for a book (*Biosphere 4.0*, Borsdorf et al. 2020), an open call was launched for contributions from academics, BR managers, planners and consultants that looked at and analysed the current status of BRs. The call resulted in 18 scientific articles, all of which underwent a double-blind peer review. Hence, these articles constitute an important information basis, highlighting different aspects, questions and research results.

In the second phase, the articles were subjected to a meta-analysis. First, we screened all articles and developed the research questions given above, deriving them from the existing literature and the 18 new articles. These questions were used for a qualitative survey that was implemented online using *Survey monkey*. Thirty-three quite diverse contributing authors were involved in the inquiry as well as in the interpretation of the results (Table 1). The results were condensed to hypotheses, which were refined in a joint virtual workshop (8 September 2020). The discussion was conducted in the program Miro, using a virtual whiteboard in connection with Zoom technology, and led to the revised and finalized results as presented in this article.

Results: BRs in the DACH region

Overview of recent research findings in the DACH region

In a comprehensive scientific analysis, Borsdorf et al. (2020) investigate the current state of BRs in the region; together with authors from the three DACH countries, they draw a picture of a *Biosphere 4.0* – a potentially new generation of BRs (for more information, see Supplementary Table 1).

Past (P1): What are significant milestones in the historical development of BRs in the DACH region?

Based on Bridgewater (2016), Hadley (2006) and Job et al. (2019), Braun et al. (2020) identified *phases* in the development of the BR concept and in establishing BRs. The historical development of BR territories in Austria, Germany and Switzerland illustrates and underlines how international policies and repeated paradigm-shifts had a visible impact *on the ground* (see Köck & Arnberger 2017; Weixlbaumer et al. 2020). The fact that changed and new policies are having an effect suggests that the BRs in the DACH region are not simply sites of learning for sustainable practices, but are indeed themselves also learning systems that respond flexibly to new developments and findings.



Figure 4 – Sustainable Development Goals. A global orientation towards sustainability (United Nations 2015).

However, it can take many years before just some of the conceptual and strategic considerations find their realization in regional management plans. One reason is that participative processes to define targets require time, and management plans usually cover a period of 10 years. Although minor adjustments to new policies can be implemented continuously, major amendments may be realized only in later management plans.

Past (P2): What significant developments have been initiated by the BRs in the DACH region?

The Seville Strategy introduced the three connected functions of BRs: conservation, development and logistical support. These functions are intended to facilitate the protection of valuable natural and cultural landscapes while also meeting the requirements of the people living in those landscapes (Köck & Arnberger 2017; Braun et al. 2020). The conservation function contributes to maintaining and enhancing biodiversity within the three zones of the BRs. DACH BRs generally aim to implement integrative concepts that take into consideration *classic* nature conservation as well as economic, social and other ecological interests. However, the conservation function takes a back seat to economic development. More emphasis should be placed on living in harmony with nature, i.e. preserving diversity as the basis for sustainable development. The development function contributes to the creation of greater added value for the region (e.g. through value chains, cooperation, regional products and services), while at the same time maintaining and enhancing biological diversity, landscape qualities, and social and cultural aspects, thus ensuring sustainable regional development. Within the support function, the importance of democratic processes, participation and acceptance at regional level should be strengthened; the importance given to science and research should be enhanced; access by (peripheral) regions to scien-

tific knowledge and institutions should be improved, and education for sustainable development should be promoted. A selection of the numerous ways in which the three functions are implemented in the BRs of the DACH region are presented in Supplementary Table 1. The variety of the examples corresponds to the diversity of the BRs and represents the respective regions well, but each BR must also set its own priorities taking into account the limits on its own resources (money, personnel, etc.). However, the DACH BRs should contribute their expertise more strongly to the WNBR. In order to do justice to new developments, further focal points should also be set, such as population decline, demographic change, migration, mobility and sub-urbanization.

The situation today (T1): What are the special features and characteristics of BRs in the DACH region?

Germany, Austria and Switzerland are federal states in which land ownership, political stability and decentralized decision-making are of great importance. Democracy and the rule of law play an essential role. The BRs in these countries are characterized by comprehensive, very diverse and regionally different participatory possibilities. This is visible in the diversity of organizational forms and legal implementation. Supporting structures are, for example, public administration entities (municipal, regional), associations, companies (mostly non-profit), foundations, or other specific legal entities. This diversity translates into a wide range of roles as regards (semi-)governmental authority, and also very diverse numbers of staff.

Nevertheless, the binding quality criteria of the Austrian and German MAB national committees and of the Swiss Federal Office for the Environment allow for implementation in accordance with international standards. The national quality stan-

dards were developed in comprehensive processes (Lange 2005; Deutsches MAB-Nationalkomitee 2007; Österreichisches MAB-Nationalkomitee 2016, 2017, 2018) and are an essential element of quality assurance in federal states that have many decentralized tasks and actors. Most of the BRs in the DACH region comply with the zoning requirements laid out in the Seville strategy. The three BRs on the Wadden Sea, however, all created since Seville, have yet to finalize their zoning and are currently trying to expand beyond the existing national park boundaries. They will then be evaluated for recognition by UNESCO in 2022 with the new perimeters; their merger into a single Wadden Sea BR is also on the cards in the longer term. In this context, it is worth mentioning that Austria has removed four BRs from the list because they did not meet the Seville criteria. National and international networking are taken seriously. Striking a balance between protection and use is always aimed for. The high standards with regard to innovation raise a number of fundamental questions, such as how innovative a BR must be, how to measure innovative strength, and how a BR as an intermediary institution can drive both structural and entrepreneurial innovation.

The situation today (T2): What are the particular strengths and weaknesses of BRs in the DACH region?

Among the particular strengths of BRs in the DACH region are the well-established participative processes (e.g. stakeholder involvement regarding BR designation and evaluation, and in drawing up management plans), democratic legitimacy, political support, the legal status of BR conferred by nature conservation laws, and cooperation between institutions (regional, national and international networking). Most BRs are regionally well anchored, local people express high acceptance of the BR in their area (von Lindern et al. 2020), and most BRs offer a wide range of sustainable development instruments and projects, particularly for peripheral regions. Thanks to the BR managements, projects and initiatives are mostly well conceived, initiated, implemented and supported. The BRs use their potential to develop into regions for real innovation and experiment. Those in DACH comprise very different types of landscape; most of them are extensive, traditionally used, cultural landscapes (Braun et al. 2020) and have high-quality standards oriented towards international developments and steered by the MAB national committees based on MAB's quality criteria. The BRs have a high degree of credibility because in the DACH countries some BRs have already been withdrawn voluntarily from the WNBR for no longer complying with current aims and criteria.

Furthermore, there are many examples of excellent visitor and environmental education offers. Awareness of sustainability topics is increasing and is generally well established among stakeholders and inhabitants of the BRs (von Lindern et al. 2020). The BRs have

developed good skills in initiating projects and in helping to support them both financially and in terms of human resources, even managing and implementing some projects themselves. In general, they also offer good opportunities for research and actively seek cooperation with scientific institutions. Marketing of BRs and the communication of sustainability topics are well established in most BRs. All BRs put a great deal of effort into monitoring their own activities. In Austria, the MAB National Committee offers funding for research projects, which are carefully approved in advance through an international peer-review process. A similar process is in place in Germany. The MAB National Committee in Austria has published several books. These include publications on local cuisine in BRs (Köck & Umhack 2011); on international examples (both good and less commendable ones) of mountain BRs (Austrian MAB Committee 2011); and a monograph on Chilean BRs (Moreira-Muñoz & Borsdorf 2014). The history of the journal *eco.mont* goes back to a joint initiative between the International Scientific Committee on Research in the Alps (ISCAR) and the network of alpine protected areas ALPARC, both of which are connected to the MAB programme.

The weaknesses of the BRs are partly due to the broad integration of the various interests and institutions at different regional levels (federal government, regional and local administrations), because of the federal structures of the DACH countries. The coordination of the different levels is time-consuming, and decision-making processes sometimes take a considerable time. For regional development initiatives to be truly sustainable, BRs need the active involvement of local stakeholders, businesses and the general population. Where this is lacking, there are significant deficits in implementation. It is typical of intensive participative processes that they require time and resources for all stakeholders' opinions to be discussed. Poorly prepared participation processes would cause considerable difficulties. This is why setting up new BRs involves enormous effort and resources. In view of the diversity of their tasks, BRs often see themselves as being under-resourced and lacking in political support compared to other protected area categories, such as national parks. Some workshop participants in our study argued that the transformative potential of BRs is not being used to the full at the political level.

Numerous specific weaknesses and opportunities for improvement can be identified in individual BRs and countries, or in relation to specific questions (e.g., insufficient financing instruments due to a lack of treaties between federal state and provinces in Austria; some German BRs see the term *Reservat* as a barrier, etc.). Overall, BRs in the DACH countries are well on their way to fulfilling the aims of BRs, but this must be continued and intensified in order to respond to the urgent ecological challenges as well as economic and social interests. Special attention should continue to be paid to the development of urban and cross-border

BRs. A successful example of the latter is the Franco-German BR Pfälzerwald-Nordvogesen.

Future (F1): What are the burning issues for the future of BRs in the DACH region?

The original intention to integrate man and biosphere within the management of BRs and to find a continuous balance between protection and uses has not changed. Both the number of questions raised and their complexity have increased significantly. In addition, very different questions have arisen in individual areas as a result of BRs' diverse ecological, economic and social conditions. The burning issues need to be dealt with individually, but a meta-methodology is needed to make the results generalizable and transferable. If a BR does not succeed in setting appropriate priorities and structuring goals and activities, or in attracting additional funding, there is always the risk of overburdening and overstressing the BR concept locally.

Future (F2): To which societal questions should BRs in the DACH region contribute in a special way for the future?

The BRs claim to take up social discourses in a comprehensive way and to contribute to solutions. They integrate major social issues such as migration, integration, inclusion, global change (in particular climate change), digitization, justice or equity, and mobility, as well as adequate performance, the post-growth economy, innovation and ecosystem services, and place them in their respective regional contexts. However, sustainability remains the central generic term. But these issues can only be addressed in reliable partnerships and in cooperation with the local populations and their interests. To avoid arbitrariness of the topics or overburdening BRs' managements and stakeholders, the BRs should develop individual future agendas that are complementary to each other at national and international levels, without losing sight of the three core BR functions. Scientific research will remain a key success factor to support transformation processes of BRs in the future (Scheurer 2020).

Discussion and conclusion

With their commitment to further developing BRs into model regions for implementing sustainability goals, BR managements face new challenges. BRs are well placed to continue spreading the idea of sustainable development in all regional fields of activity – and this they must do if they are to continue to fulfil their mission of being spaces of innovation for nature conservation, since they are explicitly supposed to integrate protection and use. This also means taking up the more recent discussions on, for example, environmentally friendly forms of mobility and lifestyle and, together with other actors, assuming a pioneering role in their regions.

There is a danger that BRs addressing sustainable development in the sense of *all* SDGs will overstretch themselves and dissipate their portfolios, leading to them becoming management bodies for all concerns related to sustainable development. This would be an impossible task and must not be allowed to happen. Nevertheless, BRs must give more thought to how they can take up the SDGs and what priorities they want to set against the background of the SDGs. Additionally, the framework of the Madrid Action Plan for BRs states that “*The role of biosphere reserves is essential to rapidly seek and test solutions to the challenges of climate change as well as monitor the changes as part of a global network. [...] [B]iosphere reserves can be areas for demonstrating adaptation measures for natural and human systems, assisting the development of resilience strategies and practices.*” In summary, the basic mission of a BR is nature conservation and biodiversity preservation, and how to anchor these in the region through regional climate protection measures, while addressing questions of mobility, lifestyle and livelihood, so that social and economic added value is also created.

BRs in Germany, Austria and Switzerland have sufficient experience in integrating nature conservation and preservation of biodiversity into regional resource-use and regional development. Thanks to their participatory procedures, mostly long-term cooperation with local actors, and relatively high acceptance among the population, they are well equipped to take up other topics in the 2030 Agenda with actors and to initiate appropriate projects, if political support can be increased. Within the network of BRs in the DACH region, only Germany has as many as 90% of its landscape biomes covered by BRs (Job et al. 2019). The representation of a sub-urban BR has so far been achieved only by Austria, with the BR Wienerwald. The aims throughout the DACH region should be to represent all landscape and cultural areas, and therefore to create further BRs.

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Potential and challenges of the Serengeti-Ngorongoro Biosphere Reserve, Tanzania

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Keywords: biosphere reserve, human-wildlife conflicts, park-people relations, Serengeti-Ngorongoro, Sub-Saharan Africa

Abstract

This article examines whether the Serengeti-Ngorongoro Biosphere Reserve, Tanzania, is successfully mitigating the immense challenges that rising population density and growing land-use pressure, as well as climate change and tourism, pose to vulnerable biodiversity hotspots, such as ancient Afromontane forests. The biosphere reserve's management approach to ecological and socio-cultural heritage was analysed using the Global-Local Drivers of Change model as a theoretical basis, together with The Economics of Ecosystems and Biodiversity (TEEB) analysis framework. This empirical study of a relatively old Sub-Saharan African biosphere reserve (established in 1981) used a qualitative research approach, where data was collected from focus groups living in the reserve, and semi-structured interviews with Ngorongoro Conservation Area officials and other main stakeholders. Results show that the management focus on environmental conservation over socio-cultural heritage has led to population growth, cultural change and landscape transformation, leading to human-wildlife conflicts and negative park-people relationships. It is concluded that this biosphere reserve needs to better exploit its vast potential and adjust its institutional structure and operational strategies to align with modern Other Effective Area-Based Conservation Methods.

Profile

Protected area

Serengeti-Ngorongoro

Biosphere Reserve

Country

Tanzania

Introduction

Africa has two biosphere reserve (BR) networks: ArabMAB with 33 BRs in 12 states, and AfriMAB with 85 BRs in 31 Sub-Saharan countries (UNESCO 2020). Fourteen African countries do not currently have any BRs. BRs can generally be divided into those established before 1995, and those founded after 1995 (the year of the Seville strategy) when UNESCO BR priorities changed to a mandated three-zone approach. In the AfriMAB network, there are 38 mountainous BRs, 17 of which include Afromontane forests. These forests occur above 1500 m and are rich in endemic biodiversity as they pre-date the formation of the African Rift Valley and the aridification of East Africa (Grimshaw 2001), making them global biodiversity hotspots (Newmark 2002). Geographically they occur from the Ethiopian Highlands in the north, down along the mountains bordering the East African Rift, to South Africa (Figure 1).

These forests contain a rich biodiversity and provide vital ecosystem services, such as watershed protection, substantial carbon sinks, cultural sites and international tourist attractions. However, the forests are threatened by the high population growth of resource-dependent communities (Abiem et al. 2020) who exploit them for agriculture and pasture (Price et al. 2011). The promotion of sustainable development and environmental conservation is therefore crucial (Botha 2020). The three-zone post-Seville BR approach is seen as an ideal solution (Job et al. 2019), where each zone (core, buffer and transition)

has a specific role in landscape-scale conservation. The buffer and transition zones are driven by local grassroots development based on the UN's sustainable development goals for 2030 (Carius & Job 2019). BRs that are actively following this approach are in line with the contemporary global conservation concept of Other Effective Area-Based Conservation Methods (OECMs) (IUCN-WCPA 2019).

This study aims to determine whether the Serengeti-Ngorongoro Biosphere Reserve (SNBR) is mitigating the challenges that the Afromontane forests face, by examining its conservation efforts, and its management of the local ecological and socio-cultural heritage. The findings for SNBR will be compared to two other Afromontane forest BRs, namely Kruger to Canyons (K2C) and Kafa, as they share key characteristics such as high population growth and consequent forest exploitation, as well as high tourism potential. Like SNBR, the K2C BR (South Africa) has a highly popular tourism destination (Kruger National Park) as its core, while the inhabitants of Kafa BR (Ethiopia) live in more traditional communities that, like the Maasai communities in SNBR, are heavily reliant on natural resources for their livelihood.

The first objective of this paper is to analyse park-people relations in SNBR to determine the protected areas' (PAs) potentials and challenges. The second objective is to compare these dynamics to the situations in the above-mentioned Afromontane forest BRs, to determine the potential efficacy of SNBR governance strategies in mitigating these challenges.

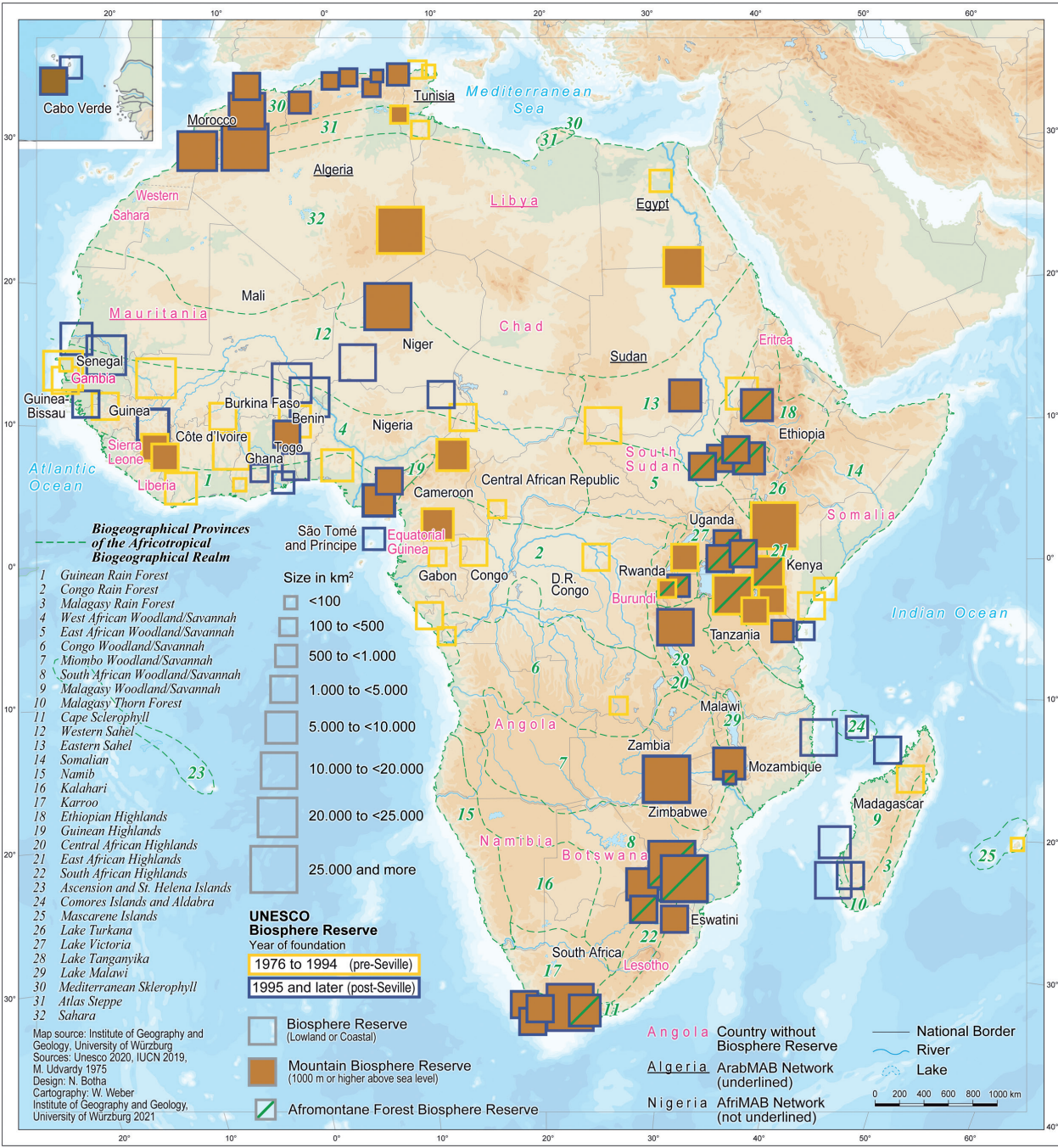


Figure 1 – African BR classifications and location of mountain BRs with Afromontane Forests.

Theoretical approach

The Global-Local Drivers of Change model (Becken & Job 2014) is used in this study, in conjunction with TEEB analysis framework. The change model identifies influences and challenges in SNBR and argues on two spatial levels (Figure 2). The first level has four external global-scale drivers of change (population development, land-use, climate change and energy use). On the second level, these drivers interact with four local-scale dimensions (conservation, community, tourism, and meaning of landscape), which both influence and are influenced by the PA.

These eight aspects of the Global-Local Drivers of Change framework were investigated from the perspective of the Ngorongoro Conservation Area (NCA) community and management authority; they were also observed directly by the researchers.

The current state of each aspect, the changes each has undergone, and the contributions each makes to the NCA system were explored using TEEB analysis framework. TEEB has four components, each of which was investigated in relation to each aspect of the Global-Local Drivers of Change framework. These four aspects are: *impacts*, which are the contributions of the ecosystem to human wellbeing; *outcomes*, or changes

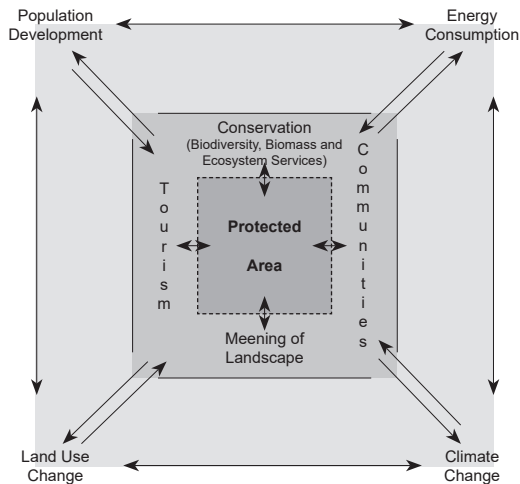


Figure 2 – Global-Local Drivers of Change framework (Source: Becken & Job 2014).

in all capital bases, which include cultural capital such as traditions, religion, knowledge and social institutions that influence the local community; *flows*, which are defined as visible and invisible value chains; and *stocks*, which are the capital base for production (TEEB 2021). Together, these two frameworks were used to create research materials and enable the analysis and discussion of the data obtained. The approach enabled questions relating to SNBR's management approach to ecological and socio-cultural heritage to be answered.

Methodology

This empirical study follows a qualitative research approach that focuses on SNBR as a case study. Data was collected from resident Maasai and park staff in NCA, using a set of open questions, during a six-week field study in summer 2018. The observation research technique was used to collect supplementary evidence for the biological, economic and social infrastructure conditions in NCA that determine park-people relations. Additionally, official documents were analysed.

A total of 104 participants from eight wards were involved in focus group discussions. (The ward is the lowest-level government administrative structure within the conservation area.) Participants were randomly selected concerning age and gender. Open questions were used to guide the discussions. A focus group was held in each ward. The groups ideally comprised men, women and young people, but in Misigyo, Ngorongoro, Endulen and Nainokanoka, full participation of local women and young people was not possible, due to cultural barriers (Figure 3). For instance, Maasai woman cannot participate in meetings where men are present; even if they attend, they will not contribute. In meetings where older men (especially leaders) were present, young men seldom contributed to discussions.

The Tanzanian Village Land Act of 1999 governs land management and administration in villages and

hamlets in rural areas outside NCA. NCA is a legally declared PA; the mandate of the land is bestowed on the NCA Authority.

The following procedures were carried out in order to conform to ethical research requirements:

- participants were assured of their anonymity and the confidentiality of the information they would provide;
- informed consent was obtained from respondents, especially for the methods that were used to collect data, such as recording;
- permits and letters of introduction from NCA and village offices were obtained;
- appointments were planned and booked in advance; participants registered with village offices and NCA upon arrival.

Seven semi-structured expert interviews were conducted with: a Pastoral Council member, the chief conservator, and NCA staff members who were responsible for resource protection (3 individuals), tourism, ecology, community, and cultural heritage. All interviews were recorded, but due to challenges relating to the area's remoteness, some recordings needed to be supplemented with written notes. The data were transcribed, coded and grouped for interpretation. A deductive coding style with pre-determined themes and categories was employed, which guided the analysis. The themes were organized in MS Excel according to the eight categories of the Global-Local Drivers of Change framework. The findings were then analysed and compared to those from similar Afromontane forest BRs, to determine whether SNBR is successfully mitigating the challenges, and whether there is potential to improve mitigation further in order to better attain the goals of OECM.

Case study

NCA is a multi-designated PA; it is internationally recognized as a World Heritage site (1979/2010), a UNESCO BR (1981), and a Global Geopark (2018) (but each with different perimeters), thanks to its diverse and unique natural features. Because of these features, it is a popular tourist destination, with a tourism income of US\$ 63 million in 2019, which was 11% higher than in 2018 (NCAA 2020). Its most famous attraction is the Ngorongoro Crater (264 km²), which is the main source of income of the NCA district administration. SNBR was chosen for a case study because the BR's historical context creates environmental and socio-economic problems (Larsen et al. 2020). SNBR is one of Tanzania's five BRs (which together cover 92 568 km², roughly 10% of the country). The national MAB committee would like to add five more BRs (Bell et al. 2013). The SNBR itself covers 23 051 km², and the volcanic massifs, which include the Ngorongoro Crater, reach an altitude of 3 587 m (UNESCO 2019a). The core zone of the SNBR, the

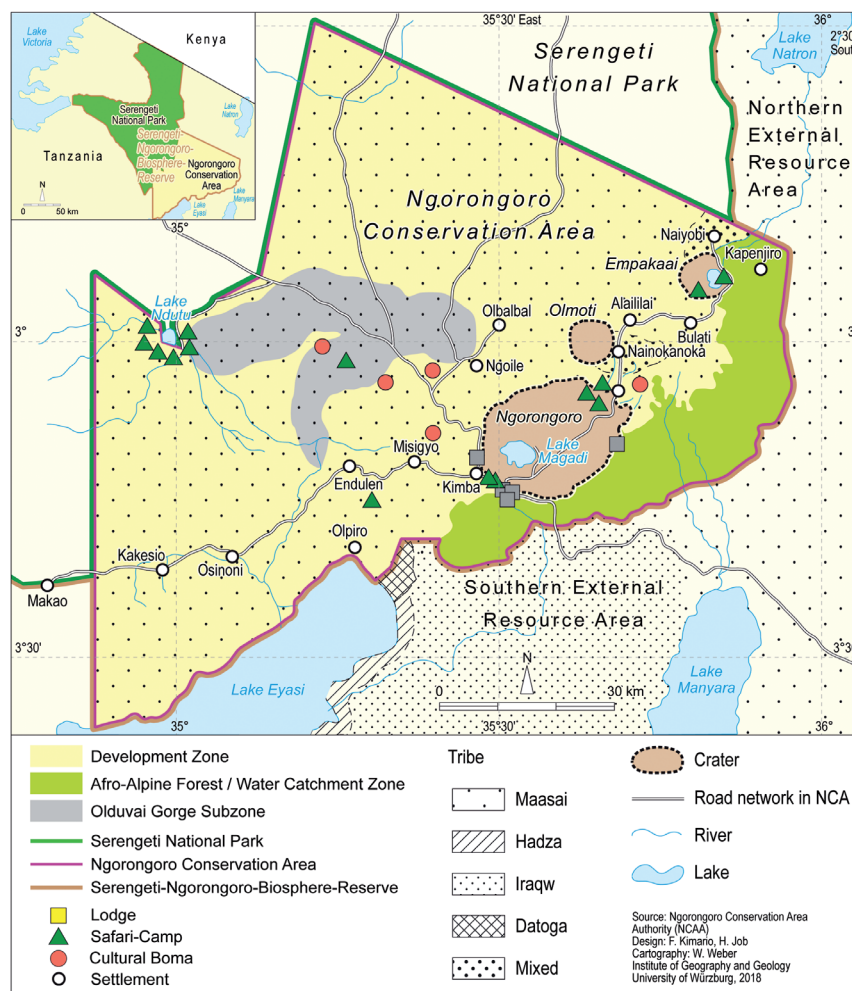


Figure 3 – Serengeti-Ngorongoro Biosphere Reserve including Ngorongoro Conservation Area and Serengeti National Park (Kimario et al. 2020).

Serengeti National Park (NP), was founded in 1951 by the British colonial administration. The Ngorongoro Conservation Area was part of this NP until 1958, when the two PAs were separated (Figure 3), and the Maasai were relocated from their indigenous semi-arid grazing land in the Serengeti NP to the Ngorongoro Conservation Area (Job & Schmid 2011).

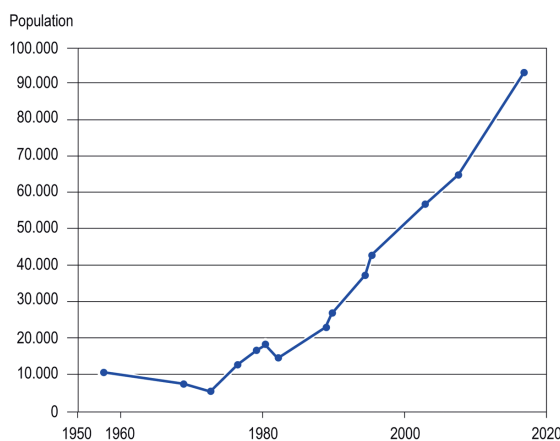


Figure 4 – Population trend of Ngorongoro Conservation Area (1954–2017) (URT 2017).

The newly formed NCA intended to allow a maximum of 20,000 herders to continue their traditional pastoral lifestyle on the fertile soil, formed of young volcanic ash. This healthier environment together with the cultural practice of polygamy resulted in a 4% annual population growth (Figure 4). The latest census (URT 2017) indicated that 50% of the population was under 14 years of age, and that only 36% of people over the age of 5 was literate. (Pre-primary education focusing on numeracy and literacy starts at the age of 4 (Mbise 1996)). Livestock is a key component of Maasai culture (Merker 1904), and while livestock numbers have increased, the livestock-human ratio has fallen (from 2.4 livestock units per inhabitant in 1994, to 2.0 units today). This ratio decrease can be attributed to epidemics and droughts that reduced the quality of the grazing (Kimario & Job 2021).

Results

The results of the focus group discussions, semi-structured expert interviews, and observations on SNBR's management approach to ecological and socio-cultural heritage are organized and discussed in

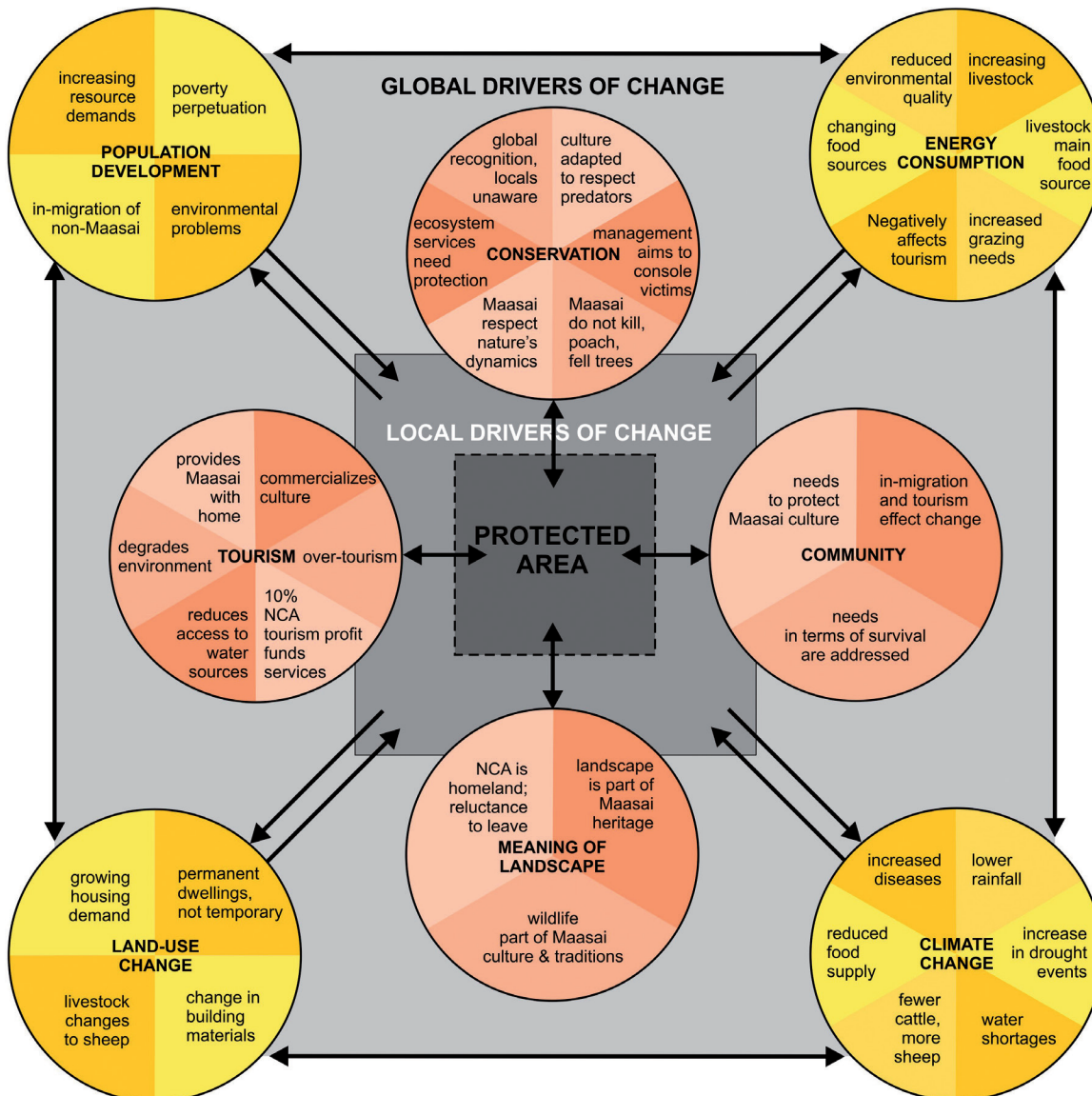


Figure 5 – Summary of NCA's role in the Global-Local Drivers of Change framework. Source: own design after Becken & Job 2014.

terms of the categories of the Global-Local Drivers of Change (Figure 5).

Global drivers of change

Population development

The steep population growth rate of both the Maasai and their livestock since their relocation is straining resources within the boundaries of NCA. Increasing demands for land, natural resources, social services and infrastructure compete directly with the ecosystem and its biodiversity; for example, over-population of people and livestock around water sources has given rise to as yet unidentified water-borne diseases in people, which also infect wildlife. The communities living in NCA largely depend on NCA to provide schools, health centres, roads, water, and livestock extension services (e.g. veterinary and nutritional services, training in animal husbandry, knowledge-

sharing), which NCA's management is not always able to supply. This deficit contributes to poverty through, for example, the low literacy rate caused by a lack of educational services.

These resource constraints are amplified by the in-migration of non-Maasai cultures attracted by the perceived social and environmental opportunities in NCA. The migrants, mostly Arushas and Merus, have a detrimental effect on the traditionally sustainable culture of the Maasai. For example, the semi-nomadic Maasai who survived on the meat, milk and blood of their cattle and goats now, influenced by the migrants, also keep sheep and practise small-scale agriculture. This is against the rules of NCA, as both these practices inevitably degrade the landscape, which in turn affects not only the Maasai's traditional grazing lands, but also tourism within NCA. As a solution, the management proposed a project that encourages community members who no longer wish to pursue the tra-

ditional Maasai way of life to live outside NCA. The idea was to buy land and build infrastructure outside NCA, at no cost to the community, but this proposal was rejected by most community members.

Energy consumption

Within the traditional context of SNBR, energy consumption refers to the flow and use of consumable natural resources. The natural environment of NCA provides its inhabitants with firewood, food and grazing for their cattle and goats, thus supporting the Maasai's traditional livestock rearing, which is their main socio-economic activity. Livestock is an important source of food and material for the Maasai, as well as a symbol of wealth and a source of pride. It is therefore understandable that as the Maasai population expanded, so did the livestock population, which has become problematic. The grazing rate has become unsustainable and is now having a negative effect on ecological systems and tourism. This led to a ban on livestock entering the Ngorongoro Crater, which is one of a few permanent sources of water.

Be it through climate change or cultural influences and increased demand for food, the diet of NCA's communities has changed. For example, foods prohibited within Maasai culture, including fish and chicken, are now commonly consumed. This cultural shift affects the natural resources needed by the community; some communities now grow potatoes, beans and maize, which requires agricultural land and permanent settlement. This is illegal within NCA, which aims to conserve the natural landscape as well as Maasai culture.

Land-use change

The growing population, their increased food demand and their changing cultural practices all contribute to landscape change. This larger population moves into once uninhabited areas to build houses. Furthermore, when the Maasai leave their semi-nomadic lifestyle, they need more permanent structures when they settle. Small, once separate villages around NCA are now merging. Traditional materials like grass, soil and dung are being replaced with bricks, cement and iron sheets. This negatively affects the natural landscape and contradicts the principles of NCA. The cultural shift is seen also in the types of livestock being raised and their impact on the environment: the focus group discussions revealed that sheep have become an important type of livestock, but their introduction has led to overgrazing, invasive and unpalatable vegetation, and soil erosion.

Climate change

Changes to NCA's climate include lower rainfall and increased drought events; water shortages threaten the communities' food supply to such an extent that subsidized cereals need to be provided twice a year. In reaction to the drought, communities keep fewer cattle

and goats as they have high water and grazing requirements. Sheep are now preferred because they are more drought tolerant.

An increase in drought-related diseases affects humans and livestock alike. NCA lost around 7400 head of cattle from unknown diseases during 2017. As one focus group participant recalled: *"It was during the dry season, but some cows even died at the water ponds. So, we cannot say they died because of drought."*

Local drivers of change

Community

Although NCA supports communities living within it, it is also partly responsible for cultural changes caused by the relocation of the Maasai in 1959. The in-migration of other cultures into SNBR and increasing contact with tourists and their cultures are changing traditional Maasai culture. This is evident in the types of clothing that the Maasai wear, the use of mobile phones, and the changing behaviour of young people, who now tend to gather around shopping centres, play cards or pool, and consume alcohol. The community asked NCA's management to address these issues by promoting and protecting the cultural practices of the Maasai through education and awareness-raising.

NCA's purpose has always been to improve environmental conservation and tourism. Social issues have not received the same level of attention, causing tension between NCA's management and local communities. The community feels that they support the NCA concept, but that the management neglects them: *"There is no rural environmental appraisal involving the local community, yet the indigenous culture promotes the existence of Ngorongoro Conservation Area"* was one statement we heard.

NCA's management does, however, have several departments that care for the community and their wellbeing. The Community Development Department addresses issues relating to food security, veterinary services, infrastructure and livestock. This is a much-needed service in light of the increased incidences of the transmission of diseases between livestock and wildlife. A prominent recent concern has been water shortages: the permanent water sources in NCA are within fragile ecosystems, and community access is therefore restricted. Dams and ponds were consequently constructed for water collection during the wet season.

Tourism

Tourism within NCA is a double-edged sword. On the one hand, it provides the Maasai with extra income through small-scale businesses, tourism activities, and employment at lodges. Tourism further benefits the community, as 10% of NCA's annual tourism income is used to fund community services, such as health-care. On the other hand, tourism has had detrimental



Figure 6 – Over-tourism in the Ngorongoro Crater (Kimario 2018).

tal effects on the environment and the culture of the Maasai. The Ngorongoro Crater is biophysically sensitive, and if the number of tourists and associated tourist activities exceed the acceptable limits, its natural beauty and biodiversity are threatened. Communities are wary of increasing tourism development, as waste disposal, access roads, water infrastructure and loss of land to lodges degrade the environmental quality of the PA (Figure 6). Culturally, tourism commercializes traditional Maasai practices: they entertain tourists at cultural *bomas* by singing and dancing for a fee, and by selling traditional beadwork, ornaments and carvings as souvenirs. These activities are staged and lack the authenticity of true Maasai cultural practices.

Meanings of the landscape

The landscape of NCA has different meanings for different stakeholders: for NCA's management, it is a source of tourism revenue; for tourists, it is the backdrop of their wildlife experience; but for the Maasai, it is part of their heritage. For them, the landscape is a source of materials, food and medicine, and contributes to their traditions. For example, honey collected from the forest is used in *Engotooroki*, a ceremonial brew. The Maasai accept the landscape and the wildlife it contains as part of their culture. The killing and consumption of wild meat are prohibited, and gazelles and buffaloes are allowed to graze next to cattle. As one participant stated: *"They feed together, and if a cow gets lost, you can find it in a group of zebras."* The livestock also experience attacks by predators, but the Maasai also accept this: *"No Ngorongoro without lions, even if they are predators."*

Communities are modernizing, and during one focus group discussion it was suggested that if the park management wanted to relocate people to areas outside NCA, it is educated young people who should be moved. Some elders believe differently: *"If we are to move, then we should return to Serengeti and nowhere else."* The Maasai see themselves as an integral part of the landscape of NCA, and their sustainable culture has contributed to its international recognition as a World Heritage Site and UNESCO BR.

The Maasai focus group discussions revealed which aspects of daily life within NCA they perceived as positive, negative or neutral. The aspects they regarded as the most positive include tourism, traditions, culture and custodianship. The aspects that they perceived to be the most negative were livestock problems, access to water, benefit-sharing issues, problems of co-existence and strained relationships. Aspects that did not arouse any strong opinions were people, population, livelihood and the killing of animals.

Conservation

The Maasai, their culture, and especially their connection to the natural dynamics in the landscape are fundamental to NCA's success. As one respondent stated: *"In areas from where indigenous people were removed, there is no wildlife like [there is in] NCA."* Wild grazing animals are often found around the Maasai's pastoral homesteads alongside their livestock, because here the wild animals are protected from predators and have access to water. As confirmed by the focus groups, the Maasai are environmental custodians: they do not kill or poach wildlife, or cut down trees. (They are, however, allowed to use cut and fallen branches for their needs.) When they encounter outsiders illegally entering the area, they report them to the authorities.

Wildlife, however, does also pose a danger to this community, especially buffaloes and lions, which frequently injure or kill humans and livestock. Other noteworthy predators are leopards and hyenas. Local communities have learned to adapt to these threats, through the clothes they wear, weapons they carry, and knowledge of what should be done when they encounter certain wild animals. To support the communities, the reserve has a Protection Department that aims to reduce human-wildlife conflict and console its victims.

The Maasai have created a sustainable lifestyle, with productive lands that still contain biodiversity. It is therefore concerning that the culture of the communities living within NCA is changing. NCA's natural assets led to its international recognition as a UNESCO BR (1981), World Heritage Site (1979, extension 2010), and Global Geopark (2018), but when these designations were mentioned during focus group discussions, the community did not know of them. While these organizations praise NCA's conservation efforts, more work is needed, especially on the protection of ecosystem services that keep NCA healthy, such as its natural water-storage capacity.

Discussion

NCA tries to manage environmental concerns and the local communities' basic needs separately. To be in line with the OECM approach, these must be managed together with cultural factors as one holistic, integrated system (IUCN-WCPA 2019). This can be a challenge, especially where resources are scarce, but it is vital for the long-term sustainability of SNBR. More

Table 1 – Overview of Global-Local Drivers of Change in Serengeti-Ngorongoro Biosphere Reserve (SNBR), Kruger to Canyons Biosphere Reserve (K2C BR) and Kafa Biosphere Reserve (BR) (own compilation).

Global-Local Drivers of Change	SNBR	K2C BR	Kafa BR
The global drivers of change			
Population development	About 92,000 people live within the biosphere reserve's (BR's) 92 568 km ² ; 50% of the population are under 14 years of age, and most live in poverty.	About 1.5 million people live within the BR's 26 080 km ² ; 32% are under the age of 15; the unemployment rate is 41% (between ages 15 and 64).	About 608 000 people live in an area of 5 406 km ² . 44% of this population are aged under 14.
Energy consumption	Firewood, food, grazing	Firewood, food, grazing, 97% supplied with electricity	Food, grazing, traditional agriculture
Land-use change	Settlements, agriculture, grazing	Settlements, agriculture, grazing	Settlements, agriculture, grazing
Climate change	Lower rainfall, increase in droughts	Increased annual mean temperature and number of rainy days.	Predicted increase of 3°C and increase in number of rainy days.
The local drivers of change			
Community	Unmitigated cultural changes	Reconciliation between economic groups.	Traditional communities where 50 000 depend on sustainable wild coffee for their income.
Tourism	Income, service benefits, environmental and cultural degradation.	Income and benefits from the Kruger NP.	Starting to develop.
Meaning of landscape	Ancestral land and uses of natural resources for cultural practices.	Traditional livestock rearing and small-scale agriculture.	Traditional forest landscape deeply engrained in local culture, economy and history. People still live in traditional clay huts.
Conservation	Maasai are culturally custodians of nature. They did not know about the international designations.	The community is supportive of the conservation efforts in the BR.	The BR was established to promote sustainable development and stop the rapid deforestation of Ethiopia's Afromontane forests. The community supports the BR's initiatives.

importantly, the Tanzanian Wildlife Management Area which borders on SNBR has a comparatively new community-based conservation approach that may add value to the UNESCO BR approach (Kimario et al. 2020).

Our results suggest that three prominent drivers of change are insufficiently addressed within SNBR, namely population, culture, and climate. This is also the case in many other UNESCO sites worldwide (Job et al. 2017). First and most important in the short term, the increasing human and livestock populations are degrading NCA's natural areas and resources, because more space is used to build housing, and to produce food and grazing. As communities expand into natural habitats, more human-wildlife conflicts occur. Second, the Maasai's traditional sustainable culture is changing and becoming more resource-intensive. NCA management's neglect of social-cultural issues such as the in-migration of non-Maasai cultures, the commercialization of Maasai traditions and cultural goods, and the modernization of buildings, has contributed to this change. Third, cultural changes are accelerated by environmental stressors, such as climate change, which increase the incidence of waterborne diseases, and affect food security and access to water. According to Masao et al. (2015), a culture's perception of its place in the natural world, and its values and beliefs will change when the community's quality of life is threatened.

NCA's recognition for its *outstanding universal value* as a natural World Heritage site is most likely the reason

management priorities are skewed towards environmental conservation. However, by neglecting social issues such as over-population and cultural changes within NCA, both its environmental quality and its attractiveness as a tourism destination may be affected negatively. Furthermore, conservation priorities are inequitable: communities' access to the few permanent water sources is restricted because these are situated within fragile ecosystems and wildlife habitats, yet mass tourism (which places high demands on limited water resources) is allowed in these areas. Such injustices and inconsistencies damage the relationship between the Maasai and NCA's management, and ultimately encourage non-respect for regulations.

The communities living in BRs that include Afromontane forests are often impoverished, nature-dependent and over-populated (Mohammed 2020). Two BRs that have found ways to mitigate these challenges are the K2C BR (South Africa), a classified OECM, and Kafa BR (Ethiopia), a PA similar to SNBR (UNEP-WCMC & IUCN 2021).

The K2C BR (26 080 km²; population 1.5 million) was established in 2001, to reconcile the impoverished, natural resource dependent population, who practise pastoralism and small-scale agriculture (and have also been displaced with the expansion of the Kruger NP), with the more affluent game ranching communities (K2C 2020; UNESCO 2019b), see Table 1. This BR is managed by private citizens, and village and government representatives. The benefits from K2C's projects must be shared amongst a large population, where

32% are under the age of 15, and 41% of people aged 15–64 are unemployed (Municipalities 2021; Chidakel et al. 2020). The K2C has affected local communities' economic development only moderately through nature-based tourism, the creation of jobs in the Green Economy, and the support of local small businesses (Clifton 2018). BR communities are supportive of conservation initiatives, which is not always the case in villages outside the BR (Anthony 2007). Since K2C's establishment, the land cover has changed in the transition and buffer zones (the core has remained largely unchanged). The Afromontane forest in particular has been reduced in extent, as the increasing population cleared areas for settlements and agriculture (Coetzer-Hanack et al. 2016). The NP attracts more than one million tourists annually, which creates around 10 400 tourism jobs and directly contributes US\$ 150 million to the local economy (Chidakel et al. 2020; SANParks 2020). Natural attractions and tourism are, however, threatened by climate change, as the mean annual temperature and number of days of rain have already increased (Wilgen et al. 2013).

Kafa BR (5 406 km²; population 608 227) was established in 2010 (UNESCO 2020) to improve sustainable development and stop the rapid deforestation of Ethiopia's Afromontane forests, see Table 1. Forty years ago, forest covered 40% of Ethiopia; now, only 3% of the original forests remain, most of which can be found in Kafa (Berghöfer et al. 2013). While Kafa does not have an NP that attracts tourists to the area, it does have a strict no-access core area that conserves the original indigenous coffee tree, *Coffea arabica*, and its almost 5 000 variants. The region's deforestation is caused by the agricultural expansion (Mohammed 2020) of communities that still live in traditional huts and settlements scattered throughout the landscape. Livestock, which represents a family's wealth, is closely tied to the people's cultural heritage. The forest ecosystem provides the communities with food, firewood and grazing (NABU 2021), and is connected to their culture, economy and history. These communities are therefore a vital component in the BR's participatory forest management scheme, which allows local coffee farmers to collect and market wild coffee cherries. In return, they are responsible for the conservation of the forest. Reforestation is vital to combat climate change, as the temperature within Kafa is predicted to increase by 3°C accompanied by more days of rain (NABU 2013). Kafa's projects aim to find long-term socio-economic and environmental solutions through job creation, promoting carbon sequestration, and climate change mitigation (UNESCO 2017). Studies indicate that since the BR was established, communities feel more responsible for their forests and see the value of their protection. Today, some 50 000 people depend on income from wild coffee, and through the BR's activities Kafa has gained international recognition as a producer of high-quality coffee (Berghöfer et al. 2013).

This comparison brings to light two issues affecting SNBR's efficacy at local level: the absence of community involvement, and of consideration of their socio-cultural heritage in management objectives. Environmental custodianship (including protection of the Afromontane forests) is part of the Maasai's culture (Merker 1904), which sets SNBR apart from the other two BRs. Of the three BRs, SNBR is the oldest, and landscape change takes place right next to the sensitive, restricted water-catchment area of its Afromontane forest zone (Kimario & Job 2021). K2C BR and Kafa BR, established since 1995, have three explicit BR zones and focus on sustainable development. Landscape change mainly occurs in their transition and buffer zones, further away from the most vulnerable core (Coetzer-Hanack et al. 2016; Mohammed 2020). In SNBR, besides subsidizing cereals and building ponds and dams (which are a source of disease), little is done to find sustainable long-term solutions to climate change. While K2C and Kafa try to address sustainable development and socio-cultural heritage issues in their landscapes, SNBR, in order to attain OECM goals, still needs to update its conservation approach to improve its impact on both the natural and the cultural landscapes.

Conclusion

SNBR undoubtedly has the potential to align with the OECM goals: it has a traditional, sustainable community that has lived in harmony with the landscapes' ecosystem dynamics for centuries; it also has the matchless natural beauty and rich biodiversity of the Ngorongoro Crater and the Serengeti. Conservation management in NCA should be expanded to include ecosystem services and socio-cultural heritage. Maasai culture is threatened, and young people should therefore be educated to appreciate and protect their heritage. Community members not interested in following the Maasai way of life could be encouraged to relocate to outside NCA: they could still access their ancestral lands, but not deplete its limited natural resources through agriculture and overgrazing. While such measures would lead to a loss of landscape meaning and cause some to reject conservation in the future, the further loss of the Maasai way of life and the natural SNBR landscape would reduce its tourism appeal and increase poverty. Projects that provide long-term solutions to mitigate the impact of climate change should also be implemented. In support of these measures, SNBR's management could demarcate three clear zones following UNESCO's global BR aims, where community and tourist industry policies could be adapted for sustainable development, which should mitigate the negative impacts on natural processes. A sustainable compromise between strict conservation measures and the community's needs within SNBR might serve to create a basis for action.

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Towards inclusive environmental governance in the Arganeraie Biosphere Reserve, Morocco

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Keywords: *argan, social-ecological systems, natural protected areas, post-normal science, ethnography, stakeholder analysis, social learning*

Abstract

Arganeraie Biosphere Reserve (ABR) in Morocco was established in 1998. Today the reserve covers 2.5 million hectares and more than 3 million people and, as such, it has been a complex social-ecological system to govern. Authors draw on *post-normal* conservation science and environmental governance studies to investigate environmental governance processes within the ABR and shed light on their outcomes and challenges to date. First, authors analyse how Moroccan institutions are managing this vast territory. Second, we look at perceptions of an *extended peer community* of decision-makers. This research adds an empirical case study to the North African region and addresses two main weaknesses of UNESCO Biosphere Reserves worldwide: 1) effective governance and 2) shortcomings in their implementation. Through an ethnographic approach, we are able to point out how low strategic priority and a weak political will regarding the ABR may be hindering inclusive environmental governance. The authors suggest some key aspects for improving the existing governance system; various baseline needs and barriers that may be addressed in advance; a set of drivers, and several proposals for inclusive governance in the ABR. This study should prompt academia, policy- and decision-makers to identify and enhance synergies that allow for a shared vision of their territory.

Profile

Protected area

Arganeraie Biosphere

Reserve

Mountain range

High Atlas and Anti-

Atlas Mountains

Country

Morocco

Introduction

There is wide consensus pointing to the benefits for local populations of natural protected areas being run under co-management schemes (e.g. Berkes et al. 2003; Holmes 2008; Brunson 2012). However, the capacity of developing sound governance systems is key to the success of these initiatives. Ison and Wallis (2017) stress that inclusiveness in environmental governance is critical. Brunson (2012) states that best outcomes are dependent on societal values and interests and the capacity of governance systems to include them. In line with this, following Funtowicz and Ravetz (1993), many scholars argue for a post-normal conservation approach (Buschke et al. 2019; Rose 2018), embracing complexity, uncertainty and multiple knowledge systems (Holling 2001; Armitage et al. 2011; Tengö et al. 2014).

UNESCO Biosphere Reserves (BRs) are a good domain to test both the existing shortcomings and the main potential of inclusive environmental governance. UNESCO BRs are one of the best-suited institutionalized approaches to deal with this coupled nature-human interface (Batisse 1982; Coetzer et al. 2013). Conceptually, BRs have proven to be a sufficiently inclusive and adaptive model to conservation. When carefully implemented, BRs contribute to the sustainability paradigm shift towards integrating local populations and conservation (Borrini-Feyerabend et

al. 2013; Heinrup & Schultz 2017; Rose 2018). However, this is not always the case, and often a gap persists between what is stated and what actually happens (Ishwaran et al. 2008; Price et al. 2010; Coetzer et al. 2013).

Despite the lack of research in North Africa on this topic (UNESCO 2014; Blanco et al. 2020), shortcomings in the implementation of BRs, challenges for the conservation and management of BRs and other governance weaknesses have been noted in the specialized literature (Table 1) (IUCN 2015; Matar 2015).

Most of the weaknesses shown in Table 1 are visible in the case of Arganeraie Biosphere Reserve (ABR)¹. So, a deeper understanding of the causes and implications of both the actual governance and the implementation of more inclusive governance is of great relevance for the future of the ABR. This study examines both perceptions and practices that coexist in the ABR with regard to inclusive environmental governance (IEG), preceded by a comprehensive social analysis. The authors adopt the concept of inclusive governance employed by Ison and Wallis (2017) when framing environmental governance (as defined by Lemos & Agrawal 2006, p. 298). In particular, the authors stress the elements that facilitate the emergence of shared visions among stakeholders about the future of the ABR. Ethnographic methodologies were conducted.

¹ Réserve de Biosphère de l'Arganeraie (RBA)

Table 1 – Main weaknesses in the governance of North African Biosphere Reserves (BRs) reported in the specialized literature.

Arab Biosphere Reserves
Communication, cooperation, and collaboration
Involvement and participation of local communities
Capacity and resources (cross-functional)
Understanding and differentiation of the BR concept.
Evaluation of BR management
Integration and mainstreaming of the MAB program.
ArabMAB institutional gaps
Moroccan Biosphere Reserves
Lack of awareness and communication programmes. Insufficient capacity for programme development.
Absence of management and/or coordination structures dedicated to BRs.
Lack of coordination between BR managers, local decision-makers, local communities.
Weak integration of local populations into BR planning, management and valorisation activities.
Lack of mechanisms and processes to encourage local participation in management.
Difficulties in the interaction between management and research.
Inadequate legal framework
Lack of functionality of zoning with dimensions often incompatible with the criterion related to land use planning.
Management plans (if they exist) are developed for Protected Areas and do not reflect Man and the Biosphere (MAB) provisions for BRs.
Absence of functional MAB Committee (members are volunteers). Networking among BRs is almost non-existent
Appropriation of the provisions of the UNESCO MAB programme is difficult.

Methodology

Study area

The Arganeraie is a meridional forest ecosystem spanning 25 000 km² as a mosaic in south-western Morocco, primarily in the Souss Massa region (together with Essaouira province in the north-west and Guelmim in the south-west). The ABR was selected for its singularity and suitability to explore the issue of IEG in a biodiverse, but complex, social-ecological system designated by UNESCO as BR in North Africa in December 1998.

The ABR covers 2.5 million hectares identified as the distribution area of the argan forest and is home to over 3 million people (DREFLCD-SO 2018). It includes the city of Agadir (420 288 inhabitants) and other towns of more than 70 000 inhabitants (HCP 2014). The ABR is internationally recognized as a paradigmatic biocultural Moroccan heritage. In parallel with the designation of the Arganeraie as BR, high investments led to the production of argan oil (the Arganeraie's flagship product) becoming a boom sector (Michon et al. 2015). Yet the challenges and stakes of exploiting local resources for the benefit of local development showcased, early on, a high level of complexity and cross-scale contradiction.

The three main historical periods of the ABR are: 1) 1990–2005, design of the initial ABR project, nomination and first implementation stage; 2) 2006–2016, an intermediate period comprising the first periodic review; 3) 2017 to the present, second periodic review and current developments.

Data collection

To identify the key elements for the examination of current environmental governance and to promote IEG in the Arganeraie, an ethnographic approach was

implemented. It combines participant observation and interviews with key informants. This approach allowed an in-depth characterization of the coexisting values, worldviews, beliefs, and interests of the *extended peer community* of decision-makers interacting in the ABR (policymakers, managers, administration officers, scientists, regional authorities, practitioners, and NGOs). Following Beier et al. (2017), the fieldwork was designed to better understand the existing ABR multi-level governance and the multiple experiences, mindsets and interests playing a role in it.

The fieldwork, which was carried out between 2018–2019, was organized in the following steps: (1) presentation and validation of the research design with key local researchers and ABR decision-makers, followed by prospective open interviews (N = 20) with some of them; (2) in-depth semi-structured interviews (N = 42) with members of the *extended peer community*; and (3) participant observation transversal to previous meetings and interviews.

The ten research-design validation meetings in step one allowed us to consider an inclusive research design and to assess its relevance at the BR level while building trust with participants. This step guaranteed access to the 42 interviewees and high-quality information from interviews due to trust and inclusiveness. Prospective open interviews provided basic information about the ABR and its stakeholders.

All the interviews were conducted face-to-face in French and followed a flexible conversational approach (Moon et al. 2019). They lasted between 60 and 180 min and took place at the respondent's workplace or in a quiet public location. Interviews were audio-recorded and transcribed for analysis. The main topics discussed in the in-depth semi-structured interviews covered their understandings of a BR, the ABR management model and their perceptions of

Table 3 – *Arganeraie Biosphere Reserve (ARB) main actors' acronyms and full names.*

Key actor acronym	Full French name	Full English name
ABH-SM	Agence de Bassin Hydraulique Souss-Massa	Water Basin Agency of Souss-Massa
AESVT	Association d'Enseignants de Sciences de Vie et de la Terre	Association of Life and Earth Sciences Professors
Agriculture DRA-SM	Direction Régionale de l'Agriculture Souss-Massa	Regional Department of Agriculture, Ministry of Agriculture
ANDZOA	Agence Nationale de Développement des Zones des Oasis et de l'Arganier	National Agency for Development of Oasis Zones and the Arganeraie
Communes	Commune territoriale	Local administration
Conseil Régional SM	Conseil de la Région de Souss-Massa	Souss Massa Regional Council
Culture	Direction Régionale de la Culture	Regional Delegation of Culture
DRE-SM	Direction Régionale de l'Environnement Souss-Massa	Regional Department of the Environment, Ministry of Environment
Eaux-et-Forêts DLCDPN/DEF	Division des Parcs et Réserves naturelles. Haut-Commissariat aux Eaux et Forêts et de la Lutte Contre la Désertification (HCEFLCD)	Parks and Natural Reserves Division. Department of Water and Forest, Ministry of Agriculture
Eaux-et-Forêts DREFLCD-SO	Direction Régionale des Eaux et Forêts et de la Lutte Contre la Désertification Sud-Ouest	Regional Department of Water and Forest, South-West
Education CRDAPP	Centre Régional de Documentation, d'animation et de Production Pédagogique	Regional Centre for Documentation, Animation and Pedagogical Production, Ministry of Education
FIFARGANE	Fédération Interprofessionnelle de la Filière Argan	Inter-Professional Federation of the Argan Sector
GIZ	GIZ – Coopération allemande	GIZ – German Cooperation
IAV	Institute Agronomique et Vétérinaire	Agronomic and Veterinary Institute
INRA	Institut National de Recherche Agricole	National Institute of Agrarian Research
IRAT-SM	Inspection Régionale de l'Aménagement de Territoire Souss-Massa	Regional Inspection of Territorial Planning
MaB Maroc	MAB Comité au Maroc	Man and the Biosphere (MAB) Committee in Morocco
PNUD Maroc	PNUD Maroc	UNDP Morocco
Provinces	Province et préfecture	Intra-regional administration
RARBA	Réseau des Associations de la Réserve de Biosphère de l'Arganeraie.	Network of Associations of the Arganeraie Biosphere Reserve
RDTR	Réseau de Développement du Tourisme Rural Souss Massa	Souss Massa Rural Tourism Development Network
Tourism-e	Direction Régionale du Tourisme	Regional Delegation of Tourism
UIZ	Université Ibn Zohr	Ibn Zohr University
Wilaya	Wilaya d'Agadir Ida Outanane	Regional administration, Ministry of Interior

(Charmaz 2014), iteratively integrating both inductive and deductive approaches.

A comprehensive social analysis was conducted in two stages. First, through stakeholder identification and mapping (actor's map) using the relationship mapping software Kumu (Kumu 2020) and data collected from prospective interviews, the two last questions in Table 2 and field notes from participant observation. Second, through an in-depth analysis of the relationships of collaboration and/or conflict, legitimacy, interest and power (i.e. CLIP descriptors) existing among actors linked to the ABR; and measured following the CLIP methodology as described in (Chevalier & Buckles 2008) with data from participant observation and in-depth interviews.

The degree of centrality is a Kumu's Social Network Analysis metric, representing the total value of each actor's connections, that is, each actor's weighted number of connections with other actors regarding the ABR. Additionally, *key actors* here are those with a maximum degree of influence (on a 0/minimum – 6/maximum scale) regarding the ABR decision-making.

Results

Social analysis I. Stakeholder identification and mapping

To properly analyse what is happening in the ABR in terms of institutional environmental governance, the authors first analysed who has a say within the ABR (Reed et al. 2009) and who was included as an institutional actor in the ABR (Table 3). According to the sampling design, the set of participants' profiles adequately reflects the broader community of ABR institutional actors.

An initial institutional actors' map of the ABR (Figure 1) shows a simplified multi-scale diagnosis of the *extended peer community* of decision-makers, including their connections, degree of centrality to the network and actors' profiles. Results unveil how out of the 24 main actors identified in the ABR (Table 3), just seven reach a high level of centrality, and only eight may be considered *key actors*, which means that a big gap exists between the number of officially recognized institutional actors and their real implication and influence. Figure 1 reveals that 1) regional NGOs and other social actors are underrepresented; and 2) relevant regional and local institutional actors are absent in prac-

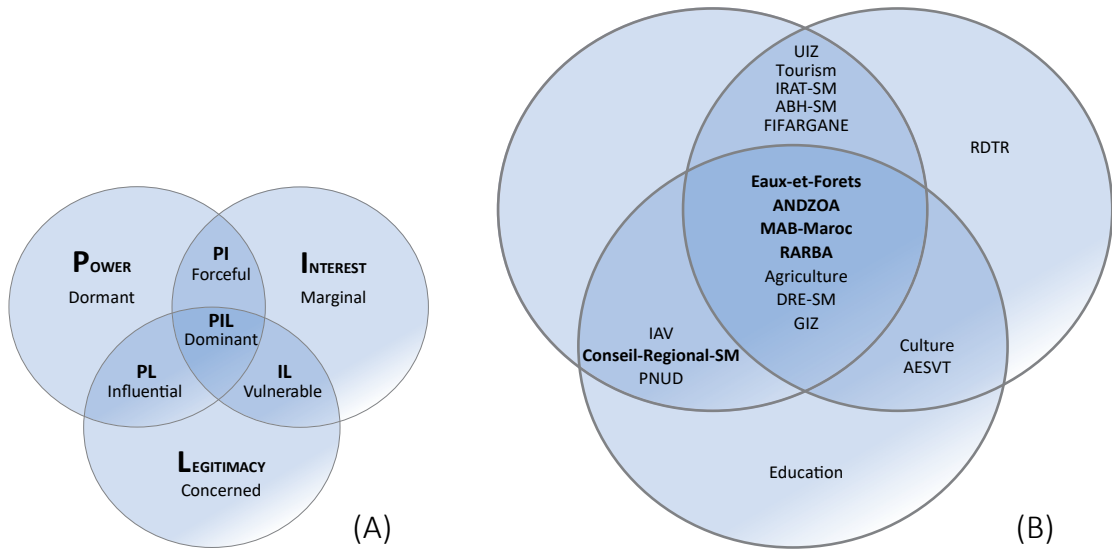


Figure 2 – (A) Venn diagram showing the relations between the various CLIP descriptors adapted from Chevalier Buckles (2008). (B) Venn diagram classifying the main Arganeraie Biosphere Reserve (ARB) institutional actors using the CLIP method. *For further detail on actors, see Table 3.

tice (i.e. provinces, communes, Wilaya), while others are dormant most of time (i.e. Conseil Regional, MaB Maroc, CRE-SM, Culture, Tourism).

Social analysis II. Power, interests, legitimacy, collaboration and conflict

To adequately describe and analyse the characteristics and relationships of the ABR institutional actors previously identified (see Figure 1), we characterized them according to their legitimacy, power, interests and relationships of collaboration and/or conflict (i.e. CLIP descriptors). Figure 2 illustrates the result of a comprehensive CLIP social analysis in which each CLIP descriptor has been divided into its component parts. The authors deemed it necessary and insightful,

given the complex and unclear governance scenario of the ABR.

Institutional management of the ABR. The theory-practice gap

An understanding of how Moroccan institutions perceive and manage the BR and the Arganeraie territory allowed us to explain why governance remains the biggest challenge in the ABR. Results based on prospective interviews and responses to the issue of institutional management (Table 2) indicate that, first, the structures in charge of the ABR are the same in charge of protected areas and state forests. Second, the National MAB Committee exists, but it is not functional enough (members are volunteers and far from the

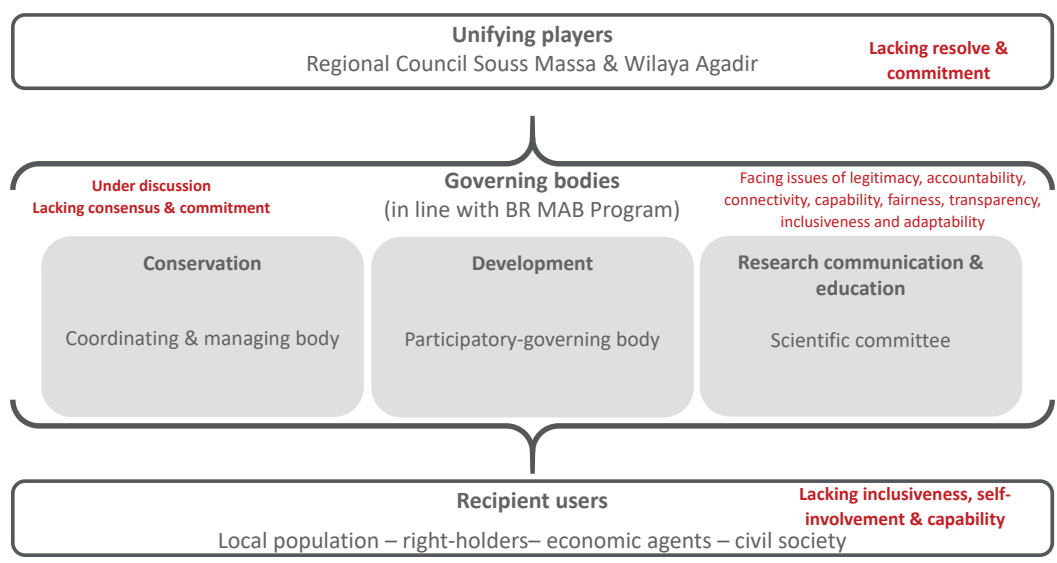


Figure 3 – Arganeraie Biosphere Reserve (ARB) official governing bodies and key stakeholders, featuring findings on their main current challenges regarding inclusive environmental governance (IEG).

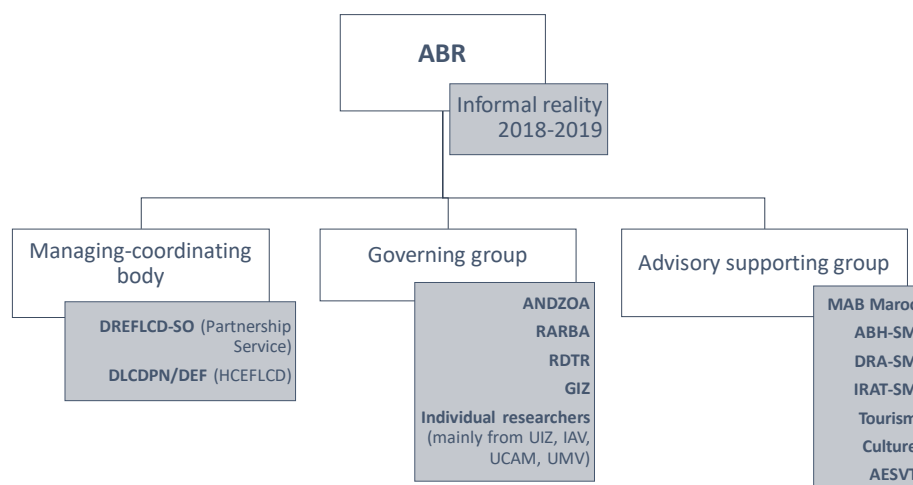


Figure 4 – Arganaie Biosphere Reserve (ABR) informal current governing group (2018–2019). A group of leading and engaged individuals and institutions and their main current roles and responsibilities. *For further detail on actors, see Table 3.

ABR). Third, apart from the NGOs involved, local populations do not have a significant place in the management of the BR.

The management of BRs in Morocco is attributed in the national legislation to the High Commission for Water and Forests (HCEFLCD). Nevertheless, this attribution is beyond the strict competencies of the HCEFLCD and covers a vast territory. This implies the need to include all territorial components and to unite all sectoral partners in governing the ABR (DREFLCD-SO 2018). The four main findings are: first, the coordination structure set up is inoperative, acting as a supervisory structure rather than a management body; second, the ABR Framework Plan (2002) is also inoperative and there was no Action Plan until 2020; third, the ABR is institutionally managed as a *Dossier* with no staff officially designated to manage it; and fourth, the role of development projects has proven to be relevant within the configuration of the actor's network. Development projects have a significant influence on the ABR dynamics.

Yet, 2018–2019 was a leverage point for the ABR, starting from the 2nd UNESCO Periodic Review, which has fuelled: (1) a communication plan, (2) the revision of zoning and limits, (3) a management plan and a regional governance workshop, where the former documents must be discussed, agreed and validated. In this regard, the new ABR Action Plan (2020) proposes various governance scenarios for debate under the structure charted in Figure 3, including the ABR's unifying players, governing bodies and users. Figure 3 shows the ABR organizational structure, featuring in red the main current challenges regarding IEG across levels, as identified in the analysis. Failure to address these challenges may result, once again, in failure to achieve an operational structure.

Findings reveal respondent's lack of clarity on the roles, mission and typology of the key ABR institutional decision-makers. Language and terminology

used to name them do not help (e.g. beneficiaries, actors involved, promoters, managers, coordinators, decision-makers, etc., are terms frequently leading to confusion); neither does the effort required by some respondents to translate from their dialect into French help. In the absence of a legitimate governing body that is widely validated by all stakeholders, each of the prominent institutions tries to position itself through discourses that are sometimes contradictory to the whole institution and at other times fuelled by financial or personal interests. This situation is a major constraint on the BR's progress, fosters confusion in people and hinders effective cooperation and dialogue.

Nevertheless, positive informal dynamics and the interaction of individual and institutional actors (i.e. relationships of trust, collaboration, alliances or dialogue) also play a relevant role in the ABR, guided by their values, identities, self-responsibility, leadership, personal concerns and willpower. They might be preventing the system from failure and foster dialogue, improvement and evolution. Figure 4 shows the ABR reality derived from the field data analysis, a major strength regarding IEG.

Perceptions of governance in the ABR

Results based on participant observation, respondents' profile and their perceptions of governance in the ABR (topics 1, 2 and 4 in Table 2) indicate that these perceptions are highly impacted by the individual actors' profiles, experiences and mindsets when it comes to their professional behaviours, decisions and discourses. Such impact has frequently been overlooked in the scientific literature to date.

There is a high consensus on identified weaknesses and on the need to improve the current ABR governance model, as shown in Table 4. However, most participants are convinced that it is feasible to reach a general agreement, despite current difficulties, if there is enough political will, combined with strong leader-

Table 4 – Main generalized perceptions (outcomes) of inclusive environmental governance (IEG) in the Arganaie Biosphere Reserve (ARB) and relevant quotes supporting them. *For further detail on actors, see Table 3.

Topic	Relevant supporting quotes	Key outcomes towards an IEG model
Vision, resolve and interests	At present: we are still discussing on paper, not in the real situation. ABR is not considered in the decisions; it is not relevant.	The ABR is not widely perceived as a territorial sustainable governance model. The ABR lacks the political and social will. And the individual resolve remains insufficient but crucial.
	There is no real will on the state's side. There needs to be a real will and targeting of political actors.	
	There is not enough involvement at the national level ... Stakeholders are worrying at the regional level. ABR is an opportunity.	
	Civil society is not organized to defend ABR.	
	There is a need for political will for the regions to take the lead.	
	In the ABR, the focus has been on the economy and not on protection and social issues. The actors are not satisfied. There are conflicts of vision between agriculture [DRA-SM] and forestry [DREFLCD-SO]. There is a [dominant economic] development trajectory.	There is not a shared vision of the development model in the ABR.
	The challenges are to achieving good communication, to reach agreement first, [...] and to reunite the interests of everyone.	
Accountability, leadership and legitimacy	We need councillors who can lead the way.	Issues of leadership, will and accountability are key but sometimes dependent on other factors like competence, interest or vision.
	There is a need for capacity building and multi-stakeholder cooperation [conciliation].	
	There is goodwill, it is a question of leadership, leadership as action. There is a lack of collective intelligence. People need to embrace the discourse.	
	There is a need to build the capacity of public actors and civil society representatives; create opportunities for people to be involved.	
	There is no official interlocutor recognised by everyone.	The managing body is not fully accepted by all stakeholders.
	The governmental actors are DREFLCD-SO [official] and ANDZOA [law] [...] but there is confusion on the spot.	
Governance and inclusion	The framework plan [2002] provides for regional, provincial and local committees, but it is not functional.	The governing body does not exist or it is not functional. There is a need for dialogue and concertation.
	The ABR needs to be institutionalized; it is paramount.	
	There are statistical data, studies, decennial reports, advances everywhere except from the governing body, where there are no advances. There is the managing body but not a governing body. There is no official interlocutor recognized by everyone.	
	There is not exactly one entity that brings together all the institutions; it is DREFLCD-SO that manage directly.	
	There is a need to raise awareness. Each one works in his own corner. First, ABR needs to be institutionalized.	
	There is a need for dialogue and institutionalization.	
	The fundamental shortcoming is not having a managing committee.	
	RAABR and DREFLCD-SO are the holders of the ABR. There is no appropriation. It needs to be institutionalized.	
	The implementation of the framework plan must be done with the population.	
Law and policy	ABR must also be defined in the legal framework.	There is a need for legal framework well-adapted to the singularities of the BR model.
	BR is an institutional structure that does not exist in Moroccan law. And this is a constraint [...].	
	The second problem is that it [ABR] cannot even be included in the national protected areas [legislation], because the BR is a category that does not exist for the IUCN [...].	
	It is the state that asked for the BRs, so it must be consistent and logical with itself and introduce the notion of BRs in its [legal] categories.	
	Now we have a second text for protected areas [...] from 2014–2015 [...] and even this new text does not contain references to BRs. It should therefore be possible, at some point in time, to amend this text and place BRs in it.	Deficient integration of the diverse sectoral and regional policies and national strategies. Including the ABR.
	It is necessary to look for synergies between the national sustainable development strategy (2017–2030) and the ABR. Local and regional authorities [regional council].	
Information and transparency	Access to information is a major issue [the importance of the unsaid].	Transparency, access to and information sharing are major issues that need to be addressed.
	Communication and consultation must be institutionalized. And each one must find its own interest.	
	An information-sharing system must be set up.	
	It is also necessary to be transparent and open with the population, [...] [to promote] discussion platforms at the level of rural communes and a great effort of mediation and confidence-building.	
	And do not forget the role of the media. There is not enough communication.	The relevant role of the media.
Languages and concepts	It is key agreeing on definitions of management and governance for each actor [organisation and/or individual].	There is a need for a shared language among the main stakeholders.
	The challenges are [...] to reunite the definitions of each one.	

Topic	Relevant supporting quotes	Key outcomes towards an IEG model
Languages and concepts	Secondly, the concept of ABR needs to be appropriated.	The concept and model of MAB-BR need to be widely understood and appropriated.
	There is a need to ... promote knowledge of ABR so that the concept is appropriated.	
	There is a lack of collective intelligence. People need to embrace the discourse.	
	Local people are detached from the term [BR] but not from the action for the ABR.	

ship. All of them consider the ABR a great opportunity and *the future* for the region; as someone literally stated: *“The Arganeraie Biosphere Reserve in the future is a major opportunity and an imperative for Morocco internationally ... There is no room for error”*.

Discussion

Evidence sheds light on the formal and informal actors' network and perspectives on governance in the ABR. It has allowed clarifying the current main dynamics and challenges for IEG in the ABR. Results are consistent and reinforce previous research in the field globally (Stoll-Kleemann 2007; Schultz et al. 2011; van Cuong et al. 2017) regarding factors influencing the success or failure of BRs. Furthermore, the ethnographic approach has uncovered several of the factors underlying these successes and failures, such as personal interests, values, identity, etc. (enablers for IEG in Table 6).

The ABR case study also permits testing the consistency of the findings (Table 5) with previous research on the main challenges for IEG and management of other North African BRs (Table 1). Table 5 shows how these challenges are the same between the ABR and other North African BRs (convergences are marked in bold).

Given the qualitative evidence, the authors summarize in Table 6: (1) the various baseline needs and constraints that must be addressed in advance, failure to do so will hamper governance; (2) some key points to improve current governance; and (3) a set of enablers to foster IEG in the ABR. We argue that, even in contexts where not even the basic principles of good

governance (Lockwood 2010) are present, informal dynamics and relations between actors (as unveiled in Figure 4) can build a certain level of resilience that prevents the system from collapsing and sets the basis for improvement, adaptation and evolution, given a favourable context. At this point, paying attention to individuals' frameworks of ideas, values, motivations, mindsets, interests, etc. (as suggested by Armitage et al. (2011), Tengö et al. (2014) or Buschke et al. (2019), among others) is paramount as institutions are ultimately made up of individuals.

Conclusion

Establishing and maintaining inclusive environmental governance (IEG) across the diversity of actors, relationships, territorial dynamics and responsibility arrangements is critical for the future effectiveness and appropriation of BRs by their stakeholders and communities. By understanding actors' perceptions and why they behave as they do, decision-makers will be better positioned to detect synergies that allow for a shared vision and thus for a proper strategy of their territory. Present research and, specifically, the ABR case study have focused on the former, contributing to one of the main weaknesses of BRs worldwide: the practice-theory gap. The authors have done so in a region that is seriously under-represented in the scientific literature published in the field (i.e. North Africa, Maghreb), despite being one of UNESCO's strategic priority regions globally (UNESCO 2014, p. 6). The ethnographic approach has allowed us to grasp in-depth crucial factors, such as individuals' frameworks of ideas, values, motivations, mindsets or interests.

Table 5 – Main challenges in the implementation of inclusive environmental governance (IEG) in the Arganeraie Biosphere Reserve (ARB). Convergences with other North African biosphere reserves (BRs) marked in bold.

ARB case study
Insufficient political support. Lack of a shared vision (multi-level and multi-actor)
Absence of a governing body. Establishment of management and/or coordination structures dedicated to (BRs)
Insufficient coordination (multi-level and multi-actor)
Insufficient capacity and resources (multi-level)
Understanding and differentiation of the BR concept. Appropriation of the BR and the BR concept (multi-level and multi-actor)
Involvement and participation of local communities. Poor integration of local communities in management. Lack of appropriation of the BR
Poor implementation of the Framework Plan and lack of an Action Plan
Inappropriate legal framework
Lack of functionality of zoning. It is unknown to most actors
Interface policy-research. Lack of social research
Lack of awareness and poor communication (multi-level and multi-actor)

Table 6 – Factors influencing inclusive environmental governance (IEG) in the Arganeraie Biosphere Reserve (ARB): baseline needs and constraints, key aspects for improvement and enablers of inclusive governance.

Baseline needs
Consider language (i.e. Tashelhit, Arab, French) and languages (i.e. fair, transparent, inclusive, non-hierarchical)
Agree over common arenas (of interests, understandings and visions)
Designate a governing body (broadly accepted and highly competent)
Either a well-suited legal support or a strong political commitment at the national level (higher than any of the sectoral ministries involved, i.e. head of government, secretary general of the government – no political affiliation –, king)
Effective conflict-resolution framework (flexible and multilevel)
Effective participation framework (inclusive, fair and multilevel)
Assigned budget (availability and continuity)
Key aspects to improvement
Clarify roles and responsibilities of governing bodies and their personnel (officially and precisely identified)
Assign sufficient human and material resources to carry out the allocated tasks (i.e. adequately trained managers-mediators to carry out exclusively tasks related to the BR in the medium-long term)
Allocate sufficient budget exclusively to capacitation, coordination and communication
Address functional connectivity (i.e. alignment of priorities, plans and activities across ABR institutions; horizontal and vertical)
Strong and mandatory commitment for transparency (including clarity in communication, visibility of decision-making processes and availability of relevant accessible information to all actors – with an allocated budget)
Foster inclusiveness, fairness and resilience, in the sense of Lockwood (2010)
Enhance legitimacy (not only legal legitimacy but also social, customary, ...)
The consideration of the spatial scale and inter-relations and the temporal dynamics
Enablers for inclusive governance
Personal interests (e.g. social-cultural relations, economic, professional) and institutional interests (e.g. attributions, national/international standards, access to funding, politics)
Identity issues or sense of place (officers or researchers with a personal attachment to their (sub-)regions of origin)
Capability and leadership (individual competence and/or institutional internal dynamics, organizational maturity and competence)
Strategic alliances (e.g. individual, political, economic, project-driven; multi-scale and/or multi-actor)
Institutional connectivity or integration
Funding (e.g. development projects)
Values (mainly individual and socio-cultural)
Willingness (individual, social and political)
Institutional accountability (downwards and upwards)

Stakeholder identification and mapping have shown the complex network of actors in the ABR and the big gap between the officially recognized institutional actors and their real presence and role. Results from the CLIP analysis and the institutional management of the ABR have evidenced the theory-practice gap, how and why CLIP descriptors shape reality and contribute to the gap, and the highly diverse outlook of formal-informal relations and their great relevance. The identified baseline needs, constraints and key aspects for improvement suggest various policy-research recommendations. The ABR is perceived as a great opportunity for most actors and IEG is thought feasible. However, enough political will and strong leadership are a must. The role and scope of informal dynamics and interrelations among actors are essential in the ABR, and their contribution is vital to its resilience.

Overall, our results provide clues and invite a re-framing of IEG, not as a goal but as a precondition to addressing factors influencing the success or failure of BRs that are widely acknowledged in the literature and confirmed in the ABR case study. Individuals' frameworks of ideas, values, motivations, mindsets and interests are, indeed, strongly linked to all the enablers of IEG identified in this study and deserve further attention from both policy-makers and the

scientific community. Furthermore, as institutions are ultimately made up of individuals, ethnographic and holistic approaches are apt to uncover many of the underlying hidden factors that have been overlooked to date.

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Local residents' place attachment and the perceived benefits for them of the UNESCO Wienerwald Biosphere Reserve

Renate Eder & Arne Arnberger

Keywords: park-people relationships, place identity, place dependence, perceived changes, Austria

Abstract

Understanding local residents' perceptions of changes triggered by the creation of a biosphere reserve (BR) is important for a reserve's successful management. This study asked 383 local residents of the Wienerwald BR, Austria, about their perceptions of changes, at individual and regional levels, nine years after the creation of the BR, and correlated these perceptions with place attachment. The vast majority of respondents perceived either no changes or positive ones in the region and for themselves. They saw the most positive impact of the BR as being the preservation of threatened landscape types and cultural landscapes. Study results revealed that local residents with stronger emotional, functional and social ties to the region perceived more positive impacts of the BR. The BR management could make use of the positive relationship between place attachment and perceptions of change, as high place attachment can be beneficial for the preservation of natural and cultural landscapes, and can contribute to greater involvement in participation processes by, and quality of life of, the local population.

Profile

Protected area

Wienerwald Biosphere

Reserve

Mountain range

Alps

Country

Austria

Introduction

Understanding park-people relationships has become important for the successful management of protected areas such as national parks or biosphere reserves (BR) (Arnberger & Schoissengeier 2012; Huber & Arnberger 2016; Job 1996; Lindern et al. 2020; Morgan & Messenger 2009; Ruschkowski 2010; Ruschkowski & Nienaber 2016; Stoll 1999). Knowledge of the impacts and changes perceived by the local population due to the implementation of a protected area is essential for management (Arnberger & Schoissengeier 2012; Pokorny 2013). Managers need to know whether the protected area they are working for has any impact on the region and what changes it has triggered. They need such information for developing communication strategies addressing the local population, but also for visitor management, marketing, and regional and local economic activities. In addition, management needs to know whether place attachment, defined as the intensity of the human-place bond, plays a role in these perceptions (Proshansky 1978; Williams et al. 1992). Research has found that place attachment is related to attitudes towards protected areas and management measures, and has positive effects on quality of life and civic engagement. Thus, place attachment is important for understanding the human dimensions of natural resource management (Williams et al. 1992).

Place attachment

Place attachment and a sense of place (which are similar) are widely and increasingly used concepts in the context of natural resource and protected area

management (Jorgensen & Stedman 2001; Williams et al. 1992). A setting, such as a region, community, neighbourhood or protected area, can become a unique place when it is endowed with meanings through lived experiences (Tuan 1977). Place formation is an experiential and interactive process involving physical and social dimensions (Lin & Lockwood 2014), and place attachment provides a number of psychological benefits. It is positively associated with quality of life, life satisfaction and wellbeing (Scannell & Gifford 2017). High place attachment can keep residents in the community (Comstock et al. 2010), and can encourage their social and political involvement in the preservation of the physical and social features of their community or neighbourhood, such as public green spaces or protected areas (Comstock et al. 2010; Lewicka 2005; Schmied, 1985); it is positively related to regional identity (Job 1996).

Place attachment has been conceptualized in several ways, and many studies have confirmed the multi-dimensional nature of place attachment (Kyle et al. 2004a,b,c; Williams et al. 1992; Williams & Vaske 2003). Its dimensions can be described as emotional, symbolic and functional; place attachment can also have a social dimension (Halpenny 2010; Kyle et al. 2004c; Williams et al. 1992; Wynveen et al. 2020). To measure the intensity of the dimensions of the human-place bonds, many researchers have relied on the approach suggested by Williams and Roggenbuck (1989), who developed a two-dimensional measure of place attachment: a cognitive component (place identity), and a functional component (place dependence). Place identity, a substructure of self-identity, refers to the connections people have between a place and their

personal identity in relation to it (Proshansky 1978; Proshansky et al. 1983). Individuals use places such as protected areas to affirm their identity and express it to others (Twigger-Ross & Uzzell 1996). Place dependence has been operationalized as the individual's assessment of the functional utility of the particular setting, compared to other places, in providing for goal achievement (Jorgensen & Stedman 2001; Williams et al. (1992). Kyle et al. (2004a,c) used a third component – social bonding: strong social ties are created among friends and family members who live in the same geographic locale.

Place attachment and protected areas

Previous research on place attachment in protected areas has explored relationships between place attachment and recreation behaviours. These include: visitor conflicts and perceptions of crowding (Eder & Arnberger 2012; Budruk et al. 2008; Hammitt et al. 2004; Kyle et al. 2004a,b; White et al. 2008); pro-environmental behaviour and environmental concern (Halpenny 2010; Larson & Lach 2018; Ramkissoon & Mavondo 2017; Wynveen et al. 2013); acceptance of protected areas (Huber & Arnberger 2016), and support for management actions (Warzecha & Lime 2001). However, findings were mixed regarding the influence of place attachment on these topics. Many researchers have suggested that natural features which allow people to relax and escape from their daily routine contribute to attachment (Kyle et al. 2004c). Arnberger and Eder (2012a), for example, showed in their study on local residents of the Viennese part of the Danube Floodplains National Park, Austria, that the perceived sum of green spaces and their qualities, as well as visits to recreation areas correlated positively with place attachment. Earlier research assumed higher place attachment to more remote natural areas. However, Wynveen et al. (2020) recently showed that attachment to an urban national park or a small urban heritage site can be even higher than attachment to remote natural or protected areas.

Research on the link between place attachment and protected areas showed that people with higher place attachment were more supportive of protected areas and management measures (Toscan 2007). Lin and Lockwood (2014) found indications that living and working in close proximity to the Tasman National Park, Australia, increased attachment. However, Huber and Arnberger (2016) showed that local residents with high place attachment counted both opponents and supporters of a planned BR in Austria. The authors assumed that supporters who had a sense of attachment might perceive the BR as beneficial to the region, while the opponents who felt attached to the place might work against the BR to defend the area's traditions and economic activities. Bonaiuto et al. (2002) observed high place attachment among opponents of two Italian national parks. Several authors assumed that local residents with high place attach-

ment would be against new developments imposed by outside experts in a top-down approach (Bonaiuto et al. 2002; Stoll 1999). Other authors (Chapin & Knapp 2015; Manzo & Perkins 2006) suggest that residents' high place attachment influences their willingness to act for the benefit of the places: however, their actions may not always be in line with the management goals of a protected area because of their own limited knowledge of social-ecological complexities.

So far, place attachment research has provided somewhat contradictory results regarding the influence of place attachment on the perception of protected areas and natural conditions. The influence of the separate dimensions of place attachment remains unclear, even though place attachment is supposed to explain local residents' readiness to act, and to support pro-environmental behaviour (Huber & Arnberger 2016; Larson & Lach 2018; Lewicka 2005; Schmied 1985; Manzo & Perkins 2006). In addition, little is known of how residents' place attachment correlates with perceptions of regional and personal changes several years after the designation of a BR in an urban / suburban context.

Study aims

This study responds to the frequent call to better incorporate attachment to place into the management of protected areas (Kaltenborn & Williams 2002; Morgan & Messenger 2009; Stewart et al. 2013; Wynveen et al. 2020). The specific objective was to investigate whether local residents of the Wienerwald Biosphere Reserve (WBR), Austria, perceived any changes triggered by the WBR nine years after its implementation. The following research questions guided this study:

RQ1: Have local residents perceived positive or negative changes at individual and regional levels due to the implementation of the WBR?

RQ2: How strong are the cognitive, functional and social ties of local residents to the WBR?

RQ3: Are the perceptions of individual and regional change influenced by dimensions of place attachment?

The WBR is a useful study area because it has an important recreational function for residents; for many, it is part of their immediate neighbourhood and thus potentially influences place bonding. In addition, the existence of an earlier study (Gastinger 2006) on awareness of the Lower Austrian part of the WBR provides the opportunity to explore whether the level of awareness has changed.

Methodology

Study area

In 2005, the Wienerwald was declared a UNESCO BR. The 105 645 ha of the WBR protect one of the largest continuous areas of deciduous forests in Central Europe and harbour a great variety of natural landscape types and cultural features (Köck & Brenner

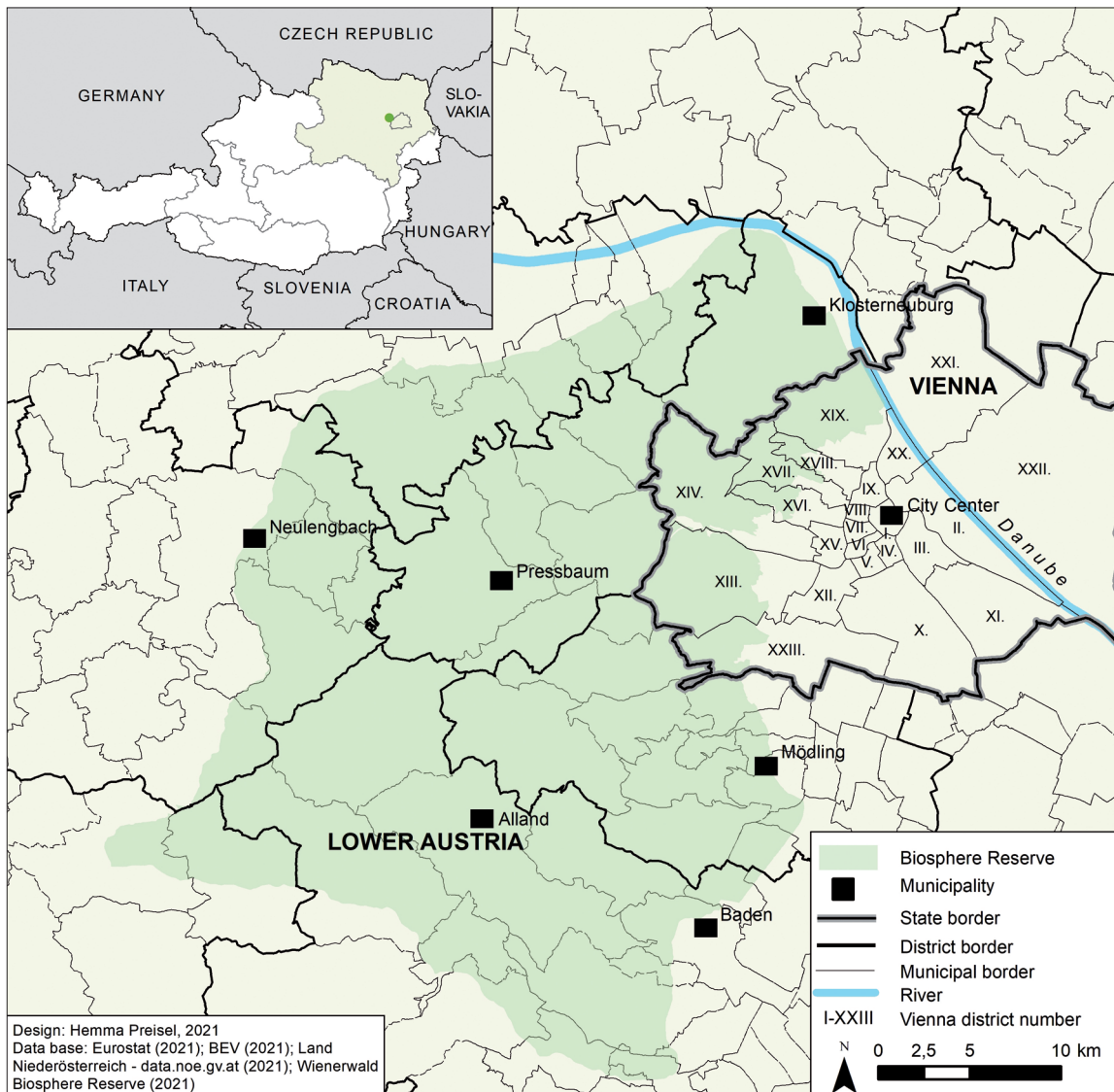


Figure 1 – Location of the Wienerwald Biosphere Reserve.

2015). Wooded hills, dominated by beech forests, alternate with extensive meadows, pastures, fruit orchards, vineyards and dry grasslands. Four nature parks and the Viennese Lainzer *Tiergarten*, an extensive historic game park, are among the 15 nature preserves in this region (Biosphärenpark Wienerwald n.d.).

The WBR extends across 51 communities in Lower Austria and seven municipal districts in Vienna, the capital of Austria, which has close to 1.9 million inhabitants (Figure 1). In total, about 815 000 people live in communities or city districts within or partly within the WBR. About 60% of the communities in Lower Austria have fewer than 5 000 inhabitants. The proximity of the metropolitan area results in high recreation-use pressure on the area, particularly close to Vienna (Arnberger & Eder 2012b; Köck & Brenner 2015).

Data sampling

Data were collected from March to December 2014 using three approaches. At the request of the WBR management, and instead of the planned postal sur-

vey, so-called *BR Ambassadors* were asked to distribute questionnaires among local residents, aged 18 years or above, with one ambassador nominated for each community or Vienna district within or partly within the WBR. However, this approach resulted in just 121 questionnaires being returned. In addition, questionnaires were distributed at WBR events, resulting in a further 160 returns. Finally, a snowball system initiated by the research team generated an additional 368 completed questionnaires. Respondents could return the completed questionnaires using either a pre-paid envelope or the collection boxes located at WBR events. Our approach, however, did not allow us to determine a response rate, which is a limitation of the study. Analysis of age, gender and education level showed that age and gender were in line with population data generally (Stadt Wien 2017; Statistik Austria 2020), while more people with higher education filled in the questionnaire. Because of the sampling process, it is possible that residents who are more knowledgeable about the BR were over-represented.

In total, 649 questionnaires were returned; the maximum sampling error (margin of error) was calculated as <5% for a 95% confidence level. About 68.1% ($N=442$) of the respondents who were local residents were aware of the WBR, with greater awareness among those from Lower Austria (77.3%) than among those from Vienna (55.0%). Of the 442 local residents, 59 did not fully complete the questions about place attachment and perceived changes since the establishment of the WBR, resulting in a final sample size of 383.

Questionnaire

The survey included questions about socio-demographic characteristics, such as age, gender, education level, and length of residence in the region. It also included a question on knowledge of the WBR using an answer scale from 1 = very high knowledge to 5 = very low knowledge. Three dimensions were used to determine localized place attachment, with questions relating to place identity (PI), place dependence (PD) and social bonding (SB). The items relied on scales developed by Williams and colleagues (e.g., Williams & Roggenbuck 1989; Williams et al. 1992; Williams & Vaske 2003; Kyle et al. 2004a,c). These scales are frequently used in outdoor recreation (Budruk et al. 2008; Eder & Arnberger 2012; White et al. 2008; Wynveen et al. 2018, 2020), community attachment (Arnberger & Eder 2012a), and regional attachment research (Huber & Arnberger 2016). Five items measured PI, two measured PD, and three measured SB. All items were measured on a five-point agreement scale (i.e., 1 = strongly disagree, 3 = neither agree nor disagree, 5 = strongly agree). We used only two items for PD, which might be seen as a limitation of the study. However, a reliability test resulted in a useful Cronbach's alpha of greater than .60 (Cortina 1993).

Questions relating to the perceived personal impacts and impacts on the region due to the WBR used a 9-pt. scale, ranging from -5 = negative change, to +5 = positive change, with 0 in the middle indicating no perceived change. Follow-up open questions

asked what positive or negative changes respondents perceived on regional and personal levels. Fourteen items asked in detail about the perceived impacts on the region of creating the WBR. These used a 5-pt. answer scale, ranging from 1 = totally agree, to 5 = totally disagree.

Data analyses

A paired-samples t-test was conducted to test for differences between perceived individual and regional changes. Cronbach's alpha assessed internal consistency in the PI, PD and SB dimensions. Pearson correlations were used to calculate the relationships between the place attachment dimensions on the one hand, and perceived personal and regional changes and impacts due to the WBR on the other. A significance level of $p < .05$ was chosen.

Results

Sample profile

The majority of the respondents were females (53.6%); the mean age was 50.0 years (18–93 yrs.). The mean number of years of residency in the region was 32.6, with 41.7% having lived in the region since birth. About 46.4% had a university degree, 31.6% had a diploma from secondary school qualifying for university admission, and 22.0% had other school leaving exams. About a quarter (27.1%) reported having very high or high knowledge of the WBR, while 27.1% reported a very low or low level of knowledge.

Place attachment

All respondents showed high PI to the Wienerwald Region (Table 1). They enjoyed living in there, and agreed that the Wienerwald had a special meaning and was something special to them. Most of them felt connected to the Wienerwald and would recommend the Wienerwald to their acquaintances as a place to live. Agreement on the PD items was lower than for the PI items, in particular for the statement *“With regard to quality of life, no other region can be compared with the*

Table 1 – Mean values of place attachment items and dimensions, and Cronbach's alpha per dimension ($N = 383$); answer scale: 1 = strongly agree, 5 = strongly disagree

Items	Mean	Cronbach's alpha
Place Identity	1.69	0.809
I enjoy living in the Wienerwald	1.24	
I feel intensely connected to the Wienerwald	1.73	
The Wienerwald is something special to me	1.78	
I would recommend the Wienerwald to my acquaintances as a place to live	1.83	
I would find it a great pity if I had to move away	1.92	
Place Dependence	3.02	0.735
I wouldn't live in any other place than the one where I am currently living	2.80	
With regard to quality of life, no other region can be compared with the Wienerwald	3.28	
Social Bonding	3.04	0.679
If I moved away from the Wienerwald, I would lose a lot of acquaintances	2.78	
My whole family lives in the Wienerwald	2.86	
All my friends live in the Wienerwald	3.48	

Wienerwald". Highest agreement of the SB items was found for the item "If I moved away from the Wienerwald, I would lose a lot of acquaintances", while more respondents disagreed with the statement "All my friends live in the Wienerwald".

An attachment index was developed by aggregating the individual item scores for each dimension; low values indicated high place attachment. The three place attachment dimensions had an acceptable Cronbach's alpha statistic (Cronbach's $\alpha > .679$) for all dimensions (Table 1). PI correlated positively with PD ($r = .628, p < .001$) and SB ($r = 0.322, p < 0.01$), and PD correlated positively with SB ($r = .481, p < .001$). The longer respondents had resided in the Wienerwald Region, the higher their place attachment (PI $r = -.191, p < .001$; PD $r = -.321, p < .001$; SB $r = -.466, p < .001$). There was no difference in place attachment for respondents residing in Lower Austria or Vienna, except for a higher SB in Lower Austria ($t = 4.692, p < .001$).

Perceived personal and regional changes due to the WBR

Many respondents perceived positive changes for the region triggered by the implementation of the WBR (Figure 2). About two thirds (66.1%) perceived no changes on a personal level, but about 30% reported positive changes. Very few respondents reported negative changes at the regional ($N = 3$) and the personal levels ($N = 11$). The personal changes ($M = .77$) were perceived as less positive than those for the region ($M = 1.87$; $t = 14.009, p < .001$). The higher the knowledge about the WBR was, the more positive the personal ($r = -.196, p < .001$) and regional changes ($r = -.306, p < .001$) were perceived to be.

When asked what specifically had changed (open question), respondents mostly mentioned increased awareness of the local protection of nature and species, sustainable development of the region, and an increase in educational and recreational offers. Very few mentioned negatively perceived changes, which

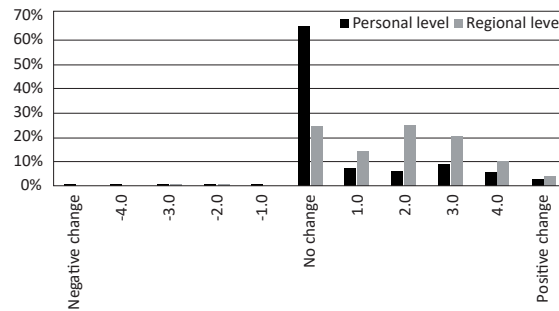


Figure 2 – Perceived changes on a personal and a regional level triggered by the implementation of the WBR ($N = 383$); Answer scale: $-5 =$ negative perception of change, to $+5 =$ positive perception of change, with 0 indicating no change perceived.

included regulations governing land use of the BR, increased numbers of visitors, intensive forestry, and increased urban sprawl.

Perceived regional impacts due to the WBR

The most positive perceived impacts of the WBR were the preservation of threatened landscape types and of traditional cultural landscapes (Table 2). Most respondents agreed that traditional economic land use management was now of greater importance locally; new opportunities and chances for the marketing of regional agriculture and its products had emerged; quality of life and recreational possibilities had increased in the Wienerwald Region. Agreement was lower for statements concerning more jobs being provided in the region, the regional economy being revived, the WBR not having changed anything in the region, and few people having profited from the WBR.

Relationships between place attachment and perceived regional and individual changes

Significant but mostly weak correlations between the place attachment dimensions and perceived personal and regional changes due to the WBR were

Table 2 – Perceived impacts on the region due to the WBR ($N = 383$); answer scale: 1=strongly agree, 5=strongly disagree

Due to the implementation of the WBR...	Mean	Place Identity	Place Dependence	Social Bonding
... threatened landscape types in the region have been preserved.	2.09	n.s.	n.s.	n.s.
... a substantial contribution for the preservation of traditional cultural landscapes has been achieved.	2.16	0.224***	0.159**	n.s.
... traditional economic land use management was reassigned a higher local value.	2.43	0.116*	0.149**	n.s.
... new opportunities for regional agriculture and the marketing of its products emerged.	2.48	0.172***	0.139**	n.s.
... the recreational quality in the region has increased.	2.50	0.274***	0.252***	0.109*
... quality of life in the region has increased.	2.61	0.287***	0.240***	n.s.
... the Wienerwald region now stands out more distinctly from the surrounding regions.	2.69	0.173***	0.256***	0.130*
... new ideas have been implemented more easily.	2.78	0.176***	0.185***	n.s.
... there are more restrictions because of nature conservation.	2.90	n.s.	n.s.	0.102*
... tourism has been impacted positively.	2.95	0.109*	0.199***	0.105*
... more jobs have been created in the region.	3.08	0.174***	0.230***	n.s.
... the regional economy has been revived.	3.15	0.146**	0.246***	n.s.
... nothing has changed in the region.	3.28	-0.113*	n.s.	n.s.
... few people have profited from the WBR.	3.31	-0.127*	n.s.	n.s.

Significance levels: *** $p < .001$; ** $p < .01$; * $p < .05$; n.s. = not significant

Table 3 – Correlations between place attachment dimensions and the perceived personal and regional benefits of the WBR.

Place attachment dimensions	Personal changes	Regional changes
Place Identity	−0.198***	−0.261***
Place Dependence	−0.129*	−0.164**
Social Bonding	−0.150**	−0.62

Significance levels: *** $p < .001$; ** $p < .01$, * $p < .05$

found (Table 3). The higher the PI and PD, the more positive the perceived personal and regional changes. SB was related not to perceived regional changes but to personal changes. The higher the SB, the higher the perception of positive personal changes. PI showed stronger correlations with perceived personal and regional changes than the other dimensions.

Relationships between place attachment and regional impacts

Many significant weak or moderate correlations were found between the place attachment dimensions and perceived impacts of the WBR (Table 2). For both PI and PD, the highest positive correlations were with quality of life and of recreational possibilities. PD, and to a lesser extent PI, correlated positively with impacts on tourism, jobs and the regional economy. SB showed that social ties were often not correlated with perceptions of regional impact. The higher the SB, the higher the recreational quality was perceived by residents, and the more they felt that tourism was positively impacted and that the Wienerwald Region stood out more distinctly from the surrounding regions. However, they perceived more restrictions due to nature conservation.

Discussion

Changes in awareness of the WBR and perceived changes

Results indicate that awareness of the WBR among the local population has increased significantly since the study conducted by Gastinger (2006) shortly after the designation of the WBR, a study which relied on telephone interviews. In Gastinger's study, about one third of local residents in Lower Austria reported being aware of the WBR. However, comparability with the present study is limited because of the different data collection approaches used. In the context of Germany, Pokorny (2013) also found an increase in awareness of BRs as a category over the 19 years since the creation of the Rhön BR in 1991.

Many respondents who were aware of the BR status reported positive changes in the region and for themselves triggered by the implementation of the WBR about nine years previously. Residents perceived far more benefits than drawbacks. This result is in line with other studies which found that residents are more likely to report positive benefits of a pro-

tected area (Arnberger & Schoissengeier 2012; Huber & Arnberger 2016; Job 1996; Lindern et al. 2020; Pokorny 2013; Ruschkowski 2010). For the study's participants, the WBR has achieved most in the preservation of the typical Wienerwald landscape and in promoting traditional land uses. Previous studies on residents of, and tourists to, protected areas often give the protection of nature as these areas' highest achievements (Kaltenborn & Williams 2002). Others have shown that modifications of familiar landscapes caused by bark beetle outbreaks, infrastructure projects, or changes in traditional land use practices due to nature conservation regulations have a significant influence on attitudes towards protected areas (Arnberger & Schoissengeier 2012; Ruschkowski & Nienaber 2016; Stoll 1999). WBR respondents felt that the BR benefited the region more than themselves, and the local population as a whole rather than local individuals. This indicates a fairly positive impression of the WBR for most of its residents, and that the WBR preserves their environment and increases their quality of life.

Place attachment and perceived changes

Results revealed that local residents showed a high PI towards the region, indicating that connections between their personal identity and the Wienerwald Region are strong. All three dimensions of place attachment correlated highly with each other, showing that social, functional and cognitive ties are all important for forming human-place bonds. The longer respondents had lived in the region, the stronger their ties were. This is in line with earlier findings that place attachment increases through lived experiences (Arnberger & Eder 2012a; Lewicka 2005). Compared to many studies on visitors in urban and rural protected areas, the mean PI was very high (Arnberger & Eder 2012a; Halpenny 2010; Kainzinger et al. 2018; Warzecha & Lime 2001; Wynveen et al. 2018, 2020). Huber and Arnberger (2016), however, reported higher place attachment in all three dimensions for local residents to the Salzburger part of the Salzburger Lungau and Kärntner Nockberge BR. It seems that local residents usually report a stronger PI to their own protected area than do visitors to protected areas, confirmed by the study of Kaltenborn and Williams (2002) among tourists to, and residents of, a Norwegian national park. However, this pattern is not always consistent (White et al. 2008).

PD and SB were lower in our study, a finding similar to ones reported by others (Eder & Arnberger 2012; Halpenny 2010; Huber & Arnberger 2016; Kyle et al. 2004a; Warzecha & Lime 2001; White et al. 2008). As the functional and social ties to the Wienerwald were not as strong as identity, many residents may consider other places to be potential sites for goal achievement, and they seem to have friends and family members outside the region. This is not surprising for people living in the metropolitan area of Vienna.

Several studies have found that rural residents reported lower place attachment than residents of more urban environments (Arnberger & Eder 2012a; Kim & Kaplan 2004), while the present study found that only the SB dimension differed between the Lower Austrian and Viennese samples. This may be because residents of smaller towns and suburban areas were included in the Lower Austrian sample. In addition, previous studies looked at community or neighbourhood attachment in different environments; they did not refer to contexts like the Wienerwald where urban and rural residents share the same environment. The reported higher SB in Lower Austria indicates that social ties may be stronger in more rural environments.

The study revealed that local residents with stronger emotional and functional ties to the region perceived more positive impacts of the WBR. However, the dimensions did not correlate uniformly in relation to perceived changes: in particular, social bonding was often not related to perceived changes. Previous research has found a positive relationship between place attachment and perceived changes due to the implementation of a protected area (Toscan 2007). However, several researchers have reported that local residents with high place attachment can be opponents of protected areas (Bonaiuto et al. 2002; Huber & Arnberger 2016; Stoll 1999).

PD was positively related to economic effects, which underlines the functional ties of place attachment and the importance of a region for jobs, the regional economy and tourism (Kaltenborn & Williams 2002). However, the mean values of the dimension were not very high, indicating that the Wienerwald cannot satisfy the economic needs of all residents. The high number of commuters from Lower Austria to Vienna may be an indication of this. SB was related not to regional benefits but to personal benefits, underlining the social component of the dimension. Overall, place attachment was weakly related to nature conservation issues. In addition, the higher the SB, the more restrictions resulting from nature-conservation regulations were perceived. Those who have strong social ties in the region and who have lived there for a long time seem to be less convinced about the regional benefits of the WBR.

Conclusions

This study found that local residents perceived no change or positive changes due to the implementation of the WBR. There seems to be local support for the management of the WBR, because many respondents perceived the WBR as beneficial for the region and quality of life (Lindern et al. 2020; Scannel & Gifford 2017; Stoll 1999). As level of knowledge about the WBR correlated positively with perceived benefits, further awareness-raising and education about the WBR, in particular in the urban area, might further increase the acceptance of the WBR. Place attachment

dimensions and perceived changes and impacts correlated with each other: the stronger the place attachment, the more positive changes were perceived by local residents who were familiar with the BR status. As strong place attachment can increase pro-environmental behaviour, readiness to act for the region, and support for management actions, the BR management could make use of this finding.

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Golija-Studenica Biosphere Reserve (Serbia) as a Driver of Change

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Keywords: biosphere reserve, Golija-Studenica, Serbia

Abstract

In the 50 years since the UNESCO Man and the Biosphere Programme (MAB) was launched, 727 sites in 131 countries have gained the status of biosphere reserve (BR). Golija-Studenica BR belongs to the group of BRs that have been active for the past 20 years. This BR is one of the most prominent protected areas and the first of its kind in Serbia. A balance between biodiversity conservation, as the primary goal of protection, and the promotion of sustainable profitable activities involving diverse actors has yet to be achieved. This research aims to provide a contextual understanding of changes in Golija-Studenica BR and draw lessons for future BR development. It relies on the experiential and practical knowledge of diverse stakeholders, including management bodies, the NGO sector and the local population itself. The methodology is based on a qualitative approach, using semi-structured interviews with open-ended questions. Research results show that the BR model is a subtle, time-reliant driver of change, with some unintentional side-effects. It brings about changes in how protected areas are managed, affects the economic behaviour of the local population, raises awareness about environmental issues, and has an impact on demographic trends and social change.

Profile

Protected area

Golija-Studenica

Biosphere Reserve

Mountain range

Dinaric Alps

Country

Serbia

Introduction

Contextual background

Golija-Studenica Biosphere Reserve (GSBR) was set up in 2001, thirty years after UNESCO commenced the MAB Programme. Located in south-western Serbia, a mountainous area on the eastern edge of the Dinaric Alps, the BR encompasses 53 804 ha of Golija Mountain. It has never been densely populated. Today, there are about 6 000 inhabitants, in 42 settlements, who are predominantly engaged in animal husbandry, and gathering herbs and mushrooms (Tomić & Stojsavljević 2013). Traditional settlements, in the form of hamlets and scattered households, are found up to an elevation of 1 300 m (the mountain's summit is at 1 833 m). A traditional lifestyle based on agriculture evolved, creating a landscape of pastures, meadows and forests (Figure 1). The natural values of Golija are still being revealed through the discovery of new habitats, flora and fauna (Vukojičić et al. 2019; Sabovljević et al. 2020). At the north-eastern edge of the BR is Studenica Monastery, a UNESCO cultural World Heritage site, built in the 12th century (UNESCO 2017). Parallel to its BR status, Golija received national protected status as a nature park (NP). The NP (which includes the BR) extends south from the BR to encompass a total of 75 183 ha (Institute for Nature Conservation of Serbia 2020) (see map, Figure 2).

In recent decades, tourism on Golija has developed alongside traditional economic activities; it is recognized as a factor in rural revitalization and the preservation of traditional architecture and customs (Sagić et al. 2019). Golija's scenic landscapes, clean

environment and tranquility distinguish it from other mountain areas in the vicinity (e.g. Kopaonik and Zlatibor) (Tomić & Stojsavljević 2013; Lakićević & Sagić 2019). Sustainable development of the area is enhanced by rural tourism businesses, which are usually small-scale, together with cultural tourism as another pillar of development in GSBR (Terzić et al. 2014; Lakićević & Sagić 2019). Although GSBR is recognized as a site of national importance for the Republic of Serbia, the area is exposed to diverse internal and external influences regarding protection, on the one hand, and economic development, on the other. This issue has been recognized in international research papers that deal with the subject of BRs (e.g. Bridgewater 2002; Krušova et al. 2008; Price et al. 2010; Ishwaran 2012; Castillo-Eguskiza et al. 2017; Kratzer 2018).

Based on the fifty-year implementation of the MAB Programme, Ishwaran (2012) sees BRs as having great potential as sources for learning about sustainable development at all territorial levels. According to Tomić & Stojsavljević (2013) and Terzić et al. (2014), Golija undoubtedly has this capacity, too. So far, there has been a gap between the concept and the reality (Schultz et al. 2018), which “*calls for more in-depth research on the BR-specific interpretations of problems*” (Kratzer 2018, p. 329). The evaluation of protected areas, including BRs, is a *neglected issue*, despite its relevance in the domain of sustainable management (Yihe et al. 2003). It was therefore one of the objectives of the Seville Strategy (1995) to make the evaluation of all MAB areas and the submission of reports obligatory (Cuong et al. 2017a). The evaluation process is



Figure 1 – Top: St. Sava's hermitage; hauling wood in Golijaska Reka; Golija landscape in Bzovik village; Bottom: Studenica Monastery. © the authors

simultaneously a learning practice that contributes to adaptive management (Hockings et al. 2006).

Theoretical background

The concept of environmental protection is based on the notion that development in areas of valuable natural resources should be controlled (Yihe et al. 2003). However, restrictive protection is not always necessary or justified. Thus, the UNESCO MAB Programme strives to create a balance between natural and manmade systems (UNESCO 1995). This is different from traditional protection concepts, since it ascribes an equal value to natural landscapes and to sustainable, manmade ones (Bridgewater 2002; Trkulja 2005). The BR concept addresses the simultaneous conservation of biological and cultural diversity; the inter-relationships between ecological, economic and social aspects; research, monitoring, education and training (Price et al. 2010; UNESCO 2016; Pool-Stanvliet et al. 2018). To become a BR, an area needs to demonstrate diverse and representative forms of sustainable development, and to be of an appropriate size within the regional context (Ibid). In addition, BRs should meet organizational requirements. The protected area must have a legal constitution; demonstrate active information exchange and cooperation between stakeholders at all levels; and have an established management body with capacities to create and implement plans (Price et al. 2010; Pool-Stanvliet et al. 2018).

Designation as a MAB BR represents an *award*, but it requires a management capable of balancing conser-

vation and development (Schultz & Lundholm 2010). Establishing quality management of a BR is relevant not only at the local and regional levels, but also regarding cooperation with other BRs – nationally and internationally. Thus, a BR can be a successful tool for coordinating regional development, fundraising and extending sustainability outside its territorial boundaries (Pool-Stanvliet & Giliomee 2013; Kratzer 2018). UNESCO has developed an international framework for the evaluation of BR effectiveness, thus controlling the implementation of the MAB programme's principles and standards (Berkes 2007). The framework requires the fulfilment of preconditions for reserve designation and obligatory periodic reports, as defined in the Seville Strategy (1995) (Reed & Eguny 2013; Cuong et al. 2017a). Among these preconditions are establishing a management body and drawing up a management plan to demonstrate how the BR host-country is able to carry out tasks independently, and to contribute to MAB objectives (Schliep & Stoll-Kleemann 2010). According to Price et al. (2010) and Reed & Eguny (2013), the periodic reports represent not only evaluation tools, but also an opportunity to reflect and share good practice with other BRs. The relevance of the evaluation framework is reflected in the greater success of post-Seville reserves in achieving higher levels of sustainability and a balance between development and protection (Cuong et al. 2017a).

According to Schultz et al. (2018), BRs still suffer from a concept-reality gap, mainly due to a poor understanding of what the model represents and how

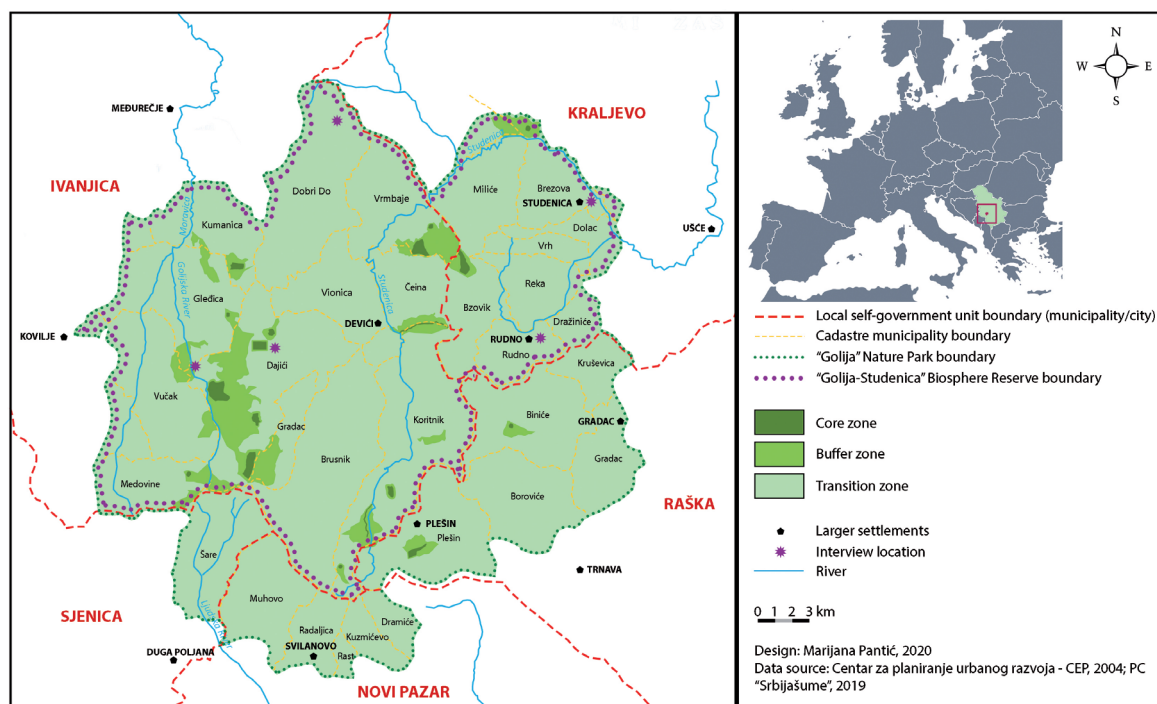


Figure 2 – Golija-Studenica Biosphere Reserve and Golija Nature Park.

sustainable development should be managed. Common problems include uncoordinated plans, central government interference, excessive exploitation of resources, strict protection of natural resources, and limited participation by local stakeholders (Cuong et al. 2017b). BR host countries face challenges from institutional and structural flaws (e.g. legislation, insufficient capacity, and lack of technical skills, which hinder implementation at the local level (Kuřová et al. 2008; Schliep & Stoll-Kleemann 2010; Cuong et al. 2017b; Pool-Stanvliet et al. 2018). On the other hand, conflicts between the newly established protection and the traditional use of resources (e.g. quarries) at the local level “*can increase vulnerability and compromise individual and collective agency for adaptation*” (Ruiz-Mallén et al. 2015, p. 97). Therefore, the MAB framework and supporting research suggest the importance of participation by stakeholders from different sectors and levels in order to enhance implementation of the concept (Trakolis 2001; O’Riordan & Stoll-Kleemann 2002; Price et al. 2010).

Aims

The main aim of this paper is to identify and examine the extent to which UNESCO BR status relates to changes in the biodiversity, socio-economic development and management of the protected area. Following one of the main principles of the BRs, namely participation, this research involved stakeholders from different fields.

The remainder of this paper is structured as follows: Methodology, Findings, Discussion and Conclusions. The Findings distinguish *Changes in GSBR* from the *Challenges of change*.

Methodology

In order to follow the changes that have occurred since GSBR was established, this empirical study employs qualitative research (Bryman 2016). Experiential and practical knowledge are crucial elements of the co-production of sustainable development practices in BRs. This is why a participatory approach is frequently used in qualitative BR research (Chapin et al. 2009). Current BR research utilizes surveys (e.g. Yihe et al. 2003; Schultz et al. 2011; Hernes & Metzger 2017) and interviews (e.g. Schliep & Stoll-Kleemann 2010; Ruiz-Mallén et al. 2015) to identify and examine the causes of change (Yihe et al. 2003). This paper aims to decode the rich practical experience of experts, stakeholders, policymakers and local users in order to provide a contextual understanding of changes in GSBR.

The data was collected through interviews conducted with the main stakeholders identified in GSBR development documents, and later via snowball sampling. The participants included representatives of BR management bodies, local self-government and national government (the Ministry in charge of spatial planning), research institutions, regional and EU development agencies, Local Action Groups (LAGs), mountaineering clubs, and local community members. In total, there were 23 interviewees, 15 of whom came from 11 institutions (public and private), while the remaining 8 were randomly sampled interviewees approached in the field (i.e. in the BR itself) (Figure 2).

The questionnaire used in the interviews contained open-ended questions, which were amended slightly according to the experience and affiliation of the interviewees. They covered topics such as biodiversity,

socio-cultural-economic development, and BR management. The interviews, which were conducted via telephone, Skype or in person, were audio-recorded, while conversations with participants in the BR were recorded in writing. Except for the interviews with families and those with the BRs' managers based in Belgrade (in the public enterprise responsible for state forests), all conversations were one-on-one. The anonymity of the participants was ensured; their affiliations are not included in the Findings section. Only those participants who gave their permission are listed in the Acknowledgments section.

The research applied an interpretive approach to data analysis and the thematic coding of narratives. The aims were to showcase participants' views about changes and challenges in GSBR, and to identify the issues and potentials involved in consolidating bottom-up and top-down approaches to sustainable development practices in this particular case. Additionally, the research identified professionals and local users as significant reservoirs of knowledge and expertise (Čolić & Dželebdžić 2018). The discussion section relates findings to the current literature.

Findings

The first part of this chapter (*Changes in GSBR*) uses narratives to present some of the main changes in GSBR in the domains of biodiversity, socio-cultural and economic development, and BR management. Along with the changes, challenges were identified in the implementation of the BR model, which are presented in the chapter *Challenges of change*.

Changes in GSBR

The subject of *promoting the cultural heritage* of Golija comes to the fore when discussing the positive effects of BR status. The combination of Studenica Monastery UNESCO World Heritage Site and the GSBR has *increased the attractiveness* of the area and highlighted the need for conservation of the cultural heritage.

"Studenica Monastery was inscribed on the UNESCO list in 1986. Although it is a pearl of our medieval architecture located in a fantastic forest, the monastery was not [sufficiently] exploited until a decision was made to declare it a biosphere reserve [...]. Declaring a biosphere reserve contributed to recognition of the monastery and its promotion as having exceptional potential for Serbia, in terms of both cultural heritage and tourism." (Interview no. 13)

This interviewee explains that BR status provided a certain level of financial security for Studenica Monastery, but also for other cultural heritage sites within GSBR and its vicinity (Gradac, Pridvorica, Đurđevi Stupovi and Sopoćani monasteries, Stari Ras medieval fortress, Church of the Holy Apostles Peter and Paul, St. Sava's hermitage). Additionally, interviewees noted that BR status had a positive effect on the *development of tourism*, which has contributed to the local economic

transformation of Golija, encouraging people to return to the area to live, and implicitly *slowing down out-migration*:

"Tourists come here because of the clean air, pristine nature and cultural heritage [...]. I would estimate that the pioneers of tourism in Golija are mostly permanent residents, but also returnees who have lived in the city [...]. Many current inhabitants are former visitors who wanted to come and live here permanently. I am thrilled that people are coming back! We have 3–4 recent examples where younger couples with children bought large properties to live here and further contribute to tourism." (Interview no. 4)

Besides promoting cultural heritage, BR status has helped draw international attention to Golija as a tourism destination, thus *promoting the area as a whole* at national and international levels:

"The largest proportion of our tourists come from countries in the Far East, who greatly appreciate the connection between natural and cultural assets which Golija offers. That's what they're all fascinated by! When I ask them how they found out about Golija, they often mention the UNESCO website." (Interview no. 13)

Tourism is mentioned by most interviewees as newly emerging and one of the most cost-effective activities for the local population. The UNESCO BR concept emphasizes the practice of *"traditional lifestyle and indigenous uses of biodiversity"* (UNESCO 2020, Article II.B.4.). This approach *enhances the preservation of traditional materials and activities, and awareness of these by tourists* (local food, recipes, textiles and clothing, use of traditional materials in construction, etc.).

"The family I visited served us juice, jam and brandy as their home-made products [...]. The house and signs for tourists are made of the local wood [...]. Younger hosts take care of the guests, while the elderly engage in agricultural activities. They grow raspberries, chokeberries [...]. They have two cows, poultry..." (Researcher's field observation)

Some interviewees mentioned that BR status has had some (but minor) effect on the improvement of *sustainable public services*. Interviewees noted that the development of tourism has motivated some people to remain in Golija, or to return or move there, which justifies keeping some public services:

"Well, maybe, thanks to tourism, the population size has remained about the same, and public services along with them [...]. The number of school children has increased in the village of Devići [there are about 100 children] in parallel with the number of inhabitants of the village and the development of rural tourism. At the moment, existing school capacities are sufficient. Some post offices were supposed to shut down, but we still have them in several villages [Gradac, Rudno, Devići, Studenica and Bratljevo]. We have several outpatient clinics as well, but we do not have a permanent doctor. Doctors travel to villages several days a week – on Monday, Thursday, Friday, something like that [...]. It is a problem when you have to chase a doctor, especially in the snake or bee season." (Interview no. 9)

Hand in hand with the development of tourist activities and the adoption of spatial plans in GSBR, *construction land has increased in value*. This has led to *illegal construction*, particularly at the outer edge of the BR:

“After the proclamation of the biosphere reserve and adoption of a spatial plan for Golija in 2001, illegal construction started almost immediately. This development occurred without a development plan for the Odvrćenica area in particular [...]. Inspectors came out and handed demolition orders to the developers. However, the Legalization Act gave all those buildings legal status [...]. This year, the trend of illegal construction is slightly reduced. It happens that two or three out of 20 buildings are built illegally every year.” (Interview no. 3)

“We have an illegally erected settlement of weekend cottages built partly in the national park core zone – Odvrćenica. This was why part of the core zone was converted into a buffer zone. Simply, biosphere protection status raises the value of the land, bringing an increase in the number of weekend cottages [...]. That land is privately owned and everyone wants to do whatever they want on their property. Neighbours copy this bad practice from each other.” (Interview no. 17)

The issue of illegal construction might be resolved in the future because BR status authorizes the Management Office (MO) to *monitor development activities*, even on land that is not in their ownership. However, the MO is not in charge of issuing building permits, nor does it have the authority to suspend construction. These limitations on the MO's powers are another formal constraint for sustainable development of the area.

“Our obligation is to monitor construction activities according to the terms issued by the Institute [for Nature Conservation of Serbia]. However, 3–4 years ago, it happened that local authorities issued permits without the permission of the Institute, so we had a meeting with state inspectors and urbanism departments from all the local authorities. We instructed them not to bypass the Institute. So, it's all right now.” (Interview no. 9)

Some illegal development activities are due to the local population's lack of awareness about procedures regarding construction in a BR. The MO *organized training sessions* for local inhabitants to demonstrate to them the benefits of living in a protected area, and to improve their capacity to engage in sustainable activities such as the collection and sale of medicinal herbs, or branding local products. One interviewee spoke about the challenge of bringing about a *change of heart* in the GSBR's local community regarding the exploitation of natural resources such as wood and stone:

“It is very important for the local community to become acquainted with all the advantages of protected areas and the benefits they may bring to the private sector. Protection is not a punishment for the local community. Unfortunately, most residents of areas such as Golija understand protection as being extremely restrictive for their lives and business. They should be instructed about the benefits of living and working in a protected area and become its guardians and protectors. The Action Plan for Golija was conceived with this vision.” (Interview no. 16)

The sustainable exploitation of BRs requires participatory decision-making (Ibid), which is still only developing gradually in Serbia. The interviewees' experience suggests that preparation of the Action Plan for Golija NP helped to implement a *participatory approach* and better *cooperation* in the management of the BR. Some interviewees explained that establishing the BR has *gradually created an awareness* of the advantages of cooperation:

“One of the main aims of the Action Plan for Golija National Park was to improve public participation in decision-making processes and establish a sustainable management model to serve the socio-economic and environmental development of the biosphere reserve [...]. We contacted representatives of public enterprises, local inhabitants and grass-roots organizations, local and national administrations, even retired architects from the local area. Around 120 school children from Golija participated in a drawing competition to suggest the future look of Golija [...]. Public participation improved the integrity of the process and collaboration and mutual trust between people, as well as between institutions.” (Interview no. 3)

The process of creating the Golija NP Action Plan provided an arena for *improved communication* at different levels – between administrative bodies in charge of the BR, municipal representatives, national body representatives and local citizens. This process increased the participation of the local community in envisioning the future of the BR, which led to the formation of LAGs. Institutions in charge of nature conservation and the MO continually communicate with the local inhabitants. The fact that the MO leader is a member of the local community facilitates direct communication with its members.

“As a Local Action Group, we cooperate with local (municipal) councils and associations, but also ministries. We have been collaborating for more than 20 years [...]. And in terms of implementation, we cooperate with everyone, depending on the topic and the need for the project and our actions [...]. When someone who worked with you 20 years ago still wants to work with you – that says something about both the organization and the people who work for it.” (Interview no. 6)

Establishing the BR, as well as the process of drawing up the Golija Action Plan, brought about changes in governance practices within the BR and an expansion of activities of the MO, which is part of a public enterprise in charge of state-owned forests. The MO's actions *expanded to research and monitoring* activities and financial support to complementary institutions (e.g. the Institute for Nature Conservation of Serbia, and the Institute for the Protection of Cultural Monuments Kraljevo).

“The benefit of protecting the area is that you have the finances and you can engage people [other institutions] in research. We plan to do a lot [of research] in the coming period – in the field of geology, culture and biodiversity. We are engaged in monitoring protected species [...]. We cooperate with the Faculty of Biology, which discovered that there are certain strictly

protected species. You can read all that in the biosphere reserve report [...]. We have arranged activities to monitor birds, monitor butterflies, amphibians, reptiles, and have prepared a list of rare species. This was achieved in collaboration with different research institutions in Serbia.” (Interview no. 8)

“I saw literature stating that there is no permanent bear population on Golija. I was surprised because I know there is. We immediately started monitoring and identified 20–25 bears in the first year [...]. Now we have started marking individual members of the population by fitting chip implants and special necklaces.” (Interview no. 9)

Monitoring results show that every year a few species previously unrecorded in GSBR are identified. Although this might be interpreted as an increase in biodiversity, the interviewees stated that the appearance of new species indicates, rather, the incompleteness of previous studies of Golija’s flora and fauna.

“Biodiversity is generally very tricky to assess because that would mean decades of research at the same sites and with the same methodology. Whenever we hire a research institution, we are told that a few species have been recorded for the first time. But the truth is that Golija is unexplored [...]. So, we can say that we have come up with new data rather than improved biodiversity.” (Interview no. 8)

Challenges of change

Even though the interviews indicated a range of positive changes brought by BR status, significant ambiguities remain in balancing economic growth and protection (for example, the illegal construction of weekend cottages for tourism purposes). This is also the reason why positive changes are taking place slowly, rather than reaching their full potential, even 20 years after the BR was established.

Some of the challenges can be traced back to the absence of formal legislation dealing with the definition of the BR, which impacts its visibility and reduces responsibility for implementing some activities and documents. Thus, actions in support of establishing a Council and Forum, or formalizing cooperation and the creation of associations at the local level, are left to the *good will* of the local community and interested stakeholders. Several interviewees spoke about this issue:

“The problem is that the Law on Nature Protection does not mention biosphere reserves at all. We do not have any legal basis for dealing with issues in reserves. The Spatial Plans of the Republic of Serbia in 1996 and 2010 define 10 areas that should obtain the status of biosphere reserve. It’s all nice, but the act of declaring a biosphere reserve is simply not sufficient.” (Interview no. 8)

“Everything comes down to the good will of the actors [...]. A Council was formed, and I am a member of that Council, but somehow it all goes slowly [...]. Since the creation of the biosphere reserve, there have been two meetings [...]. The Forum involves local communities from Kraljevo, Ivanjica, Novi Pazar, Sjenica and Raška – but members of the Forum from those local communities have not been appointed.” (Interview no. 17)

“It is well known that in planning we have a problem with scarce input data, and this is highlighted especially when a territory does not coincide with the administrative boundaries of local governments. It is statistically difficult to measure socio-economic indicators [population composition, income, population movement, number of household members] in parts of the municipalities which the Golija-Studenica Biosphere Reserve comprises.” (Interview no. 3)

“There are no regulations on way marking in our law. I was in Slovenia; if someone violates the law and removes the trail signs, there is a penalty. We have no punitive measures.” (Interview no. 2)

Despite the BR’s protected status, some excessive development activities still find their way there. Until recently, the BR resisted intensive development, such as the creation of ski resorts, but the BR and NP do have a few ski resorts that have negatively impacted the natural environment. The example of Odvrćenica ski resort (located on the outer border of the BR, in the NP) has shown that the development of ski slopes in an entirely new location, outside existing settlements, accelerates the spontaneous and uncontrolled illegal construction of tourist facilities, including in the core zone. Golijska Reka ski slopes were also developed at a previously uninhabited location, this time in the BR itself. Accommodation and recreation infrastructure were built next to the ski slopes. Part of the forest was clear-cut for the ski slope on the very edge of the core zone. Second-hand cable cars were brought to the location, but they fell into disrepair before they were put into operation. The location has never fully conformed to its designated use (Figure 3). The focus of these projects, as well as the current project of the Ski Resorts of Serbia Public Company to build another ski slope at another new location, does not reflect the opinions of the local communities or MO. Due to this, the BR status of Golija was questioned by the UNESCO representative who visited GSBR after the first periodic report was submitted. One of the interviewees commented:

“Let’s be clear, I have nothing against the development of a ski resort and slopes. Golija has a trail and a ski lift 40 years ago [Golijska Reka]. This space should be revitalized, new ski slopes set up, the cable car restored [...]. Many houses in Dajići village are suitable to welcome many of the ski resort’s tourists – we need to use these available resources and think of biodiversity – animal species also have their zones and spaces... We don’t need to develop an entirely new ski resort that will disturb the habitats of these wild animals in order to make St. Moritz on Golija! The Institute for Nature Conservation of Serbia will certainly agree with what I am saying now.” (Interview no. 13)

On the other hand, local self-governments recognize the economic interest of establishing another ski resort in the BR:

“Golija is of national importance and should be supported by the state [...]. Local councils have neither the resources nor



Figure 3 – Golijaska Reka ski resort – abandoned before it conformed to its designated use. © the authors

the capacity for development activities [...] but they recognize the economic interest of ski resorts because such projects enhance infrastructure development as well. The state financed the Odračnica-Ivanjica road, which provides us with access to the part of the municipality that was inaccessible before.” (Interview no. 18)

Still, most of the other interviewees were sceptical about the development of a new ski resort and emphasized the potentially unfavourable impact on the BR’s sustainable development, with only a few positive outcomes for the local population.

“No one is against ski resorts, but a lot of forests will have to be cut down for that purpose.” (Interview no. 20)

“Some economic interests can harm the environment [...]. And we already have an old location for a ski resort [Golijaska Reka], so why do we need a new one?” (Interview no. 6)

Mini hydropower plants (MHPPs) are an additional environmental issue in GSBR which, combined with the ski resort issue, highlights the difficulties in resolving conflicts between economic growth and environmental protection.

“In fact, mini hydropower plants are the biggest sin [...]. Every mini hydropower plant causes damage to both flora and fauna, and creates a problem for citizens in the maintenance and use of roads because the mini hydropower plant pipes are buried either in riverbeds or under roads. The local population does not benefit from them. In other countries, mini hydropower plants are approved only when there is no other option for power supply

in rural areas.¹ Besides, investors in mini hydropower plants on Golija are rich people usually coming from Belgrade, [and] the local population was deceived. They were told that mini hydropower plants would employ many members of the community [...]. Ultimately, all this [operation of MHPPs] is done by a camera and two people per power plant, but no more.” (Interview no. 4)

The general ability to balance development and protection appears to be challenged by an insufficient flow of information, and a lack of knowledge and awareness within the local community. Part of the local population engaged in the exploitation of natural resources sees the BR as a constraint to their local businesses:

“There are areas of Golija where the benefits of the biosphere reserve are noticeable. We have the example of the village of Rudno as one of the first villages in Serbia to engage in rural tourism. On the other hand, the biosphere reserve status is a problem for some households that are traditionally involved in logging, or extracting stone.”² (Interview no. 13)

“Some inhabitants think that the protection status should be removed [because it restricts some of their local business activities]. But it’s not people’s fault. They live in poor conditions and also lack awareness about the economic potential of Golija-Studenica Biosphere Reserve for them.” (Interview no. 18)

¹ Electricity produced in Golija’s MHPPs is distributed externally and not locally.

² Logging now requires a permit from the Ministry in charge of BRs. The GSBR area is known for its medieval quarries and white Studenica marble; extraction is under strict control.

Regarding the failure to recognize GSBR's new economic potentials, one of the interviewees explains that:

"In Serbia, generally we are not very open to creating associations, cooperatives... Maybe it's because of the unencouraging environment or... Everyone is [socially] cordial to each other, but when it comes to [economic] association, they immediately show resistance. Is it an absence of desire or a simple misunderstanding...?" (Interview no. 6)

Another challenge is related to the lack of staff on local councils or in the Golija NP management office. These institutions rarely assign any employee to deal exclusively with GSBR-related project preparation and implementation.

"The worst thing is that he is alone – the biosphere reserve manager is the only person, there is no one else in that work unit." (Interview no. 4)

"It [successful management] is also a matter of the availability of people, employees in municipalities and cities. It takes a lot of energy and enthusiasm and strength, money and everything to build momentum so that it can go further." (Interview no. 17)

Plans prepared by local municipalities and the NP's management are being implemented only in part. This has a negative impact on stakeholders' willingness to get involved in future participatory processes. One interviewee stated:

"My experience is that there have always been activities and plans for Golija. I've been involved on many occasions. The time has come to see some results! In multiple promotions, discussions and agreements about the aforementioned plans, the outcome is always the same. So, I dare to be a little rude and ask decision-makers 'What have YOU done on Golija in the last 15–20 years, apart from elaborating a couple of projects that haven't been implemented?'" (Interview no. 2, emphasis added)

Discussion

In order to understand more deeply some of the changes which have occurred in the GSBR, this section outlines the research findings of the BR and examines them in light of the existing literature in the field. The interviews in this research have shown that changing land ownership by selling it to non-local people is viewed in a positive light. From the interviewees' point of view, non-local owners of weekend cottages who have started investing in tourism contribute to the vitality of this depopulated area. Bearing in mind local people's standard of living and awareness of GSBR's potentials, it is likely that it will be the non-local population, rather than the local population, who will be future investors in tourism on Golija (Lakićević & Sagić 2019). Although Golija's settlements are benefiting from the increasing number of non-local inhabitants (e.g. through public services being maintained), potential negative consequences should be kept in mind before a point of no return is reached (Soszyński et al. 2017). A fading of authenticity, a weakening of

the spirit of the place, customs, local products and traditional economic activities, might occur if the non-local population outnumbers the local inhabitants as the only mainstay of indigenous Golija culture (Boulouxi 2016; Pantić et al. 2019). This would bring about a substantial change in communities and activities that comprise one of the basic preconditions for establishing and maintaining BR status (Soszyński et al. 2017).

Sustainable development is one of the MAB programme's principles (UNESCO 2020). It is based on the premise that the economic, social and environmental components of development are equally relevant. However, hiding behind capital investments in GSBR (e.g. in a new ski resort) and logging activities are the economic interests of state companies or of private investors coming from more developed regions of the country (e.g. to construct MHPPs). This contradicts one of the advantages of BR status recognized so far – preventing the construction of urban megaprojects, which would have a dramatic impact on natural resources (Castillo-Eguskitza et al. 2017). The benefits for the local population thus boil down to increasing the value of land and the creation of a few jobs. But there are significant consequences for biodiversity when land goes into the hands of non-local profiteers. The earlier development of ski slopes and tourist resorts has resulted in soil erosion, water, soil and air pollution, light pollution, deforestation, loss and fragmentation of natural habitats, noise, reduction of biodiversity, negative changes in the balance of watercourses and groundwater, and sometimes visitor overload (Rodríguez-Rodríguez & Bomhard 2011; Čurčić et al. 2019). Degradation of the ecosystem undermines the natural and landscape values of the BR, which were its key attractions, and above all a precondition for MAB status (Tomić & Stojšavljević 2013). In the case of small hydropower plants, the channeling of streams into pipelines negatively impacts the local population's water supply (Ristić et al. 2018) as well as degrading the ecosystem. At the same time, the benefits for both local communities and the state are negligible: it is estimated that hydropower plants can produce a maximum of 2–3% of Serbia's power needs (Ibid). Additionally, the number of jobs provided is insufficient to be considered crucial for local communities (Đurđević 2019).

Implementation of the ski resort project requires *"cutting down about 70% of the forest in the ski slope area"* (interviewee). Forest losses are directly related to soil erosion, climate change, air quality and the water regime (Medarević & Vasiljević 2006; Ristić et al. 2006). While the project is expected to increase the number of foreign tourists (Sagić et al. 2019), it conflicts with rural tourism, which depends on nature's attractions (Ibid). Since the spatial plan for Golija NP is based on 30-year-old data on climate, snow coverage and soil quality (Tomić & Stojšavljević 2013) and because Golija does not exceed an elevation of 2000 m, the development of ski tourism has become questionable.

Nowadays, even Alpine resorts face challenges with snowfall and the added cost of artificial snow (Steiger et al. 2019).

Choosing what actions to take depends on the information available, knowledge and education, which are key for the local population's and other stakeholders' awareness. Due to their geographical remoteness and above-average age, the populations of Serbia's mountainous areas often suffer from insufficient information, resulting in their being less open to adopting new knowledge (Pantić 2019). Although local people are aware of the BR status, obstacles to the area achieving its full potential include ignorance about how the BR status may be used to their advantage, and resistance to *imposed* development. Therefore, engagement in the field of education is crucial (UNDP 2006; Terzić et al. 2014). Pantić (2019) states that government financial support is extremely important to, and objectively needed by, the local population.

Financial challenges also apply to municipal councils. Some of the interviewees stated that local governments and the MO have problems organizing participatory processes, since they are challenged in terms of financial capacities, manpower and suitable venues for meetings. As the governing model of Serbia is insufficiently decentralized, local government has no power to influence how revenues are allocated, so local budgets are insufficient for development ventures (Aničić et al. 2020). In contrast, UNDP emphasizes that the decentralization of protected area management ensures proper environmental management by *"strengthening the democratic process by involving local institutions and communities, ensuring effective transfer of power to the local level, increasing accountability, improving local revenue collection and allowing more effective sharing of knowledge for sustainable natural resource management"* (UNDP 2006, p. vi). Decentralization is needed to achieve the effective participation of local actors and capacity building. Education plays a major role in fulfilling both these aims (Ibid).

Cooperation is another precondition for successful development that is gradually improving in GSBR, although it is still hampered. By cooperating and sharing, members of local communities and institutions would improve their knowledge. The examples of GSBR and Golija NP show that participatory processes are an opportunity to share and learn. In Italian mountain areas, the cooperation and association of municipalities are legal requirements (Castelein et al. 2006). In France, Bulgaria and Romania, governing bodies for mountain areas exist by law; they comprise elected representatives and many stakeholders at the local and regional levels (Ibid). According to some interviewees, legislative interventions are necessary to encourage cooperation in Serbia, including in GSBR. Given that the law would improve cooperation conditions, the rights of future associates would be less open to abuse and investments would be safer from being misappropriated. This would gradually build trust with regard to cooperation and creating associations.

The BR's role and responsibilities regarding cooperation or the establishment of a Council and Forum is unclear as the BR has no legal status, and its internationally obtained status is ignored in national legislation. The MO is not in a position to ask for funding, establish a Council and Forum, or stop the development of ski resorts, MHPPs or illegal construction. The only financing the MO can obtain is through the status of the NP, but the cost of activities in the BR itself remains uncovered, which runs counter to BR principles (Price et al. 2010; Pool-Stanvliet et al. 2018). Medarević & Vasiljević (2006) also stress the need to amend the legislation so that it clearly states which activities are allowed in protected nature areas, and can resolve conflicts of interest.

Conclusions

GSBR was the first BR in Serbia (established two decades ago), and is the only mountainous one. As Ishwaran (2012) states, MAB areas represent excellent laboratories for learning about sustainable development and research. The aim of this study was therefore to provide a contextual understanding of changes in GSBR and draw lessons for future BR development.

Most of the changes brought about by BR status are positive. Since the MO was assigned the duty of protecting the area and MAB principles, the concept of protection has expanded from a focus on forests and biodiversity to monitoring, research, and evaluating the social and cultural capital of GSBR. BR status also inspired the introduction of a participatory approach, and improved communication and cooperation between stakeholders from different sectors, thus raising awareness of what BR status represents. When the planning documents were adopted, BR status increased land value, which led to the development of tourism. As a new source of income, tourism has encouraged some members of the local communities to remain on Golija, and has attracted non-locals as investors and tourists. Indirectly, this has secured the preservation of public services (e.g. local health centres, post offices) in some villages.

Even though BR status has influenced many areas of life, the extent of the positive change is subtle and is developing only slowly, because negative changes are developing in parallel with the positive ones, and an entire range of challenges exist, some exceeding the power of actors at the local level. The increased attraction of the area led to illegal construction, intensive use of some locations for the development of a ski resort, and the installation of derivative-type mini-hydropower plants. The resulting developments seem to be occurring faster than existing institutional capacities can handle. As in other BR areas world-wide, GSBR's development is challenged by institutional and structural flaws – legislation and a centralized governing model. Legally undefined BR status hinders activities such as the functioning of a Council, the forma-

tion of a Forum, or being provided with financing. No legislation regulates a framework for cooperation and forming associations, the participation of all relevant stakeholders in all planning phases. Therefore, these activities are conducted on the basis of good will or are omitted due to distrust and a fear of abuse. With their lack of staff, specific knowledge and meeting rooms, local institutions do not have the capacity to focus specifically on the BR. The BR's governance is set up so that its financing and decision-making capacities depend on the state.

The lessons learned in this study indicate that the priorities in improving GBSR should be: 1) legislative amendments, 2) decentralization in governing protected areas, and 3) education. Legislative amendments should, first of all, recognize BR status, and regulate the BR's management model. The law should also determine what are acceptable numbers of weekend cottages and non-local investors compared to local households, and restrict intensive development activities. Furthermore, (controlled) development might be accelerated if legislation enforced and clearly regulated participation in the decision-making process, cooperation and association. Responsibilities should be clearly defined so that there is no doubt about who is responsible for what, and what the punitive measures are in case of failure to act. Decentralized governance could be expected to improve management, cooperation and participation, as well as to address the requirements of space (meeting venue, offices), staff and knowledge. The third pillar – education – is of vital importance for empowering staff, the local population and other stakeholders with regard to management, participation, strategic thinking, and for raising awareness about the obligations, rights and opportunities that come with BR status.

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Gender differences in visitor motivation and satisfaction: the case of Golija-Studenica Biosphere Reserve, Serbia

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Keywords: UNESCO Biosphere Reserve, Golija-Studenica Biosphere Reserve, visitor motivation, visitor satisfaction, gender, Serbia

Abstract

The UNESCO Golija-Studenica Biosphere Reserve (BR) is located in southwestern Serbia. Its captivating beauty, breath-taking landscape diversity, and preserved natural and cultural values make it one of the country's most beautiful mountains. This paper aims to determine the differences in motivation and level of satisfaction with the tourism offer of Golija-Studenica BR based on the visitor's gender. Motivation and satisfaction of 642 visitors to Golija-Studenica BR were analysed using factor analysis, Cronbach's alpha coefficient and regression analysis. Research findings confirm that gender matters – there is a gender-based impact on the motivation and satisfaction of visitors. The paper makes both scientific and practical contributions. Thus far, insufficient attention has been given to researching motivation and satisfaction of visitors to biosphere reserves in Serbia. Therefore, this paper can serve as a scientific basis for future research, for the improvement of the tourism offer of Golija-Studenica BR with the aim of encouraging its diversity, and for the development of sustainable tourism in this destination.

Profile

Protected area

Golija-Studenica

Biosphere Reserve

Mountain range

Dinaric Alps

Country

Serbia

Introduction

Biosphere Reserves (BRs) are areas of terrestrial or coastal / marine ecosystems, or a combination of the two (Biosphärenpark Wienerwald Management 2016), internationally recognized under UNESCO's Man and the Biosphere (MAB) Programme. Together, BRs form the World Network of Biosphere Reserves, which includes representative examples of all major natural and semi-natural ecosystems. BRs, by definition and intent, have economic and social benefits for local people, but also have the value of demonstrating sustainable development linked to conservation in the wider biogeographical region (UNESCO 2020a). The MAB Programme is among UNESCO's flagship programmes and is prioritized for linking landscape and nature to sustainable development. The overarching goal of the MAB Programme is the harmonious development of people and their environments (Köck et al. 2009; Ruoss 2013; Braun et al. 2020). The growth of nature-based tourism has raised the need for a better understanding of visitor expectations with regards to outdoor recreation environments (Tyrväinen et al. 2017). People who are aware of the need to protect natural resources are opting in large numbers to visit protected natural areas (Trišić 2019). Natural areas, when protected, not only conserve the natural environment but also function as social spaces, where tourism brings increased income,

employment, and financial support for conservation. In this context, visitors' satisfaction with their experiences in the protected areas is an important objective that depends not only on the protected area itself but also on the services provided (Oviedo-García et al. 2019).

Numerous studies have found links between visitor motivation and satisfaction with a destination's offer. Visitors are more likely to choose destinations which they believe will best fulfil their internal needs (Meng et al. 2008). Motivation refers to psychological need and the wish to fulfil desires, and it explains why visitors behave in a certain manner (Beh & Bruyere 2007; Mehmetoglu & Normann 2013). To understand visitor motivation is to recognize why a person chooses a certain destination (Sandybayev et al. 2018). Visitor motivation is the combination of needs and desires that affect the propensity to travel in a general sense, which can also differ according to the person's age, gender and nationality (Meng et al. 2008). Wu (2015) states that visitor motivation refers to a person's desires, such as to relieve pressure, to enjoy the natural environment, to experience beautiful scenery and to learn, which drive the individual to go on vacation. On the other hand, visitor satisfaction is defined as an individual's emotional state after experiencing a trip (Baker & Crompton 2000), i.e. positive feeling or pleasure gained from the experience or from consuming any tourism product. It includes the evaluation of the travel experience or the tourism product in terms of visitor motivation (Buckley 2009; Ma et al. 2018).

Studying the motivation and satisfaction of visitors in an empirical manner has become a primary task for many researchers, especially in protected areas, be-

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cause interaction with nature affects satisfaction with the visitor experience (Mutanga et al. 2017). Diaz-Christiansen et al. (2016) and Mahika (2011) found that the main motives for visiting natural areas in Ecuador were intellectual, social, challenge and relaxation. Fung and Jim (2015) in their study of nature-based tourism in the Hong Kong Global Geopark identified three main motivation categories relating to natural environment, heritage, social aspects and approachability (of personnel, of local people). Motivation factors such as social aspects, relaxation, escapism, nature and recreation have commonly appeared in studies about nature-based tourism. Carvache-Franco et al. (2020) state that the main motives for visiting the Samanes Protected Area in Ecuador are *“to enjoy the environment and pure air”*, *“to enjoy its public recreation spaces”*, *“to do sports”* and *“to engage in activities in nature”*, while the most valued attributes in the satisfaction are *“personal safety”* and *“places of recreation”*. Lee et al. (2014) found that the motives *“relax and escape”* and *“seek knowledge”* were significant predictors of repeat visits to ecological parks in South Korea.

Various factors may affect destination choice, for example age, income, personality, cost, distance, risk and motivation (Kozak 2002). Demographic and socio-economic characteristics have mainly been used as the basis of visitor segmentation. However, the power of age, gender and wealth in predicting purchasing behaviour is markedly situation-dependent, because they are only indirectly related to purchasing intentions (Park & Yoon 2009). A correlation between visitors' sociodemographic characteristics, such as gender, age, education level and income, and their motivation and satisfaction has been reported in some earlier studies (Jang & Feng 2007; Jönsson & Devonish 2008). Mutanga et al. (2017) conducted research in two national parks in Zimbabwe and proved the correlations between age and motivation, education level and motivation, income level and motivation, as well as visitor origin and experiences with wildlife. Ma et al. (2018) examined the relationship between sociodemographic, motivational and satisfaction factors for visitors to two protected areas in South China. Kim et al. (2008) suggested that younger people are more motivated by novelty-seeking than older people.

Some studies deal exclusively with differences in visitors' motivation and satisfaction based on their gender. Tourism itself is a product of gendered societies, and its processes are gendered in their construction, presentation and consumption (Pritchard & Morgan 2000). In the tourism industry, gender has been considered an important determinant of tourist or visitor behaviour and may be of great use in segmenting markets (Um & Crompton 1992). Women and men are involved differently in tourism consumption (Swain 1995; Figueroa-Domecq et al. 2015). Andreu et al. (2006) consider that female tourists have stronger relaxation and escape-based motives, while male tourists prefer recreation and activity at the desti-

nation. Suki (2014) states that male and female visitors may have rather different views of the relationship between service quality dimensions and tourist satisfaction. Thus, ignoring any gender-based differences may create a false picture. Kwok et al. (2016) point out the differences in visitor satisfaction at the destination when it comes to men and women, and state that women choose destinations with a modern and attractive tourism offer because this gives them a higher degree of satisfaction. There are gender differences in visitor perceptions, preferences and attitudes, and this should influence how marketing managers promote tourist destinations (Ryan et al. 1998).

Women tend to spend significantly more money than men. It is therefore important to extend, adapt and modernize the offer to continue the trend of (women's) increasing spending. It is also important to examine what products and services would increase men's willingness to spend more money (Krejić et al. 2016).

Schlagenhauf (2010) points out that more men than women travel for leisure. Gender may influence how sites are interpreted for visitors, as well as the associations that visitors make with places. Women's motivations for travel are often related to childhood memories and family life (Squire 1994). Compared to men, women are motivated by a sense of safety while travelling and staying in a tourism destination, which also brings them a higher level of satisfaction (Ritichainuwat 2008). Chen and Kerstetter (1999), in a study of the image of Pennsylvania as a rural tourism destination, conclude that women were more likely than men to agree that the tourism infrastructure and natural values of the destination are important for the destination's image. Women also have higher destination-related expectations than men (Wang et al. 2016). Furthermore, in developing countries and patriarchal societies, the relations between women and men are quite specific, which influences their travel choices (Brown & Osman 2017).

This study aims to investigate gender differences concerning the effect of motivation on satisfaction with the tourism offer in Golija-Studenica BR.

The main research questions of the study are:

- What are the motives for visiting Golija-Studenica BR, and what are visitors' levels of satisfaction with the reserve's tourism offer?
- Does the visitor's motivation affect their level of satisfaction with Golija-Studenica BR's tourism offer?
- Are there gender-based differences in visitor motivation on satisfaction with Golija-Studenica BR's tourism offer?

Study area

Golija-Studenica BR is situated in southwestern Serbia, in the inner zone of the Dinaric mountain system (Dinaric Alps). The mountainous region

includes a mosaic of different ecosystems such as forests, shrubs and lakes (UNESCO 2020b). Golija Mountain is classified as an area of special natural and cultural values; it is a site where the quality of the landscape and the physical structure of settlements are of outstanding importance for the development of tourism. It is therefore necessary to pay special attention to the protection of the landscape, planning and development (Josimovic & Crncevic 2012). The mountain has a network of streams that cut through gorge-like valleys. The most picturesque among them are those of the Studenica and Izubra rivers. The mountain is adorned with a vast expanse of forest cover that includes Heldreich's or the Balkan maple (*Acer heldreichii*), making these the most beautiful (and best-conserved) deciduous and mixed deciduous-coniferous forests in Serbia. The mountain is also home to about 1100 plant species, many of which are relict or endemic (e.g. *Alhysum markgrafi*, *Alhysum jancheni*, *Pancicia serbica*, *Viola elegantula*, *Vjerasaim adamovicii*, *Thymus adamovicii*). In addition to numerous mammalian species, such as the lesser mole-rat (*Spalax leucodon*), alpine shrew (*Sorex alpinus*), brown bear (*Ursus arctos*), wolf (*Canis lupus*) and fox (*Vulpes vulpes*), Golija Mountain is inhabited by almost 100 highly significant bird species, including woodlark (*Lullula arborea*), rock partridge (*Alectoris graeca*), common redshank (*Tringa totanus*), and common redstart (*Phoenicurus phoenicurus*) (Institute for Nature Conservation of Serbia 2020; Dingarac & Pesic 2011).

Golija-Studenica BR was the first BR to be established in Serbia. It was designated in 2001 on the basis of the natural values of Golija Nature Park and the cultural heritage of the twelfth-century Studenica Monastery, which is inscribed on the UNESCO World Heritage List. Golija-Studenica BR covers over 70% of the territory of the Golija Nature Park, and has an area of about 54000 ha, where some of the most valuable sites, both natural and cultural, are located. Preserved forest ecosystems flourish throughout the territory of the Nature Park and the Biosphere Reserve (Institute for Nature Conservation of Serbia 2020).

Since ancient times, Golija has attracted visitors who wished to explore it (Krejić et al. 2017). The tourism offer is diverse, and tourism in Golija is currently developing extremely rapidly (Lakićević & Sagić 2019). Thanks to the preserved state of nature here, the mountain offers numerous opportunities for visitors, the most popular of which are skiing, hiking, mountaineering, paragliding and cycling. Given the extraordinary wealth of its fauna, Golija is very attractive to hunters and fishermen. With 95 bird species, Golija is also one of the most important ornithological mountain sites in Europe. The diversity of the area's birds encourages birdwatching and enriches the tourism offer. Golija also offers visitors unique nature expeditions, in the form of *survival* programmes and education in nature. One of the

most beautiful possibilities for children and adults is a full-day walk through the dense forests while collecting medicinal herbs, picking mushrooms, wild strawberries and blueberries, and encountering wild horses that run free on green pastures (Ivanovski & Popović 2018; Josimovic & Crncevic 2012). The existing natural resources should be a significant factor in the current intensive tourism development of mountains generally, and particular emphasis should be placed on the development of ecotourism (Milićević et al. 2020).

The cultural heritage of Golija consists of monuments of exceptional importance dating back to the golden age of the medieval period (Studenica Monastery and Gradac Monastery); various structures and artefacts from prehistory that survive to the present day; preserved natural and rural environment; significant traces of medieval mining, and examples of preserved traditional architecture. A number of cultural heritage properties of exceptional importance stand out: the historical ensemble of Sopoćani Monastery, which includes Old Ras, Saint George's Pillars and Saint Peter's Church, all protected by UNESCO (Roganović et al. 2020). The particular gastronomic offer of Golija is related to the exceptional nutritional value of the area's agricultural products (Arsić et al. 2010).

Methodology

The research examines the motivation of people visiting Golija-Studenica BR and their degree of satisfaction with particular elements of its tourism offer. The aim of this paper is to determine the impacts of gender on visitor motivation and satisfaction with Golija-Studenica BR's tourism offer.

The primary data were collected using a survey questionnaire. Motivation and satisfaction scales are based on studies done by Kozak (2002), Lee et al. (2004) and Ma et al. (2018), and on the analysis of Golija-Studenica BR's tourism offer. The first part of the questionnaire covers visitors' sociodemographic characteristics: gender, age and level of education. The second part consists of 12 closed questions concerning the basic motives for visiting Golija-Studenica BR. The answers to these used a 5-point Likert scale (1 – I completely disagree, 5 – I completely agree). The third part of the questionnaire refers to the satisfaction with various elements of Golija-Studenica BR's tourism offer.

In August 2019, the authors visited Golija-Studenica BR. This was an opportunity to distribute the questionnaires to the receptionists and owners of private accommodation facilities, who later asked their guests to fill them in after checking out. A total of 860 questionnaires were distributed, of which 700 were completed by guests staying in hotels (280), rural households (160), boarding houses (60), villas (50), apartments (50), and mountain lodges (100). The response rate was 81.4%. After reviewing all question-

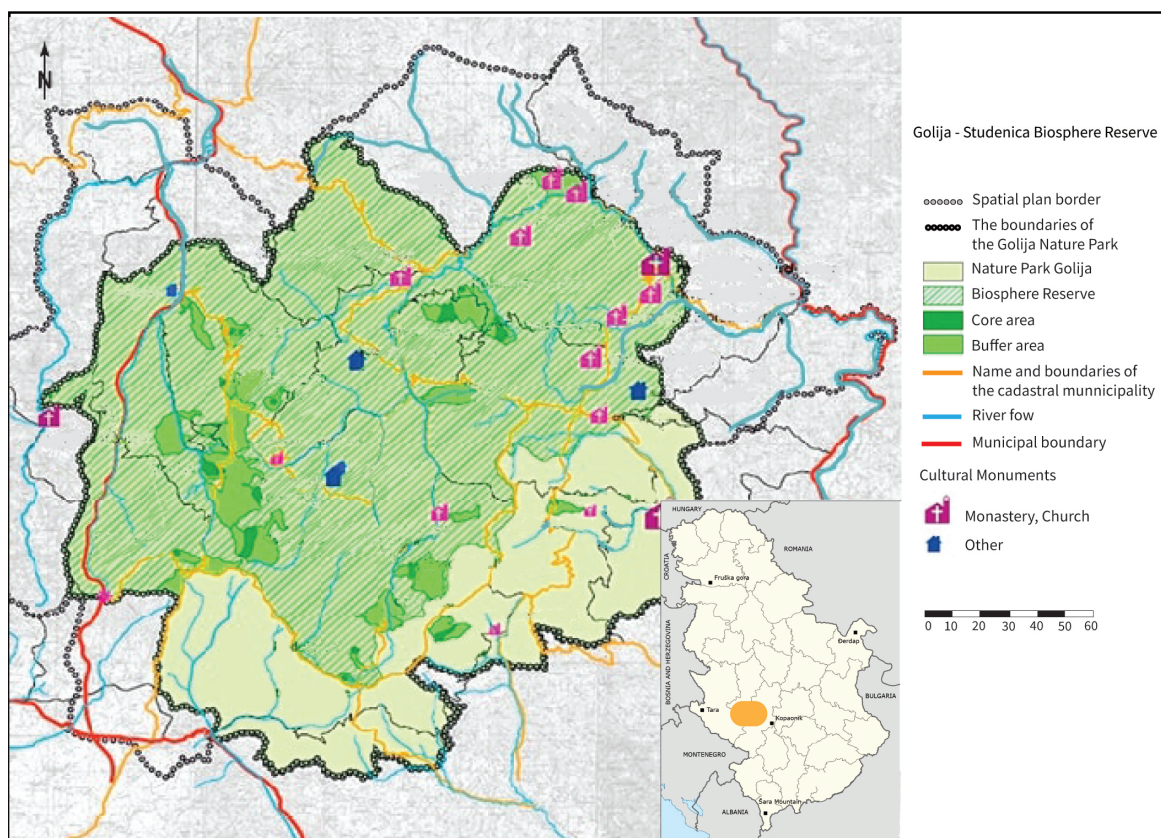


Figure 1 – Golija-Studenica Biosphere Reserve. Source: MediaSfera 2020, modified by the authors

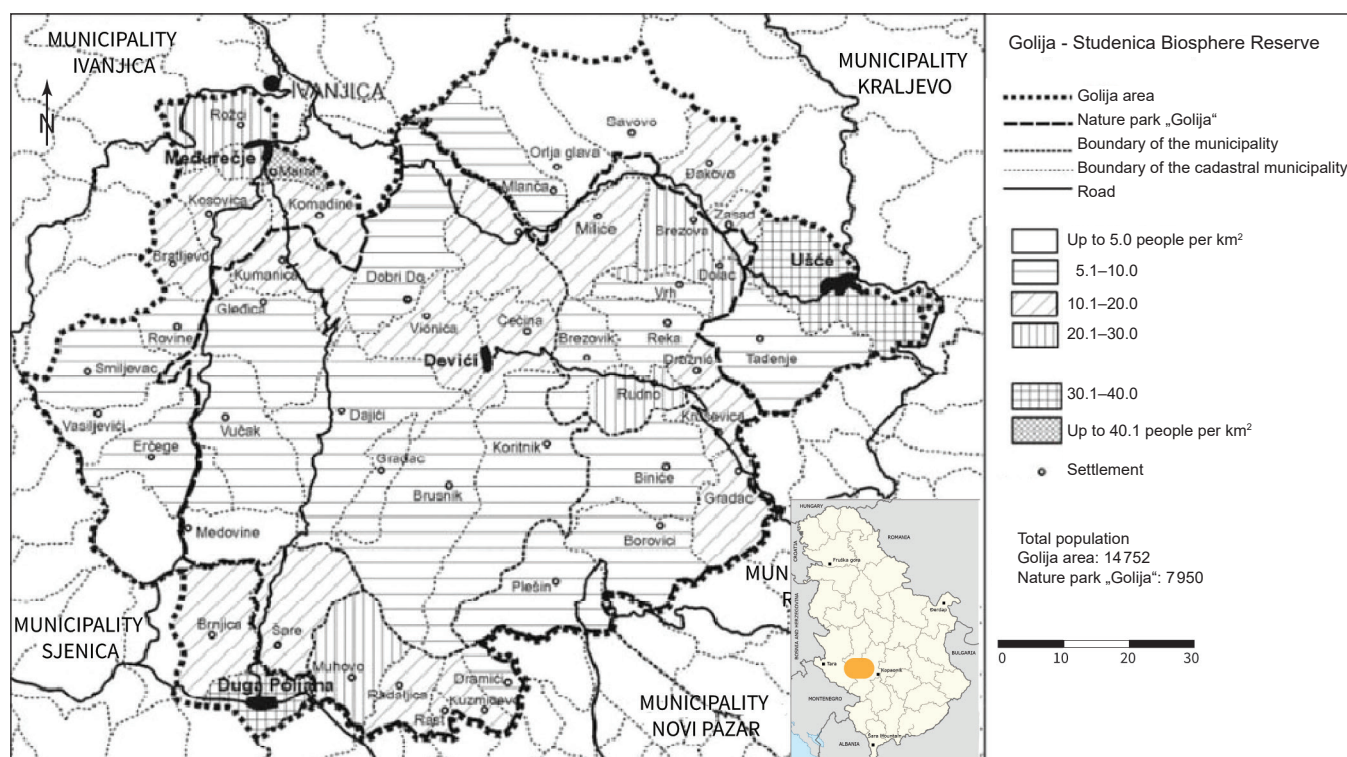


Figure 2 – Golija – population and settlements. Source: Vojković & Stojanović 2006, modified by the authors

naires, it was found that 642 were adequately completed, giving a final response rate of 74.6%.

The data collected in this research were sorted, tabulated and analysed using the SPSS, v.21. Factor

analysis was used to reveal dimensions of visitor motivation and satisfaction. The internal consistency of the sample was verified using Cronbach's alpha coefficient. To check the relationship between motivation

and satisfaction, regression analysis was used. Using the regression analysis, the relationships between the independent and dependent variables were described and quantified according to gender.

Results

The survey included 642 visitors, of whom 50% were women and 50% were men. Most visitors belong to the age groups 21–40 (41.28%) and 41–60 (40.80%). In terms of education, the single largest group (45.17% of the total number surveyed) left education when they completed high school. The sociodemographic characteristics of respondents are shown in Table 1.

Table 1 – Sociodemographic characteristics of respondents.

		Frequency	(%)
Gender	Male	321	50.0
	Female	321	50.0
Age	<20	15	2.34
	21–40	265	41.28
	41–60	262	40.80
	61–80	100	15.58
Education	High school graduate	290	45.17
	Bachelor's degree	210	32.71
	Master's degree	131	20.40
	Doctorate	11	1.71

The main motives for visiting Golija-Studenica BR, rated by the respondents on a 5-point Likert scale, were subjected to factor analysis. First, the appropriateness of using factor analysis was checked. To simplify the loadings of items, Varimax rotation was used. A considerable number of variables correlated at the 0.30 level or above. The data was considered suitable for factor analysis because the Kaiser-Meyer-Olkin value was 0.796, and because the statistical significance according to Bartlett's Test of Sphericity was confirmed ($p = .000$). The Scree plot identified a

break after the second factor. Factor 1 (*Passive motives*) and Factor 2 (*Active motives*) were therefore included in further analysis. All items had factor loadings of more than 0.5. Factor 1 explained 40.34% of the variance, and Factor 2 27.09%. This means that 67.43% of the total variance was explained by these two factors. Cronbach's alpha, i.e. a reliability coefficient of 0.801 for *Passive motives* and of 0.732 for *Active motives*, confirmed that reliability was achieved. The motives rated over 4.50 were M_7 : *Active vacation in nature (Skiing, Hiking, Biking, Mountain climbing, etc.)*; M_8 : *Picking medicinal herbs, forest fruits or mushrooms*; M_3 : *Educational eco-tours*; M_4 : *Enjoying viewpoints and landscapes*; M_{11} : *Hunting*; M_{12} : *Fishing*. Overall, the mean score of the *Active motives* was 4.43, while the *Passive motives* had a slightly lower rating, of 4.28 (Table 2).

Factor analysis was also used to reveal dimensions of visitor satisfaction with elements of Golija-Studenica BR's tourism offer. According to a Kaiser-Meyer-Olkin value of 0.796, and the statistical significance of Bartlett's Test of Sphericity ($p = .000$), data was suitable for factor analysis. The Varimax rotation revealed the presence of a simple structure of factor loadings. Four factors explaining 67.43% of variance were derived: *Facilities and services* (21.76% of variance), *Preservation* (17.67% of variance), *Organized activities* (10.74% of variance), and *Hospitality and approachability* (8.54% of variance). Factor loadings for all items were found to be above 0.5. Cronbach's alpha ranged from 0.697 (*Hospitality and approachability*) to 0.865 (*Facilities and services*). Visitors gave the highest scores (i.e. ratings over 4.50) to the following elements of the tourism offer: S_6 : *Wealth and preservation of natural beauty, flora, and fauna*; S_2 : *Quality and diversity of gastronomic offer*; S_3 : *Quality and diversity of outdoor sports and recreational offer*; S_5 : *Organization of excursions to introduce the traditions and customs of local communities*. According to mean scores of factors, *Organized activities* were rated highest ($M = 4.46$), while *Hospitality and approachability* were rated lowest ($M = 3.84$) (Table 3).

Table 2 – Visitor motivation for visiting Golija-Studenica BR: Factor analysis results and mean values.

Factor	Factor loading	Eigen value	Explained variance	Cronbach's Alpha	Mean
Factor 1: Passive motives		4.039	40.34%	0.801	4.28
M_1 – Passive vacation in nature	0.921				4.16
M_2 – Introduction to the local way of life (culture, traditions, gastronomy)	0.811				4.18
M_3 – Educational eco-tours	0.789				4.61
M_4 – Enjoying viewpoints and landscapes	0.766				4.54
M_5 – Wildlife watching	0.732				4.21
M_6 – Cultural-historical heritage	0.654				3.97
Factor 2: Active motives		3.251	27.09%	0.732	4.43
M_7 – Active vacation in nature (Skiing, Hiking, Biking, Mountain climbing, etc.)	0.841				4.88
M_8 – Picking medicinal herbs, forest fruits or mushrooms	0.715				4.75
M_9 – Camping & Picnics	0.651				3.92
M_{10} – Environmental events and workshops	0.636				4.00
M_{11} – Hunting	0.513				4.51
M_{12} – Fishing	0.501				4.54
Total variance explained			67.43%		

Table 3 – Satisfaction with the elements of Golija-Studenica BR's tourism offer: factor analysis results and mean values.

Factor	Factor loading	Eigen value	Explained variance	Cronbach's Alpha	Mean
Factor 1: Facilities and services		2.61	21.76%	0.865	4.24
S ₁ – Quality and diversity of accommodation facilities	0.796				3.98
S ₂ – Quality and diversity of gastronomic offer	0.751				4.77
S ₃ – Quality and diversity of outdoor sports and recreational offer	0.736				4.62
S ₄ – Picnic and camping sites	0.531				4.13
S ₅ – Tourist info. centres and info. points	0.519				3.70
Factor 2: Preservation		2.12	17.67%	0.803	4.34
S ₆ – Wealth and preservation of natural beauty, flora and fauna	0.863				4.86
S ₇ – Wealth and preservation of cultural and historical heritage	0.820				4.03
S ₈ – Preservation of rural area and traditional rural architecture	0.744				4.15
Factor 3: Organized activities		1.29	10.74%	0.702	4.46
S ₉ – Organized excursions with the purpose of introducing the traditions and customs of local communities	0.622				4.50
S ₁₀ – Quality and organization of educational content	0.609				4.43
Factor 4: Hospitality and approachability		1.03	8.54%	0.697	3.84
S ₁₁ – Hospitality and approachability of employees and local population	0.771				3.89
S ₁₂ – Road access	0.589				3.80
Total variance explained			58.71%		

Based on the factor analysis, several regression analysis models were set up in order to check whether the composite motivation factors for visiting Golija-Studenica BR (passive and active motives) were important in determining each composite factor of satisfaction with elements of the destination's tourist offer (satisfaction with facilities and services, preservation, organized activities, and hospitality and approachability). These composite factors of satisfaction were taken as constant variables, and therefore four models were defined in order to run the regression analysis. The results of the regression analysis showed that 25.9% of the variation pertaining to satisfaction with facilities and services was explained by the variables included in *Model 1*. The passive motives were considered the most important indicators of visitor satisfaction with facilities and services in Golija-Studenica BR: their statistical significance was 0.003 ($p < .10$). Passive motives also had a significant impact on visi-

tor satisfaction with facilities and services ($\beta = .361$). A total of 32.3% of the variation concerning satisfaction with preservation was explained by the variables included in *Model 2*. The results indicated that, once again, passive motives were important indicators, in this case for visitor satisfaction with preservation in Golija-Studenica BR ($p = .000$), and that they had a significant impact on this type of satisfaction ($\beta = .329$). In terms of satisfaction with organized activities, the variables included in *Model 3* explained 28.6% of the variation. The statistical significance of active motives in this model was .001, meaning that such motives are important indicators in determining visitor satisfaction with organized activities in Golija-Studenica BR. With a beta coefficient score of .377, active motives were shown to significantly impact visitor satisfaction with organized activities. The variables included in *Model 4* explained 31.6% of the variation concerning satisfaction with hospitality and approachability. The

Table 4 – Results of several regression analysis.

	Std. Beta Coefficient	t-value	Sig. level
Model 1 (Note: $R^2 = .259$; F change = 8.383; $p = .000$)			
Satisfaction with facilities and services (constant)		3.321	0.034
Passive motives	0.361	5.601	0.003
Active motives	-0.084	-1.425	0.211
Model 2 (Note: $R^2 = .323$; F change = 9.362; $p = .000$)			
Satisfaction with preservation (constant)		2.152	0.021
Passive motives	0.329	5.230	0.000
Active motives	0.071	1.728	0.459
Model 3 (Note: $R^2 = .286$; F change = 7.452; $p = .000$)			
Satisfaction with organized activities (constant)		2.135	0.022
Passive motives	-0.012	-0.030	0.972
Active motives	0.377	5.989	0.001
Model 4 (Note: $R^2 = .316$; F change = 9.614; $p = .000$)			
Satisfaction with hospitality and approachability (constant)		3.101	0.041
Passive motives	0.015	0.820	0.263
Active motives	0.032	0.850	0.597

Table 5 – Standardized coefficient derived from multiple regressions according to gender, for each satisfaction factor. * $p(t) < .05$

Male					Female			
Satisfaction with								
	facilities and services	preservation	organized activities	hospitality and approachability	facilities and services	preservation	organized activities	hospitality and approachability
Passive motives	0.42*	0.02	0.15	−0.19	0.74*	0.36*	0.03	0.33
Active motives	0.17	0.09	0.61*	0.32*	−0.02	0.59*	0.87*	−0.14
	R ² = .301; F change = 8.542; p = .000	R ² = .319; F change = 9.298; p = .000	R ² = .279; F change = 7.359; p = .000	R ² = .315; F change = 9.620; p = .000	R ² = .248; F change = 8.102; p = .000	R ² = .341; F change = 9.412; p = .000	R ² = .294; F change = 7.653; p = .000	R ² = .318; F change = 9.706; p = .000

results indicated that neither passive ($p = .263$) nor active motives ($p = .597$) were important indicators in determining visitors' satisfaction with hospitality and approachability.

The additional gender-specific regression analysis aimed to investigate whether passive or active motives were important indicators of gender-based differences relating to the four factors of satisfaction. Men were found to identify passive motives as important indicators of satisfaction with facilities and services, while women considered passive motives to be significant drivers of satisfaction with preservation, hospitality and approachability, as well as satisfaction with facilities and services. Active motives were shown to have an impact on satisfaction with organized activities for both groups, men and women alike. Active motives were also identified as good predictors of satisfaction with hospitality and approachability in men, and of satisfaction with preservation in women (Table 5).

Discussion

According to studies, the dominant motives for visiting nature reserves are the excitement of seeing animals up close, taking part in different activities, having an enjoyable experience, and feeling a sense of wonder or awe. The most common visitor activities in biosphere reserves include enjoying the scenery, trekking and hiking (Ballantyne et al. 2011; Panin & Mbriica 2014; Hakim & Soemarno 2017; Carvache-Franco et al. 2020; Sánchez-Martín et al. 2020). The results of this study indicate that the main motives for visiting Golija-Studenica BR are primarily active ones, such as M7: *an active vacation in nature (Skiing, Hiking, Biking, Mountain climbing, etc.)*; M8: *Picking medicinal herbs, forest fruits, or mushrooms*; M11: *Hunting*; M12: *Fishing*. When it comes to passive motives, the most dominant are M3: Educational eco-tours and M4: *Enjoying viewpoints and landscapes*. These findings are similar to those of papers by other authors, where the dominant motives are linked to enjoyment, learning and discovery (Vistad et al. 2020; Ballantyne et al. 2011).

The study carried out by Meng et al. (2008) points out that motivation factors do not have any sta-

tistically highly significant impact on visitor satisfaction with a tourist destination. Our research, on the other hand, indicates that passive motives are significantly important indicators of visitor satisfaction with preservation, as well as with the facilities and services offered in Golija-Studenica BR, while active motives are significantly important indicators in determining satisfaction with organized activities. Where gender is concerned, some earlier studies suggest that female tourists are motivated to stay in nature for the purposes of learning, enjoyment of well-preserved landscapes and passive enjoyment (Li et al. 2005; Saayman & Van der Merwe 2008; Kruger & Saayman 2010). McGehee et al. (2007) note that the importance of gender in tourism should not be overlooked. Beerli and Martin's (2004) research shows that there are gender differences in the satisfaction of people who are visiting a destination for the first time. Also, according to their study, women rate the natural and cultural values of tourism destinations, as well as their infrastructure, more highly than men do. Heung et al. (2001) state that women more than men prefer to use their free time for travelling. Kim et al. (2003) find that women place more importance on the push factor of *family togetherness and study*, whereas men emphasize pull factors of *appreciating natural resources and health* and *adventure and building friendships*; as a pull factor, women perceived *key tourist resources* at national parks to be more important than did men. The results of our study also indicate that there are indeed gender-based differences when it comes to motivation and satisfaction with the BR's tourism offer: passive motives are better predictors of women's satisfaction with the offer (Satisfaction with facilities and services, Satisfaction with preservation, Satisfaction with hospitality and approachability) than is the case for men (Satisfaction with facilities and services). There are also differences when it comes to active motives: these are good predictors of men's satisfaction with hospitality and approachability, and for women's satisfaction with preservation.

In future, the development of a tourism destination should take visitor satisfaction into account. While Vigolo et al. (2018) point out that gender has no impact on visitor satisfaction, our research points out that there are differences between women and

men regarding their motivation and satisfaction with Golija-Studenica BR's tourism offer.

Conclusion

The development of tourism in biosphere reserves can have multidimensional significance for the entire region. Based on the research results and discussion presented in this study, it can be concluded that there are gender differences among people visiting Golija-Studenica BR where their motivation and satisfaction with the tourism offer are concerned. Passive motives are more likely to influence the satisfaction of female visitors to the BR, while active motives are predictors of their satisfaction with preservation. On the other hand, active motives are important indicators of satisfaction with hospitality and approachability for male visitors. For both female and male visitors, passive motives are predictors of satisfaction with facilities and services, and active ones are predictors of satisfaction with organized activities. The results also indicate that passive motives are important indicators for visitor satisfaction with preservation, facilities and services, while active motives are significantly important indicators in determining satisfaction with organized activities.

Studies examining visitor motivation and satisfaction in natural areas are important for the implementation of preservation strategies, while information about visitors' experience in such areas may support their future protection. The identification of motives that can determine visitor satisfaction independently of the visit motivation is very useful in terms of destination marketing planning. Bearing in mind that visitors are heterogeneous, their demographic profiles should be taken into consideration in the development of tourism products and promotional programmes. More diverse nature-based tourism services should provide financial incentives to local residents to encourage tourism and support the conservation goals of the biosphere reserve (Hearne & Santos 2005).

The results of the present research have both scientific and practical value. This study aims to explore the actual and potential contributions of biosphere reserves to tourism development, while the results can be used for comparison with biosphere reserves around the world. There are no earlier studies investigating visitor motivation and satisfaction with regard to BRs in Serbia. Furthermore, this study makes a scientific contribution to the international knowledge base about visitors' motives and satisfaction in biosphere reserves. Further scientific implications of this study are evident: to date, there have been no studies that focus on gender differences in visitor motivation and satisfaction regarding biosphere reserves. The practical aspect of this contribution lies in the possibility of using the results to modify Golija-Studenica BR's tourism offer in such a way as to satisfy visitors' needs and demands that are conditioned by various sociodemographic characteristics. The main limita-

tions of this study are related to the time period during which the survey was conducted. Future research should be conducted throughout the year, and additionally could focus on day-trippers who come to Golija from nearby tourist centres. The questionnaire should be expanded with questions relating to the satisfaction of day-trippers, accessibility of reserves, quality of infrastructure, and respect for the principles of sustainable development and environmental protection. It should also allow a much more detailed analysis of sociodemographic characteristics of visitors, such as age, marital status and level of education.

As this research relates only to visitors to Golija-Studenica BR, a similar study of motivation and satisfaction with the tourism offer of another biosphere reserve in Serbia, Bačko Podunavlje, is needed. Future research could also analyse the attitudes of the local populations, which could contribute to improving the quality of the tourism offer, and nature preservation and conservation.

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Austrian UNESCO Biosphere Reserves as model regions for regional culinary enjoyment

Günter Köck

Keywords: biosphere reserves, sustainable development, food products, marketing, partner networks

Abstract

In many UNESCO Biosphere Reserves (BRs), the production and marketing of regional farm produce are an essential, if not the most important, contribution to regional development. Using the example of the Austrian BRs, this article reviews the possibilities and framework conditions for the production and marketing of farm produce, and discusses culinary potential as an important component of the sustainable development of the region in national and international contexts.

Introduction

Today, protected areas such as national parks, UNESCO Biosphere Reserves (BRs) and nature parks are increasingly taking on regional economic activities and playing an important role in the economic development of the region. The production and marketing of regional farm produce are important contributions to regional development. BRs, with their multifunctional orientation as model regions for sustainable development, are particularly suitable for establishing environmentally sound land-use concepts and regional marketing structures for sustainable local products.

Like many other BRs, those in Austria face the challenge of combining biodiversity conservation with economic development in the best possible way. As agriculture still plays a central role in BRs' traditional cultural landscapes, many initiatives in recent years have focused on agriculture (Weixlbaumer & Mose 2019). The broad spectrum of possible actions ranges from close-to-nature and site-appropriate land use, the use of environmentally friendly technologies, to the implementation of forms of tourism that are compatible with both (social or tourist) expectations and environmental concerns. Particular potential lies in the development of regional value chains, starting with the production, distribution and marketing of environmentally friendly regional products. Regional culinary products can have positive effects on several levels: for producers, they are a source of additional income; for local people, they are an essential element of food supply; for visitors, they are sought-after souvenirs. Thus, culinary products are valuable instruments for nature conservation, education and regional development (Asamer-Handler & Handler 2019). Regional farm produce can be vehicles for making people more aware of the concept of sustainability and of the importance of biocultural diversity, while at the same time promoting the economic development of the region.

Using the four Austrian BRs as examples, this paper aims to showcase the opportunities that the regions have in terms of the production and marketing of farm produce and local specialties. The BRs' po-

tential for delivering culinary enjoyment will also be discussed, with regard to how it can be used to implement the complex BR concept in a national and international context. At the same time, the relationships between producers, consumers and gastronomy businesses will be elucidated.

The Austrian BRs

With the Großes Walsertal, Salzburger Lungau & Kärntner Nockberge, Wienerwald and Lower Mura Valley BRs, Austria currently has four model regions for sustainable development (Figure 1, Table 1). A variety of foodstuffs are made in the BRs, ranging from traditional local products that have been produced in the regions for a long time, to innovative products that use new production methods.

The description and selection of the examples presented in this article are based on an extensive literature review, enquiries made in the BRs, and informational interviews with representatives of the BRs' management and producers on site. The aim is to present the current spectrum of culinary BR products as comprehensively as possible (see also Table S1, available online).

Culinary enjoyment as an opportunity for conservation of biocultural diversity and sustainable development

The UNESCO Man and the Biosphere (MAB) Programme's BR concept is ideally suited to protecting valuable natural and cultural landscapes, which have often been influenced and shaped by man for centuries, for future generations, in a sustainable manner. In the second half of the 20th century, the great intensification of agriculture led to excessive degradation of cultural landscapes and to a significant decrease in agrobiodiversity. At the same time, political and cultural resistance to this process of agro-industrialization developed. Sustainability experts, civil society and consumers are increasingly calling for change. The typical small-scale ecological agriculture of BRs is not only

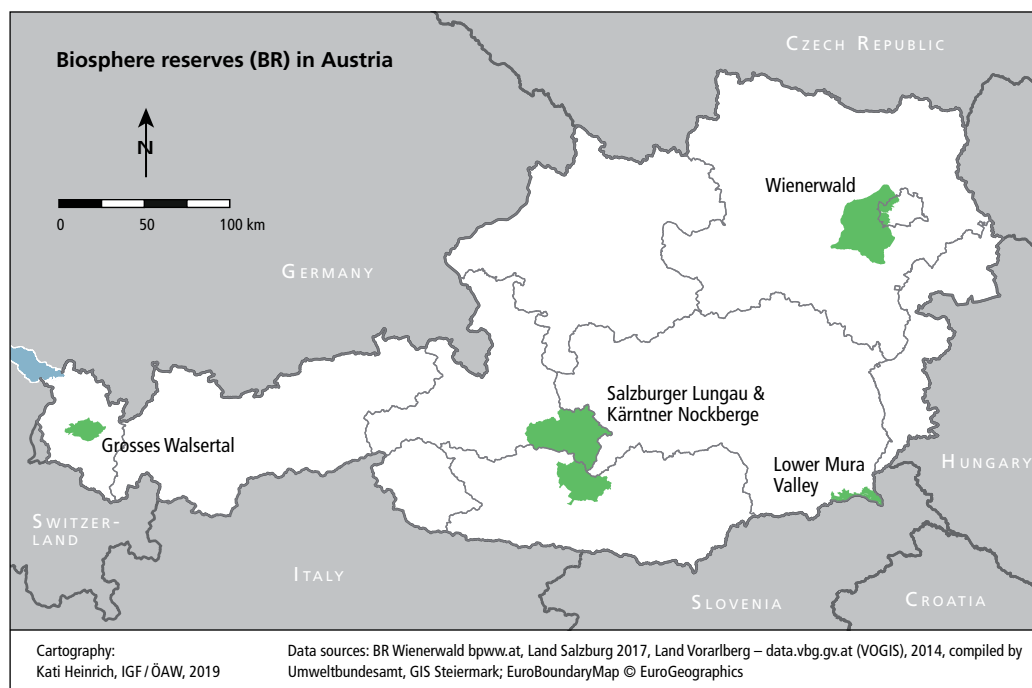


Figure 1 – BRs in Austria.

more efficient in terms of land and energy use, but also combines food security with climate protection and soil conservation. In addition, it also forms the basis for the long-term culinary enjoyment potential of a region by providing traditionally produced food, heritage varieties of fruit and vegetables, and tasty local specialties (Weixlbaumer & Mose 2019).

In times of climate change, the protection of diverse, small-scale agricultural landscapes, associated with locally adapted, sustainable agricultural practices, as well as the promotion of local, artisanally made goods, is particularly indispensable. Preserving a high level of agrobiodiversity, which secures not only the future basis of human life but also the supply of a diverse range of high-quality foods, includes the conservation of habitats, species and intra-species diversity (IPBES 2019; BfN 2020). Several international initiatives aim to contribute to this. These include the Globally Important Agricultural Heritage Systems (GIAHS) programme of the Food and Agriculture Organisation (FAO) for the conservation of agricultural heritage, and the Interreg AlpFoodway project for the preservation of the cultural food heritage in the Alpine region (Scheurer et al. 2018; AlpFoodway 2019; FAO 2020). Such aims have now also become an international concern at the political level, as demonstrated by the

declaration of the agriculture ministers of the world's biggest economies (G20) in July 2018, which promised, among other things, to promote sustainable agriculture and agri-food supply chains, and to revitalize sustainable traditional farming systems (G20 2018). Outdoor-based livestock farming, the avoidance of high nutrient loads through synthetic fertilizers, as well as voluntarily avoiding the use of synthetic pesticides, as in organic farming, are indispensable strategies in this context. They are also called for in the Farm2Fork strategy published by the European Commission in May 2020 (European Commission 2020a,b).

For BRs, it would certainly be desirable to obtain a protected geographical indication of origin for their culinary products, such as inclusion in the EU's Register of Protected Designation of Origin (PDO) or Protected Geographical Indication (PGI). PDO means that the entire production process of a product in a specific geographical area must follow a recognized, established and legally controlled procedure. For PGI, it is sufficient if at least one of the stages of production (production, processing or manufacture) has taken place in a specific region of origin, or if the product has a particular reputation or quality.

Through strict protection and control, displaying a label of legally protected geographical origin means

Table 1 – List of biosphere reserves in Austria.

Biosphere Reserve	Federal province	Established	Size [ha]	Location
Großes Walsertal	Vorarlberg	2000	19 200	47° 13' 8" N, 9° 54' 8" E
Wienerwald	Vienna, Lower Austria	2005	105 004	48° 8' 28" N, 16° 4' 56" E
Salzburger Lungau & Kärntner Nockberge	Salzburg, Carinthia	2012	148 914	46° 58' 09" N, 13° 43' 32" E
Lower Mura Valley (Unteres Murtal)	Styria	2019	13 180	46° 43' 34" N, 15° 50' 46" E

significant added value for both producers and consumers. Such labels are credited by consumers with a high degree of trust, for whom they signal a high level of quality. As a result, many consumers are prepared to pay higher prices for such products, which can naturally benefit regional value-creation (EU-IPR Helpdesk 2016; WIPO 2017).

The same applies to the two global initiatives of the Slow Food Foundation for Biodiversity, namely Ark of Taste and Presidia (Slow Food 2018). Although these do not offer legally controlled protection of origin, they do contribute to awareness-raising and strengthen short (regional) quality-oriented supply chains. By anchoring supply chains in regional ecosystems, landscapes and cultural areas, such initiatives can contribute to bio-cultural diversity, and to the preservation of region-specific production structures, skills and jobs (Ermann et al. 2018).

Regional culinary enjoyment as an opportunity for sustainable development

Culinary delights are an excellent vehicle for marketing local products as a quality feature of a region (Köck et al. 2013; Weixbaumer & Mose 2019). Furthermore, the production and sale of regional culinary products contributes not only to the conservation of bio-cultural diversity, but also to the stimulation of the regional economy (Kraus 2015; Ketterer Bonnelame et al. 2019).

Locals and tourists alike value authentic, high-quality regional goods, produced in an environmentally friendly manner, that allow identification with the region. For tourists, edible souvenirs from their holiday region have a high reminder value and may inspire them to visit the place again. Studies show that, regardless of people's primary travel motives, enjoyment of local culinary specialities is important on holiday and therefore has a decisive influence on the image of a destination. According to these studies, approximately 30% of holiday expenditure is on food and beverages (Stöckl 2015, 2017). This means that the local culinary offer is seen as an important addition to the overall offer of a destination, giving a competitive advantage to regions that can offer local specialities and various culinary activities (e.g. tastings and demonstrations). The quality of the culinary experience is therefore a decisive factor in terms of visitor satisfaction and loyalty.

According to a study conducted on Austrian consumers by the University of Applied Sciences Krems, food and nutrition have become a lifestyle issue. Furthermore, regionality, seasonality and ethical correctness have become important factors influencing the decision for or against purchasing a given product (Stöckl 2015).

Many gastronomic and tourist accommodation businesses are following this trend and increasingly use regional products. Unfortunately, after initial en-

thusiasm, many of these initiatives fail due to the often-limited availability of regional products. Particularly in tourist areas with large gastronomic and tourist accommodation structures, many businesses regret the small size of the available product range, as well as the shortfall in supply resulting from the small size of the producers.

If local people bought more regional products, they would make it easier for local producers to survive economically and thus enable the expansion of production and distribution structures. If there was sufficient supply and thus security of supply, the gastronomic and accommodation businesses would increasingly choose these products and thus further secure the economic success of the producers. However, gastronomic and tourist accommodation businesses, producers, tourists and consumers must all be able to demonstrate a certain degree of flexibility: not all products have to be (or can be) available at all times and in the desired quantities.

Strategies to promote regional culinary enjoyment

An active BR management could play a significant role as initiator, facilitator and information hub in the implementation of strategies for promoting regional cuisine, like the preservation of region-specific production structures and bio-cultural diversity.

Partner networks

An active BR management could certainly help as a platform and provider of ideas for local agriculture, trade and tourism. The BR management could play an important role in establishing a partner network by moderating and supporting the development of criteria for becoming partner businesses and for BR products. Eligible to become BR partners would be companies from various sectors committed to the sustainable development of the region, resource protection and the promotion of regional value chains. Good examples can be found in numerous BRs in Switzerland, Sweden and Germany, where well-functioning networks of business partners have been developed, e.g. in the Entlebuch, River Landscape Elbe and Rhön BRs (Knaus et al. 2017; Flusslandschaft Elbe 2018; Rhön 2019).

When drawing up the framework conditions in a participative process with all stakeholders, care must be taken to ensure that ambitious but achievable goals are set. Criteria that are overambitious and / or too narrowly defined, which overstretch the capabilities of many companies and thus exclude some from the outset, are counterproductive. Of course, the involvement of organic farms is absolutely desirable and should be encouraged. However, for *organic* status to be a mandatory criterion is counterproductive if a significant number of farms in the area do not operate (officially) according to organic criteria. But it often happens that

farms, especially smaller ones, *do* produce according to organic standards but cannot afford official organic certification and the associated requirements.

Usually, certified partner farms in a BR are entrepreneurial, are committed to sustainable regional development, and thus underline the MAB programme's claim to show exemplary ways of sustainable development in its model regions. For example, the BR managements of the German federal states of Lower Saxony, Mecklenburg-Vorpommern, Brandenburg and Sachsen-Anhalt, and the *Kommunale Arbeitsgemeinschaft zur Zusammenarbeit im Elbetal* (KAG) (the municipal working group for cooperation in the Elbe Valley) have created a standardized conceptual framework for interested businesses in the River Landscape Elbe BR. The framework is in line with the guidelines for partnerships as represented by the umbrella organization for all large-scale German protected areas, the *Nationale Naturlandschaften e.V.* (Flusslandschaft Elbe 2018). For certification, a contract between the BR management and the partner company, in which the rights and obligations of the contractual partners are defined, is mandatory. This is intended to support an important objective of a BR (as well as to support interested companies in the region) – namely to safeguard and to further develop local ways of life and economic activity, in a manner that is permanently environmentally compatible, and the infrastructure required for this, including the social and cultural foundations.

Regional branding

During an international MAB workshop on Biosphere Reserve Branding Through High Quality Products and Gastronomy, it was emphasized that branding and labelling of high-quality food products and gastronomy in BRs should play an essential role in the implementation of the Lima Action Plan 2016–2025 for the MAB Programme and its World Network of Biosphere Reserves, notably for reaching the desired outputs of actions C7.1 *Global BR brand established with associated national guidelines*, and C7.2 *BR brand used in marketing of goods and services in line with national guidelines* (MAB 2016).

The creation of a regional brand would certainly be a milestone for a BR in increasing the added value of a region. An excellent example of successful brand development is the *Echt Entlebuch* brand owned by the *Association of Municipalities* within the Entlebuch BR. This seal of quality is awarded to specialties that are produced in the BR in accordance with strict guidelines, thus offering consumers the guarantee of a high-quality regional product. Products bearing the label are sold both inside and outside the Entlebuch BR to customers who are prepared to pay a higher price for innovative products of known origin and / or quality. In the BR itself, this strategy not only leads to additional sales volumes and thus to higher added value and the preservation of jobs, but also stimulates innovative product development (Ketterer Bonnelame

et al. 2019). The brand, under which more than 500 products are now certified, thus serves as a successful culinary ambassador far beyond the BR's borders (Biosphäre Entlebuch 2020), generating more than six million euros in added value (Knaus 2012; Knaus et al. 2017; Ketterer Bonnelame et al. 2019). However, the development of a successful brand label is time-consuming, requiring a participatory bottom-up process involving the largest possible number of people and companies; it also requires trust and constructive cooperation between the BR's management and producers (Ketterer Bonnelame et al. 2019).

Of the four Austrian BRs, only two (GWBR, and Nockberge [part of the SL&KNBR]) have so far created their own brand labels for products that comply with quality criteria.

Unfortunately, creating business partnerships and the marketing of BR products are confronted by a major hurdle set up by UNESCO itself, namely the extremely restrictive guidelines on the use of UNESCO's own name, acronym and logos. Accordingly, neither the UNESCO logo (the well-known *Temple*) nor the official BR logo (composed of the UNESCO logo and the logo of the MAB programme) may be used for commercial purposes. This includes all forms of advertising, the sale of goods and services, merchandising, and commercial publications distributed through bookshops. Violation of this counter-productive rule may result in legal action being taken by UNESCO. As a result, BRs have not yet been able to use the world-famous UNESCO logo to advertise their high-quality products or to award to partner enterprises. The International Co-ordinating Council of the MAB programme has been trying to find a solution to this problem for many years through working groups and workshops.

Product marketing

While locals of course know where they can get local produce, it is usually much more difficult for tourists to find out where they can buy local food-stuffs. This is where the BR's management could provide support in the form of attractive informational material. It would certainly be an incentive for guests if accommodation businesses or restaurants offered a range of regional or even home-made products. In addition, the BR visitor centre (if there is one) or the local tourist office could offer a range of regional products for sale. In Austria, the visitor centre of the BRGW is a positive example in this respect: here, a BR Bistro offers high-quality local BR products and products from two other Austrian BRs (BRGW 2018b). Creating a year-round BR visitor centre, which is mentioned as a *target criterion* in the *Criteria for BRs in Austria* (MAB-Austria 2016) drawn up by the Austrian National Committee for the UNESCO MAB programme, would certainly be attractive for residents and visitors to the region alike if it also functioned as a sales outlet for regional products.

As a study carried out in German BRs shows, many companies see a need for support through the BR's management, particularly in the areas of advertising and public relations (Kullmann 2007) – functions which could be fulfilled by year-round visitor centres.

From the perspective of environmental protection, logistics for the distribution of products represents a major challenge. Numerous studies show that transport routes are less significant in terms of impacts on climate-change than inefficient production and processing structures (Ermann et al. 2018). Shorter transport routes do not necessarily result in a smaller carbon footprint: for example, the CO₂ efficiency of vehicles used for direct marketing is considerably lower than that of larger container ships. Thus, goods produced locally in glasshouses are not necessarily better than imported goods in terms of climate protection. Moreover, for ecological as well as economic reasons, it usually makes little sense to use motor vehicles for the delivery of individual products in the course of direct marketing. New online platforms with regional distribution points could help here in the future. The Austrian food platform *Markta* is a kind of digital farmers' market that links producers and consumers (Markta 2018). Here, producers can make their products visible and market them in a self-determined manner, at fair prices. High-quality and traceable manufactured goods are offered by regional micro-producers, about whom consumers also receive comprehensive information. The products are delivered directly from the farm, either individually or in a so-called combined shipment. Local suppliers and cooperatives serve as regional collection and dispatch points, and bundle orders from several producers at one location for combined dispatch or collection on site. This reduces distribution costs and carbon emissions.

In summary, given the fast and well-functioning logistics systems already in place, the exchange of products between BRs could certainly be expanded with ease. Here too, an active BR management could not only contribute to the development of distribution networks, but also serve a central function for regional marketing. A German study shows that BR administrations have a key role to play in this respect (Kullmann 2005): after initial joint activities, the economic actors of a region expect the BR's management to take a leading role with regard to sustainability and the marketing of quality, as well as to provide continuity in terms of qualified and committed BR staff as key contacts.

Studies show that the culinary factor can play a decisive role in many types of holiday (Stöckl 2015, 2017). While alone the culinary offer is not usually a reason for choosing a destination, a non-existent offer, or one that is difficult for travellers to research, may be a reason to exclude a destination. For this reason, too, increased cooperation between the BR management, tourism associations, gastronomy and producers would be helpful.

With regard to the presentation and authenticity of its regional products, Italy can certainly serve as a role model. In the famous folk festivals known as *Sagre*, which attract large numbers of people, local products and specialties are put in the spotlight. While in the past these historic festivals usually had a religious character, many similar events have come into being in recent years with the aim of promoting regional gastronomic specialties.

UPVIVIVUM, initiated by the Italian MAB National Committee in 2017, can be seen as an exemplary project that combines many aspects discussed in this article. This initiative is a gastronomic competition that brings together producers and food-lovers. The idea behind it is that BRs not only offer high-quality farm produce, but that their production techniques are also closely linked to the protection of the landscape and the environment. UPVIVIVUM is a network of five Italian BRs, which are very diverse in terms of landscape and culture, but share a common vision: outstanding cuisine, with an emphasis on products guaranteed to be local (*zero km* – zero foodmiles), and the protection of local varieties / races and cultural biodiversity (UPVIVIVUM 2019). The success of the project, which recognizes the important role of gastronomy as a vehicle for promoting the values of BRs and their underlying concept, is confirmed by the number of participants: in 2018 / 2019, which focused on the theme of bread, over 100 producers and 35 restaurants took part (Lenzerini 2019).

In the Austrian BRs, the promotion of authentic regional products by means of special events, which reach far beyond the borders of the BRs themselves, could certainly be expanded.

Partnerships between farmers and cooks

Committed gastronomic businesses can help to achieve the desired regionality of products by encouraging local producers, building their confidence and educating them. An outstanding example of this strategy, which unfortunately does not come from a BR region, is that of the renowned and multiple award-winning South Tyrolean chef Norbert Niederkofler. Almost 10 years ago, he radically regionalized the cuisine of his Restaurant St. Hubertus in Alta Badia (South Tyrol, Italy), which until then had been based on international ingredients (Burghardt 2013). This change became possible only through years of persistent persuasion and motivation work among local producers. According to Niederkofler, it is important not only to confirm for farmers how important their work is, but also to give them purchase guarantees and to pay prices for their products that reflect the value of their work. Niederkofler also initiated the *Cook the Mountain* project presented at EXPO 2015 in Milan. The project, on mountain gastronomy, includes research workshops and events aimed at introducing the public to mountain cuisine and culture. The project is constructing a network of chefs, farmers, breeders,

alpinists, naturalists, sociologists and businesses from mountain regions worldwide. In addition, Niederkofler is committed to ethical responsibility and sustainability in the gastronomy business with his *CARE's* project (*the Ethical Chef days*). This involves the responsible use of natural resources, appreciation of the work of producers and farmers, waste avoidance and recycling of leftovers (Niederkofler 2018).

Best practice examples of restaurants that have established successful partner networks with producers can, of course, also be found in Austria – for example, the Reitbauer family with the *Steirereck* and *Wirtshaus* Pogusch restaurants, Andreas Döllerer from Döllerers *Genießerrestaurant* in Golling, or Josef Floh of *Gastwirtschaft Floh* in Langenlebarn. The chef of *Gastwirtschaft Floh* obtains almost all the produce used in the kitchen from within a radius of around 66 km of the restaurant. Diners in these restaurants will certainly appreciate that a good proportion of the vegetables on their plates comes from farmers 'just around the corner', instead of being transported over long distances by plane or truck.

All initiatives have one thing in common: they establish and showcase local producers as important partners of the local gastronomy, highlighting the special features of regionality and sustainability, and thus contributing to the continued existence of the products and to the economic survival of the producers.

Although BRs as model regions for sustainable development would be ideal for such cooperation, successful networks between chefs and producers seem to be under-represented in Austria's BRs.

Cookbooks

Regional cuisine is not only an important element of cultural identity; it also contributes to the sustainable economic development of a region by increasing the demand for, and consumption of, local produce. A cookbook presenting the beauty and uniqueness of a region and its culinary products in an attractive way, allowing producers and chefs alike to express the meaning and benefits of their work, as well as explaining the possible benefits of enjoying local products on the region, can be an ideal instrument for helping public understanding of the complex interrelationships between an often centuries-old cultural landscape and the products created from it, and the need to protect the region and its biodiversity through the sustainable use of its resources. Furthermore, a well-designed cookbook, even if specifically tailored to a BR, can also reach far beyond the boundaries of the BR. Indeed, in recent years, some BR managers have recognized the suitability of cookbooks as vehicles for promoting the complex concept of *BRs as model regions for sustainable development*.

Ten years ago, the Austria's national MAB Committee successfully used the culinary enjoyment potential of the country's BRs to bring the modern but rather abstract concept of the UNESCO BRs

closer to the public by means of a publicity campaign centred on a cookbook. The project, *Vielfalt Genießen* (Enjoying Diversity), was conceived as a three-stage programme. It started with a competition for schools during the International Year of Biodiversity 2010, followed by the publication of an award-winning cookery book, *The Austrian Biosphere Reserves. A Connoisseur's World*, and culminated in an educational programme about BRs, lasting more than a year, carried out at the *Landesberufsschule* Waldegg (a vocational college for the hotel and catering trades). This third stage of the project was complemented by BR-related activities (recipes using ingredients from the BRs; an information folder) in selected restaurants around the Wienerwald BR (Köck et al. 2011, 2013; Köck 2019).

Additional examples from Austria are the two cookbooks from the Grosses Walsertal BR (BRGW 2006, 2015). Further successful examples come from elsewhere in Europe: cookbooks from Schorfheide Chorin and Berchtesgaden BRs in Germany; a cookbook about the Dordogne BR in France; from Spain, a cookbook from the Gran Canaria BR, and one published by the Spanish Ministry of Agriculture, Fisheries, Food and Environment, with recipes from all 48 Spanish BRs (Stäblein 2009; Lenz 2014; Amir 2016; CdGC 2018; Ministerio 2018).

Meanwhile, the key roles of high-quality produce and gastronomy in BRs have also been recognized by the wider MAB Community. For example, an international MAB workshop on Biosphere Reserve Branding Through High Quality Products and Gastronomy recommended that the MAB programme should produce a cookbook that includes recipes from BRs around the world (MAB 2016).

The culinary enjoyment potential of Austrian BRs

A long-standing priority of the Austrian MAB Committee and BR managements has been and still is to significantly increase the level of popularity of Austria's BRs. The topic of culinary enjoyment is certainly a successful advertising strategy to get both the local populations and visitors interested in BRs.

The Austrian BRs have also recognized this, launching initiatives for the production and marketing of regional products. The introduction in 2005 of the *Genuss Region Österreich* brand, an umbrella brand of the Austrian Ministry for Agriculture, Regions and Tourism and Agrarmarkt Austria (AMA), was helpful in this context (Genuss Region 2019). The aim of this initiative was to make visible the regional origin and production methods of farm produce and specialties while also providing information about the culinary offers of the individual regions. Each region has a lead product, which the region has created and markets itself and which, if possible, has a close connection to the traditional cultural landscape of the area. In order

to take account of the growing trend towards regionality and consumers' desire to know where their food comes from and how it is produced, the brand, which is very well known in Austria, was realigned in 2020 within the framework of the *Culinary Austria* strategy with the introduction of the new seal of quality *AMA Genuss Region* and the founding of the *Netzwerk Kulinarik* (Culinary Network). The initiative also includes continuous monitoring of the quality and origins of products (Netzwerk Kulinarik 2020). The label can be used by certified, rural, direct marketers, producers and gastronomy businesses. This is intended to lay the foundation for stronger networking and synergies between all businesses involved in the value-added chain. The next step is to establish a joint sales and marketing strategy. An additional component of the initiative is the database of Traditional Foods in Austria, which aims to collect, make public and preserve traditional knowledge about Austria's culinary heritage. It contains details of produce and dishes that have been cultivated or made using traditional knowledge in Austria for at least 3 generations or 75 years (BMLRT 2015). Among the more than 100 Austrian regions of culinary enjoyment, seven belong to BRs: *Großwalsertaler Bergkäse Walserstolz* (mountain cheese), *Lungauer Eachtling* (potatoes), *Nockberge Almwind* (a breed of cattle that spends the summer grazing on mountain pastures), *Wiesennviernwald Elsbeere* (wild service tree), *Steirische Käferbohne* (Styrian scarlet runner bean), *Steirischer Kren* (Styrian horseradish) and *Steirisches Kürbiskernöl* (Styrian pumpkin seed oil). Four of these BR products are also protected by the PDO and PDI schemes (European Commission 2020c): Walserstolz mountain cheese known as Vorarlberger Bergkäse PDO, Styrian Scarlet Runner Bean PDO, Styrian Horseradish PGI, and Styrian Pumpkin Seed Oil PGI.

Selected examples of culinary delights from Austrian biosphere reserves

Here, due to limited space, we describe only products that are typical of the BR region, have a long tradition, and thus, to a certain extent, represent flagship products. A more complete list of typical BR products along with their detailed descriptions are presented as Supplementary Information (Table S1, available online).

Grosses Walsertal BR (GWBR)

One success story of this region is the founding of the *Walserstolz* cheese brand (Walserstolz 2018). Typical of the region are the many high-altitude alpine dairies, which are difficult to manage and have considerably higher production costs compared to their competitors. In the 1970s and 1980s, the situation was exacerbated by low milk prices, so there was a risk that many of these small farms would be abandoned. In 1998, Walserstolz created a common regional brand under which three alpine dairies produce high-quality

mountain cheese made from silage-free hay milk. The construction of a modern cooperative dairy in the village of Sonntag has greatly facilitated independent milk processing, with milk being bought at a reasonable price, and ensuring lower production costs and thus higher added value. The involvement of a larger company (Emmi Österreich GmbH) increased the supra-regional sales opportunities, such that many products have been available throughout Austria for a number of years. This has also increased the level of awareness of the BR throughout Austria. As a result, both jobs and traditional agricultural practices have been preserved. Traditionally, the summer months in the high alpine pastures play a major role in mountain farming. In the GWBR, 47 such pastures are currently being farmed, and on 20 of these the milk is transformed into various products directly on site during the summer (Rumpold & Klenovec 2019).

Another project is the herbal initiative *Alchemilla*, founded in 2006 by women who love and are knowledgeable about herbs, which aims to impart herbal knowledge and the special value of the region's plant diversity (BRGW 2018a). The members of the initiative offer seminars on local herbal knowledge that has been handed down over centuries, and convey the sensitive interactions between man and nature during herbal walks. The women also produce high-quality handcrafted products made from local herbs and raw materials, including body-care products and culinary delicacies such as herbal tea, herbal syrups and wild herbal salt.

The local added value creates jobs in the region and thus secures the living space for future generations. Furthermore, the use of regional crops also contributes to the preservation of traditional food, drinks and customs, which in turn encourage production of the traditional crops. The transfer of traditional knowledge of wild plants in natural areas, cultivated plants and agriculture is thus ensured.

Salzburger Lungau & Kärntner Nockberge BR (SL&KNBR)

A success story from the Salzburg part of the SL&KNBR is the conservation of Lungauer Tauern Rye, a heritage cereal that was typical of the region. This variety is well adapted to the harsh climatic conditions of the Lungau region and very well suited for cultivation in the marginal areas of grain cultivation due to its undemanding nature. Until the 1960s, Lungauer Tauern Rye was the most important cereal variety in the Upper Enns Valley (BMLRT 2017a). By the middle of the 20th century, the original seed was being propagated and marketed by more than 100 mountain farms in the Lungau. In 1954, the distribution of Tauern Rye reached its peak, with 122 hectares under cultivation; in 2005, the rye accounted for only about 2 hectares (Kulinarisches Erbe 2018). However, a Slow Food initiative launched in 2006, which led to the creation of the Lungauer Arche Association,

has quadrupled the area of Tauern rye, certified by the Austrian Food Safety Agency as now covering 8 hectares (Löcker 2020 pers. comm.). The cultivation of this variety makes an important contribution to the preservation of ecological diversity, the enrichment of the cultural landscape, and the development of a typical regional food culture.

The management of the Salzburg part of the BR is committed to creating infrastructure for the production of regional products by means of a participatory regional agenda. Among other things, this promotes the labelling, marketing and purchase of local quality products in order to preserve small-scale, traditional agriculture in the region (BRSL&KN 2018a).

The Carinthian part of the BR also offers great gastronomic potential. A few years ago, the BR's management, together with regional producers, reviewed potential BR products according to quality criteria and awarded them a label. These range from Nockberge alpine cattle, honey, fish and cheese, to alpine hay products (BRSL&KN 2018b).

The region has a centuries-old tradition of extensive livestock farming on the mountain pastures, which are located at between 1500 and 2440 metres a.s.l. The high quality of the meat of the Nockberge Almrind cattle is the result of the cattle being raised outdoors, including the obligatory summer grazing on the alpine pastures in the Nockberge area. The grazing of the alpine pastures up to the summit areas is a special feature of the region. The environmentally conscious and soil-conserving management of the farms and alpine pastures contributes significantly to the sustainable maintenance of the alpine landscape in the region.

The BR's management is strongly committed to supporting the producers in marketing their high-quality products and has recently created an online marketing platform for produce from the Nockberge region (Mayer 2021 pers. comm.). This creates and maintains jobs in the region, while the producers also do very valuable work for the preservation of the unique landscape and high biodiversity of the Nockberge.

Wienerwald BR (WBR)

A few years ago, the BR's management started to create a network of producing, processing and marketing companies in the fields of agriculture, gastronomy and accommodation, and to draw up criteria for membership. The *Biosphärenpark Wienerwald Partnerbetrieb* award is given to companies that live the philosophy of the BR (namely ecological, social and economic sustainability), and are committed to increased cooperation with the WBR and the surrounding area (BRWW 2020a).

The BR, founded in 2005, currently has a small partner network relative to its size and age, despite the fact that the BR includes a large number of producers and thus potential partner companies. One reason for the under-utilization of the region's great potential

could be that the BR has failed to convey to businesses the added value of being awarded the status of a partner enterprise. As the companies are located in the wealthy suburban sprawl of Vienna (a city with almost two million inhabitants), and can therefore easily sell their products, it could be that they do not see any additional advantage from belonging to such a network. A further reason could be that the criteria are too narrowly defined, which overtaxes the possibilities of the companies. Recently, however, new initiatives have been undertaken by the new management to expand the partner network. Since spring 2020, for example, a blog created by the BR's management on the subject of *Sustainable consumption in the region* presents producers and their gourmet products from the BR.

The Wienerwald is not only an exceptional forest area, but also has a share in three outstanding wine regions. These species-rich viticultural landscapes were one of the reasons for the designation of the area as a UNESCO BR. A special feature is the traditional *Wiener Gemischter Satz* wine, listed as a Slow Food Presidium since 2008. In February 2020, an application was submitted for this wine to be included in the EU register of Protected Designations of Origin PDO (European Commission 2020c).

Since 2006, certificates and special labels have been awarded by the BR's management for the best wines produced in the BR. In order to promote sustainable viticulture in the WBR, only wines that have been cultivated and produced within the BR in an ecologically sustainable manner are eligible to compete (BRWW 2020b). Each award-winning winery is assigned a special animal or plant species found in its vineyards, which it protects and preserves in the form of a *sponsorship* through the sustainable cultivation of its vines. The responsible and sustainable management of the vineyards forms the basis for an intact cultural landscape and ensures its extraordinary biodiversity. By purchasing these wines, the consumer can therefore not only enjoy excellent wines, but also contribute to the preservation of the unique viticultural landscape and high biodiversity in the BR.

Unfortunately, the WBR Wine Award is overshadowed by several well-known and thus very influential wine awards made by gastronomy journals and wine fairs, awards which are of great importance for the winemakers in terms of consumer visibility and the marketing of their products. Thus the winemakers in the BR promote the awards for BR wines only to a small extent, and so their public impact is comparatively low.

Lower Mura Valley BR (UMBR)

As the BR located in south-eastern Styria was officially recognized only in June 2019, it is too early to list any BR-specific activities. However, as the area belongs to the Steirisches Vulkanland region, which comprises 32 municipalities, the potential for culinary enjoyment here is very high. Within the framework of its *Vision*

2025 created in 2010 and presented in the nomination application to UNESCO, the *Steirisches Vulkanland* brand, which has existed since 1999, is committed to shaping the three areas *regional life culture*, *living space* and *regional economy*, with the involvement of local people, in such a way that the region will continue to maintain its human, ecological and economic foundations for independent development and high quality of life (Steirisches Vulkanland 2019).

The Mur river plane in southeast Styria offers not only great nature experiences in Austria's second largest alluvial forest, but also a wealth of excellent regional culinary delights and products - on both sides of the state border between Austria and Slovenia, which is formed by the Mur. Under the umbrella of the *GlaMUR Genuss am Fluss* (Culinary Enjoyment along the River Mur), a transboundary network of more than 200 Austrian and Slovenian businesses from ten Austrian and nine Slovenian municipalities has been formed to draw attention to the immense diversity of regional culinary products in the lower Mur valley. The network includes high-quality businesses such as inns, wine taverns (*Buschenschenken*), fruit and vegetable producers, farm shops with regional products, innovative winemakers and breweries (GlaMUR 2020). GlaMUR combines the region's wide range of tourism offers with the finest culinary delights and regional produce. In addition, through various measures such as cooperation with schools, it aims to convince people to shop and consume regionally.

Three flagship products of the south-east Styrian region, which have almost cult status, are the Styrian Scarlet Runner Bean PDO, Styrian Pumpkin Seed Oil PGI, and Styrian Horseradish PGI (BMLRT 2017 b,c,d). Styrian Pumpkin Seed Oil PGI especially is iconic and inseparable from the culinary culture of Styria (see Table S1). Like many other high-priced food products, the oil is frequently a victim of counterfeiting: seeds from other regions (e.g. China) are pressed along with the Styrian pumpkin seed, or oils of different kinds and origins are mixed. However, there are reliable test methods to detect such fakes, for example elemental fingerprinting, developed by the University of Leoben to determine the precise geographical origin of the oil (Bandoniene et al. 2013).

More recently, two promising BR initiatives with culinary potential have emerged, namely rice cultivation using the dry rice cultivation method, and historical and traditional cross-border wine production (Fröhlich 2020; Fuchs 2020; Weinzeitung 2020; G. Pock 2020 pers.comm; see also Table S1).

With the new transboundary *5-Country Biosphere Reserve Mura-Drava-Danube* (TBR MDD), connecting Austria, Croatia, Hungary, Serbia and Slovenia with their individual BRs, further positive, sustainable, development of the regional economy can be expected through greater cross-border cooperation (Köck et al. 2022).

Conclusion

Culinary products can be valuable in terms of how people identify with their region. Local people are often proud of high-quality regional products. In addition, the producers can feel that they are an active part of the BR as a model region for sustainable living and economic activity. In this way, traditional practices can be not only safeguarded, but also further developed to meet future needs.

As the success of the Austrian BR cookery book shows, the Austrian BRs are already using the existing culinary potential quite successfully. However, there is room for expansion in the partner networks, through partnerships between producers and the gastronomic sector, as well as by the introduction of a regional or even nation-wide BR brand.

The maintenance and/or increase of agrobiodiversity and the protection of sustainable traditional agriculture should be important roles for BRs. To this end, agriculture should be positioned more strongly as a strategic partner of tourism, trade and gastronomy. Functioning networks between local producers and catering businesses – including, of course, the food trade – are certainly an excellent basis for supporting the regional economy. If restaurateurs increasingly purchased their products direct from farmers and regional suppliers, it would be worthwhile for agriculture to focus more on the needs of chefs, for example by planting old and heritage varieties of fruit and vegetables. Such cooperation would thus help keep alive fruit and vegetable varieties that are suitable for the region but can barely cope with market pressure, and whose disappearance would change the character of the cultural landscape. Although many old varieties are less productive than the few mass-produced varieties available in supermarkets, they usually taste much better – a fact that creative chefs take advantage of in order to continue using traditional recipes or to create refined or new recipes from old varieties.

In summary, restaurants that use local produce for their dishes are an excellent and very visible stage for presenting a region and its cultural landscape, even though there will and should continue to be chefs who bring the tastes of the world closer to their guests, using products from other more distant parts of the world (e.g. sea fish instead of fish from lakes or local fish farming, exotic spices instead of regional herbs). However, despite curiosity and interest in exotic products and tastes, there will be an increasing number of diners, especially in times of climate change, who are concerned to keep their ecological footprint small, and to contribute to the protection of the environment and thus society by preferring to enjoy high-quality local produce with low food miles.

It is not only local actors in the food supply chain, including restaurants and consumers, who should be held accountable. In many of the activities described above, an active BR management could be both ini-

tiator and hub to collect, develop and disseminate ideas appropriately. In addition, through educational programmes and the provision of information, a BR's management can raise awareness concerning the importance of preserving the cultural landscape, agrobiodiversity, and the advantage of local economic cycles, thus sowing the seeds for new ideas and future-oriented concepts. In addition, the national committees could become more involved in communications with the general public as well as with potential BR partners, and in generating or uncovering new ideas to foster sustainable development within the BRs. Last but not least, UNESCO itself and the national committees should pause to think. UNESCO should allow BRs to use its logo for labelling BR products and identifying partner businesses.

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Mountain research in UNESCO's Man and the Biosphere Programme: the first five decades

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Keywords: mountains, biosphere reserves, Man and the Biosphere Programme, UNESCO

Abstract

Within UNESCO's Man and the Biosphere (MAB) Programme, MAB Project 6 (MAB-6), entitled *Impact of human activities on mountain and tundra ecosystems*, was initiated in 1971. This paper begins with a history of the activities and key outcomes of MAB-6, which largely comprised national activities within a global framework. From the 1990s, a number of collaborative international projects took place, relating particularly to global change and sacred mountains. The paper ends with brief conclusions.

Introduction

Within UNESCO's Man and the Biosphere (MAB) Programme, Project 6 (MAB-6), which considered mountain ecosystems and their inhabitants, was initiated in 1971. To a considerable extent, MAB-6 helped to shape Chapter 13, *Managing fragile ecosystems: Sustainable mountain development* of *Agenda 21*, agreed in 1992 at the United Nations Conference on Environment and Development. This chapter referred to mountains as important sources of water, energy and biodiversity and other key resources, but as susceptible to erosion, loss of habitats and widespread poverty among mountain people (United Nations 1992, para 13.1). These characteristics and challenges remain true five decades later (e.g., United Nations General Assembly 2019).

The two main sections of this paper, first, provide a brief history of MAB-6, its activities and key outcomes from 1971 to the early 1990s and, second, outline subsequent collaborative international activities in mountain areas within the MAB Programme. The paper ends with conclusions and a look forward.

MAB-6: from 1971 until the early 1990s

The MAB Programme began in 1971, when its International Coordinating Council (ICC) met for the first time. The ICC stated that the Programme would be “concerned with subjects of global or regional significance” and be interdisciplinary (UNESCO 1971, p. 7). Over the previous two years, international experts and the MAB Secretariat had defined 31 possible research themes for the Programme, of which one was *Human adaptation, land-use, and environmental relationships, in extreme environments – including deserts, high mountains, and polar and subpolar regions* (Batisse 1971). From these themes, in 1971 the ICC defined 13 (later 14) MAB Projects; number 6 (MAB-6) was on *Impact of human activities on mountain ecosystems* (Hadley 2006; UNESCO 1971, 1988). For each project, the ICC outlined the *problem*: for MAB-6, this was very similar to what was stated 21 years later, in 1992, in Chapter 13 of *Agenda 21*.

MAB-6 built on strong foundations of international and interdisciplinary mountain research (Ives & Messerli 1990; Ives 2013), and thus developed quite quickly. In January / February 1973, an expert panel met (UNESCO 1973b); and in April, the ICC decided that MAB-6 should be one of four projects “*particularly suitable for special attention*” (UNESCO 1973a, p. 15). In November, a working group met in Norway. They renamed MAB-6 as *Impact of human activities on mountain and tundra ecosystems* and outlined a core programme with three *problem areas*:

1. resource development and human settlement in tropical mountain regions;
2. tourism, technology and land use alternatives in temperate mountains;
3. land use in high-latitude mountain and tundra ecosystems (UNESCO 1973c, p. 18).

They also stressed the need for comparative worldwide research activities.

In 1974, the ICC noted that MAB-6 “*had probably received greater and more intensive attention than any other MAB Project*” (UNESCO 1974, p. 21) and, a year later, that it “*constituted one of the most advanced themes within MAB*” (UNESCO 1975, p. 16). The next session of the ICC in 1977 noted that MAB-6 had showed “*healthy progress*”, with almost 50 activities operational in 19 countries (UNESCO 1977a, p. 24); by 1981, there were 85 activities in 31 countries (UNESCO 1981). In 1984, following the *Ecology in Practice* conference in 1981 (Di Castri et al. 1984) and the first overall assessment of the MAB Programme, the ICC reviewed a progress report on, and proposals for, MAB-6, and stated that “*MAB activities concerned with mountain ecosystems [should] remain a priority*” (UNESCO 1984b, p. 22).

Information about MAB activities in mountain areas from 1984 onwards is available mainly from UNESCO's InfoMAB newsletter, journal articles and reports. Together with a compilation of titles and other details of field projects (UNESCO 1981), these are the principal sources of the remainder of this section. This presents MAB-6 activities according to the parts

Table 1 – MAB-6 projects in the Alps. Source: Price (1995), UNESCO (1981)

Country	Area	Years of research	Main theme(s)
Austria	Obergurgl	1971–1980	Systems analysis of an integrated social-ecological system experiencing rapid growth of tourism
	Grossglockner	1973–1980	Structure and function of grassland ecosystems; other environmental and ecological studies
	Sameralm	1973–1983	Physical and human geography studies; comparative ecogeographical studies
	Gastein	1977–1985	Natural science studies, including impacts of ski areas
France	Briançonnais	1974–1980	Pasture ecosystems, pastoralism, tourism, societal evolution
	Aime	1981–1984	Pastures, forests, slope/soil stability, environmental economics
Italy	Adige valley	1975–1978	Anthropization of the environment and remote sensing
Switzerland	Aletsch	1979–1985	Natural science, partly on influences of human activities
	Pays d'Enhaut	1979–1986	Agriculture, forestry, land-use planning, nature protection, demography/economy, tourism, society and the environment
	Davos	1981–1986	The biophysical environment and human influences, impacts of tourism; compiled in a GIS
	Grindelwald	1978–1988	Natural sciences, agriculture, tourism and its impacts; compiled in a GIS
Germany	Berchtesgaden	1981–1991	Ecological problems concerning land use, carrying capacity; integration in a GIS

of the world specified in the *problem areas*, with key references, followed by conclusions.

Activities in temperate and high-latitude mountains

An overview and evaluation of MAB-6 activities in the temperate mountains of Europe and the former USSR was published by Price (1995). Consequently, these activities are only summarized briefly here, based on this book; as the book includes a comprehensive bibliography, references are not provided here. The Alps were a major focus, with major projects in Austria, France, Germany and Switzerland (Table 1), and numerous interactions between scientists involved in the projects. In addition, the Swiss MAB-6 programme produced a number of thematic studies – particularly on agriculture, forestry and tourism – and two syntheses of its overall findings. Also of note is the evolution of modelling approaches, from the Obergurgl project (Austria) to the Swiss projects and the Berchtesgaden project (Germany) (Ives & Messerli 1990; Price 1995; Scheurer 2020).

In Europe beyond the Alps, MAB-6 activities took place in the Pyrenees, other French mountain ranges, the UK, the Carpathians (Table 2), and in Crimea, and the Caucasus and Urals (Infobox). Although there was

considerable research in mountain biosphere reserves (BRs) and within other MAB Projects (e.g., Project 2, on temperate forests) in the former socialist countries, only projects in Poland and the USSR were formally recognized as part of MAB-6 (Price 1995).

Beyond Europe and the USSR, activities also took place in the temperate mountains of Australia, New Zealand (Table 3) and the USA. Activities in the mountains of Colorado (USA) were of particular importance; these included not only meetings (Ives & Stites 1975), geo-ecological research (Ives 1980) and the production of an environmental atlas (Ives & Dow 1982), but also the establishment of the International Mountain Society and its journal *Mountain Research and Development (MRD)* in 1981. This was the first international interdisciplinary peer-reviewed journal on this theme, and it has since published many key papers and proceedings of meetings.

UNESCO (1981) identifies various MAB-6 projects at high latitudes, most in lower-lying areas. Exceptions were projects on land use in northern Sweden and reindeer in Svalbard, Norway (Abrahamsson 1985; Solberg et al. 2001). Subsequently, within the MAB Programme, high-latitude mountains were considered primarily within the Northern Science [later, Sciences] Network, established in 1982, and aligned

Table 2 – MAB-6 projects in other European mountain ranges. Source: Price (1995), UNESCO (1981)

Country	Area	Years of research	Main theme(s)
Spain	Western High Aragon (Pyrenees)	1971–1984	Multidisciplinary studies (natural and social sciences), pine forests
		1976–1990	Ecosystems with large herbivores
	High Catalan Pyrenees	1985–1989	Land uses, infrastructure, demography; compiled in a GIS
UK	Upland England and Wales	1975–1982	Upland land use; introduced tree species and plantation forestry
Poland	Carpathians	1976–1983	Tourism, reservoirs, land uses
France	Causse Méjan (Massif Central)	1981–1992	Development of an observatory of ecological, social and economic changes
	4 protected areas in the Alps, Pyrenees, Corsica and Vercors	1984–1988	Inter-park programme on high-altitude rangelands
	Vallée des Duyes (pre-Alps)	1984–1993	Production systems linking sheep-raising, diversified plant production, and forest resources; negotiations for rural management
	Cévennes (Massif Central)	1991–1993	Natural sciences, sustainable development of marginal areas

Table 3 – MAB-6 projects in Australia and New Zealand. Source: UNESCO (1981)

Country	Area	Years of research	Main theme(s)	Key publication
Australia	Snowy Mountains	1972–1978	Timberlines	Slatyer (1976)
		1972–1977	Utilization of eucalypts	Waugh (1980)
	Southern Tablelands	1977–1982	Ecological effects of fire and grazing	Leigh et al. (1987)
New Zealand	Waitaki basin	1973–1979	Ecological and social aspects of changing resource use and development	O'Connor et al. (1984)
	Queenstown	1977–1980	Impacts of tourism	Pearce & Cant (1981)

with MAB Project 3, which focused on grazing lands (Freeman 1983).

Activities in tropical and sub-tropical mountains

MAB-6 activities took place in the mountains of 16 countries in Africa, Asia and Latin America (UNESCO 1981). Among these, the only partial regional synthesis is for the Andes (Little et al. 1981), where there were many regional meetings, and a UNESCO-UNEP integrated programme (1975–1983). Its first phase was the preparation of a state-of-knowledge report on Andean ecosystems, published as four issues of *MRD*: vol. 1(2), 2(1), (3), 4(2). The second phase comprised national projects in Argentina, Bolivia, Chile, Colombia, Ecuador and Peru. In 1984, the evaluation of MAB-6 noted that “*Reporting on some of (these projects) is well advanced whereas others have only been published in a very limited way to date*”, and that “*the objectives originally set for the national projects had been largely achieved, while acknowledging that problem-solving and application-oriented research is only beginning in the Andean region*” (UNESCO 1984b: p. 100, 101). Publications include syntheses of research in Chile (Castro et al. 1984; Fuentes & Prenafeta 1988), Peru (MAB Peru 1984), and Argentina (Luti 1986). Little et al. (1981) also mention ongoing projects on migration and health in Chile, and migration and population biology in southern Peru.

In Asia, a regional meeting in 1975 considered integrated ecological research and training needs in the mountains of south Asia (UNESCO 1977b). One recommendation was to establish a regional institute for integrated mountain development. This was achieved in 1983 with the inauguration of the International Centre for Integrated Mountain Development (ICIMOD) – serving the eight countries of the Hindu Kush-Himalaya – in Nepal, a country where MAB-6 activities focused particularly on mapping natural hazards (e.g. Kienholz et al. 1984; Zimmermann et al. 1986), with the involvement of scientists from Switzerland and funding from a number of sources, including the UNU as part of its *Highland–Lowland Interactive Systems* (later, *Mountain Ecology and Sustainable Development*) project (Ives 2013). In the Indian Himalaya, ecological studies were undertaken in various areas (UNESCO 1981), as well as a project on the impacts of human activities in Sikkim (Bhasin et al. 1984). There were also projects on tourism in the mountains of Iran, on mountain forest steppes in Mongolia, and on ecology

and resource management in the northern mountains of Pakistan (UNESCO 1981).

In Africa, there were projects in the late 1970s on the ecology of mountain forests in Burundi, pastoral agriculture in the Atlas of Morocco, and the impacts of human activities on mountain ecosystems in Zaire (UNESCO 1981). However, the first meeting devoted to the African mountains did not take place until 1986, organized by the Commission of Mountain Ecology of the International Geographical Union with support from MAB and UNU. The workshop resulted in the creation of the African Mountains Association, and the proceedings were published as vol. 8 (2/3) and (4) of *MRD*, which include many papers resulting from activities in Ethiopia linked to the MAB Programme. Another project in the 1980s, with support from UNDP, concerned the Mayombe mountains of Central Africa (Sénéchal et al. 1988).

Conclusions

MAB-6 was an immense catalyst for research in mountains in many parts of the world. Some projects were truly interdisciplinary; most were more narrowly focused. With the exception of Europe and the former USSR, it is often difficult to identify the outcomes in terms of publications. However, publications were not the only outcomes; perhaps at least as important were opportunities for knowledge-exchange and training through many meetings, and the establishment of the International Mountain Society (with *MRD*) and ICIMOD. The continuing existence of these institutions evidences the recognition by international organizations of the need to collaborate with each other towards sustainable mountain development. Another long-lived example was the UNU project; the MAB Secretariat and other organizations involved in MAB-6 also developed links with FAO, ICSU, IGU, IIASA, IUCN, UNEP (UNESCO 1984b) and IUBS, with which the MAB Programme became a partner in the *Comparative studies on tropical mountain ecosystems* [TME] programme within the Decade of the Tropics Programme (Monasterio et al. 1987; van der Hammen et al. 1989). It should also be noted that, despite these many international initiatives, the comparative worldwide research activities called for in 1973 did not effectively emerge until the establishment of the Mountain Research Initiative in 2001 (Becker & Bugmann 2001).

It should also be recognized that research in mountain areas in the first two decades of the MAB Pro-

Infobox. The key role of MAB-6 in sustainable mountain development in Russia

After the National Committee of the MAB Programme for the USSR gave the Academy of Sciences' Institute of Geography the task of coordinating MAB-6 in the USSR, the Institute established a *Mountain Geosystems* research laboratory in 1983. This MAB-6 Centre (in Moscow) worked closely with the International Mountain Society, International Geographical Union Commission for High Mountain Geo-ecology and the University of Bern. From 1983 to 1985, regional centres were established, at academic institutes, for the Caucasus (Tbilisi, Georgia), Central Asia (Dushanbe, Tajikistan), the Carpathians-Crimea (Lviv, Ukraine), Altai-Sayan (Barnaul, Altai region), and Baikal (Irkutsk); these centres coordinated research carried out mainly by natural scientists (Price 1995). The MAB-6 Russia group has continued to the present day.

At the global scale, the MAB-6 Centre – with the MAB Programme, the United Nations University (UNU), and the East-West Center (USA) – played a key role by organizing the international conference *Transformation of the Mountain Environment* (1989) in Tsahkadzor, Armenia. The proceedings were published as issues 11(2) and 12(1) of *Mountain Research and Development*. The conference also played a significant role in catalysing mountain research and development research in the USSR and, later, Russia and the countries of the Commonwealth of Independent States (CIS). The Centre was also involved in the Bishkek Global Mountain Summit, the concluding event of the International Year of Mountains (2002), and the GLOCHAMORE and GLOCHAMOST projects.

At the regional scale, in 1998, MAB-6 Russia created the concepts of an Altai transboundary BR (China, Kazakhstan, Mongolia, Russia; designated by UNESCO in 2017), and an *Altai-Sayan-Baikal mega-corridor of connectivity conservation and development* (Badenkov 2010), presented at an international conference in 2010, supported by UNDP, GEF and IUCN, on climate change and biodiversity connectivity conservation in the region.

At the national scale, MAB-6 Russia has made significant contributions to both science (e.g., Kotlyakov et al. 2014) and policy. Activities have included the development of a network of mountain BRs across Russia, as well as:

- 1996–1997: preparing the first national report on *Mountain Regions of Russia: State and development problems* (Badenkov 1998).
- 2002: organizing parliamentary hearings on the outcomes of the International Year of Mountains, in association with the Commission of the State Duma (House of Representatives) on sustainable development. These were attended by representatives of most of Russia's mountain regions, and led to the adoption of recommendations to the President, the Parliament and the Government of the Russian Federation, public organizations and the Russian Academy of Sciences.
- 2016: advice to the Government of the Republic of Dagestan, which proposed a Charter of the Mountain Regions of the Russian Federation and a Federal Law *On the Development of the Mountain Regions of Russia*.
- 2018–2019: expert advice to the Ministry of North Caucasus Affairs and the Institute of Legislation and Comparative Law of the Government of the Russian Federation, leading to a model law *Development and Protection of Mountain Territories of the CIS Member States*, which was adopted by the Interparliamentary Assembly of Members of the CIS in 2020.
- 2020: leading consultations on *The State strategy for spatial development of the Russian Federation for the period up to 2025* on criteria for the definition of mountain municipalities and the development of measures for the sustainable mountain development of Russia's mountain territories. This was the first time that mountain regions had been included in the State Strategy for Spatial Development, and was the result of nearly 40 years' work by the MAB-6 group.

gramme took place within other MAB Projects – for example, UNESCO (1988) mentions activities relating to arid lands (Project 3), urban areas (Project 11) – and, increasingly, in BRs. These included Sierra del Rosario BR (Cuba) (Herrera et al. 1988); Changbaisan BR (China), where a major conference on temperate forests took place in 1986 (Yang et al. 1987); and Krkonoše BR (Czech Republic), where an international conference on monitoring and management took place in 1993 (Flousek & Roberts 1995). In effect, with the exception of the USSR (Infobox), MAB-6 activities gradually ceased in the early 1990s. Subsequently, BRs have been the main focus of both the

MAB Programme as a whole (Reed & Price 2019) and mountain activities within it.

MAB mountain activities from the 1990s

Since the late 1980s, while research has continued within individual mountain BRs (see e.g. Austrian MAB Committee 2011; Borsdorf et al. 2020; Schaaf 2007, 2009), MAB activities in mountain regions have changed from national-level projects within a global framework to international projects, mainly undertaken in collaboration with other organizations. Examples have been the meetings of the African Mountains As-

Table 4 – Mountain biosphere reserves included in the GLOCHAMORE and GLOCHAMOST projects. Those included in both projects are in bold.

The Americas	Europe
<ul style="list-style-type: none"> - Mount Arrowsmith and Waterton (Canada) - Araucarias and Torres del Paine (Chile) - Cinturón Andino (Colombia) - Huascarán (Peru) - Denali, Glacier (renamed: Crown of the Continent) & Niwot Ridge (USA) 	<ul style="list-style-type: none"> - Gossenköllesee and Gurgler Kamm (Austria) - Berchtesgadener Land (Germany) - Sierra Nevada (Spain) - Lake Torne (Sweden) - Entlebuch and Swiss National Park (renamed: Val Müstair-Parc Naziunal) (Switzerland)
Asia-Pacific	Africa
<ul style="list-style-type: none"> - Kosciuszko (Australia) - Changbaishan (China) - Nanda Devi (India) - Issyk-Kul (Kyrgyzstan) - Uvs Nur Basin (Mongolia) - Katunskiy, Sikhote Alin and Teberda (Russian Federation) 	<ul style="list-style-type: none"> - Mount Kenya (renamed Mount Kenya – Lewa) (Kenya) - Oasis du Sud (Morocco) - Kruger to Canyons (South Africa)

sociation – in Morocco in 1990, with papers published in vol. 12(4) of MRD; Kenya in 1993; and Madagascar in 1997 (Hurni & Ramamonjisoa 1999) – as well as many meetings of the IUBS TME programme and at ICIMOD. The MAB Programme was also involved in global initiatives, such as the establishment of the Mountain Forum in 1996 and the Mountain Partnership in 2002 and, in particular, the International Year of Mountains (2002). Mountain BRs have also been an increasing focus of meetings of regional MAB networks and global conferences (e.g., Centre for Mountain Studies 2020). Two major emphases, on global change and on sacred mountains, are described below.

Global change in mountain regions

Interdisciplinary science has always been a hallmark of the MAB Programme, and the *logistic function*, including research and monitoring, has been one of the three functions of BRs since the first were established in 1976 – as underlined in successive action plans for BRs (UNESCO 1984a, 2008, 2017). The two most recent – the Madrid and Lima Action Plans – specifically mention climate change, loss of biodiversity, and other aspects of global change as priorities for the MAB Programme. For mountains, this emphasis was foreshadowed by a seminar associated with the Euro-MAB meeting in Poland in 1993 (Breymeyer 1995). Subsequently, three global initiatives took place.

GLOCHAMORE

The *Global Change in Mountain Regions* (GLOCHAMORE) project (2003–2005) aimed to: (1) develop an integrative research strategy for detecting signals of global environmental change in mountain environments; (2) define the impacts of these changes on mountain regions; and (3) facilitate the development of sustainable resource management regimes for mountain regions. Recognizing that mountain environments – and their people – are particularly prone to the impacts of global change (Huber et al. 2005), mountain BRs were a focus of the project since they include both protected areas with natural or semi-natural environments, where global change impacts can be assessed without direct human disturbance, and

non-protected areas, inhabited by people and used economically. Consequently, mountain BRs provide case studies for analysing the response strategies developed by people vis-à-vis global change.

The GLOCHAMORE project was funded by the European Commission under its 6th Framework Programme, with additional resources from the MAB Programme and UNESCO's International Hydrological Programme. Led by the University of Vienna (Austria), the partners comprised 11 universities and research organizations from across Europe and UNESCO. Managers of mountain BRs (Table 4) and over 140 scientists from around the world collaborated in preparing a research strategy for planning and implementing global change research.

Following five international workshops (Lee & Schaaf, 2004a, b; 2005) and an Open Science Conference (Price 2006), the Mountain Research Initiative published the GLOCHAMORE Research Strategy in 2006 (Björnsen Gurung et al. 2006). This highlights 10 key areas for research needed to guide the sustainable management of mountain regions, particularly in BRs: climate; land use change; the cryosphere; water systems; ecosystem function and services; biodiversity; hazards; health; mountain economies; society and global change. In 2008, at an international workshop at ICIMOD, participants suggested that, ideally, all ten key areas should be implemented for global change research in mountain BRs; however, since developing countries may face financial constraints in doing so, a focus on five key areas was recommended: climate; land use change; water systems; biodiversity; and mountain economies.

GLOCHAMOST

In the follow-up project to GLOCHAMORE, *Global Change in Mountain Sites* (GLOCHAMOST) (2009–2011), the GLOCHAMORE Research Strategy was implemented in nine mountain BRs (Table 4). Reports on their activities are available at UNESCO (2020b).

GLOCHAMORE and GLOCHAMOST were among the MAB Programme's first research projects which specifically addressed global change in BRs. Us-

ing an interdisciplinary and intercontinental approach, and applying a comparative methodology through the resulting research strategy, the two projects generated a wealth of scientific information that can be used for effective management of mountain BRs in the face of global change. Several initiatives that were started by the projects continue, such as the Sierra Nevada Observatory for Monitoring Global Change in Spain's Sierra Nevada BR (Zamora Rodríguez et al. 2016).

Climate change and ecosystem services

A further project focusing on mountain areas, *Climate Change Impacts in Major Mountainous Regions of the World: Multidisciplinary Network for Adaptation Strategies (Africa, Asia, Latin America and Europe)*, took place in 2013–2014. Unlike the GLOCHAMORE and GLOCHAMOST projects, it did not have a specific focus on mountain BRs. The project was organized by the International Hydrological Programme and MAB in cooperation with UNEP, ICIMOD and the Mountain Partnership Secretariat at FAO. The final report (Egan & Price 2017) presents a review of potential climate change and anthropogenic pressures on mountain ecosystem services (ES), particularly in relation to water resources scarcity and increasing water demand resulting from rapid increases of population and utilization of mountain ES. While the report takes a global perspective, it also analyses how regional specificities may differentially affect mountain ES in different mountain systems. The report concludes with recommendations on future policy directions to support adaptation measures, specifically for mountain ES, using an ecosystem-based approach.

Sacred mountains and biosphere reserves

According to traditional worldviews in Africa, Asia and Latin America, many mountain BRs contain sacred natural sites. Their roles in conserving biological diversity and ensuring cultural integrity were the objective of a MAB research initiative from 1997 to 2005. Studies on the interrelationships of environmental conservation and cultural expressions focused on mountain BRs – e.g. Uluru (Australia), Changbaishan and Xishuangbanna (China), Sierra Nevada de Santa Marta (Colombia), Boghd Khan Uul (Mongolia), Huascarán (Peru), and Hawaiian Islands (USA) – as well as sacred natural sites in non-mountain BRs. International workshops in India, Japan, Mongolia, Peru and the USA further elucidated this topic and culminated in an international symposium in Tokyo, organized by UNESCO and UNU, with partners including FAO, IUCN and the CBD (Schaaf & Lee 2006).

Conclusions and prospective

MAB activities in mountain areas have been a major – and often leading and innovative – element of the MAB Programme and, indeed, of mountain science, for nearly half a century. Since the conclusion of

the projects described in the previous section, a workshop on mountain BRs took place at the 4th World Congress on BRs in Lima, Peru, in 2016 (UNESCO 2020a). This recognized that there has been, and still is, much ongoing research within mountain BRs, particularly on biophysical aspects (including climate change), but that research related to socio-economic aspects needs to be strengthened. The participants recommended that a network should be established to exchange information and experiences and undertake collaborative work, including between the universities working in and with mountain BRs, in order to achieve synergies in relation to research and monitoring, and management for decision and policymaking, especially in relation to the provision of ecosystem services. Discussions to these ends are ongoing, and the MAB Programme is launching the World Network of Mountain BRs in 2021 to mark its 50th anniversary. It will be desirable that – in addition to interdisciplinary science as promoted by MAB-6 in the past – transdisciplinary science should shape future MAB activities in mountain areas. This is particularly relevant with regard to BRs, as they foster not only biodiversity conservation, particularly in their core areas and buffer zones, but also sustainable development, especially in their transition areas, for the benefit of mountain people and hundreds of millions more.

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Biocultural resistance and re-existence through a dialogue of knowledges and citizen art in a threatened biosphere reserve

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Keywords: *dialogue of knowledges, creative geographies, GeoHumanities, biocultural landscapes*

Abstract

Biosphere Reserves face huge challenges worldwide, especially those located in metropolitan areas such as La Campana-Peñuelas Biosphere Reserve in central Chile. As well as direct threats, such as urban sprawl and wildfires, such reserves face a less evident threat in the form of weak community engagement and awareness of the value, opportunities and challenges that the name *biosphere reserve* offers. Since 2015, environmental conflicts have intensified in this area of Chile, and counter-movements towards re-territorialization have arisen under the slogan “We are biosphere reserve”. This implies a deep understanding of the imbrications of the lives of humans and more-than-humans in a common territory which face common challenges with regard to the preservation of life and regenerative actions and pathways. In Chile, this local social/political/spiritual movement now converges with a national movement towards recovering sovereignty over common goods through a new Constitution. In this article, we describe a fruitful academia-community dialogue of knowledges created through a series of open-access courses, collaborative mapping, and artistic initiatives developed by citizens, such as textile-making and handcrafts using natural pigments. All of these initiatives come together within the framework of very local geopolitical actions for the preservation of the biocultural landscapes found within the biosphere reserve. We discuss these initiatives as forms of biocultural resistance and re-existence.

Profile

Protected area

La Campana-

Peñuelas Biosphere

Reserve

Mountain range

Andes

Country

Chile

Introduction

As we approach the 50th anniversary of UNESCO's Man and the Biosphere programme (MAB), a biocultural paradigm has emerged as one of the main shifts in the recent evolution of biosphere reserves (United Nations 2010; Merçon et al. 2019; Reed & Price 2020). This turn means that biosphere reserves (BRs) have “evolved from a main focus on conservation and natural science toward a transdisciplinary endeavour that aspires to promote local participation and inclusiveness” (Hanspach 2020, p. 2). BRs are now moving towards “community-based research, action research, and transdisciplinarity” (Reed & Price 2020, p. 322). In this context, the notion of biocultural diversity associated with BRs emphasizes “the interdependence between biological and cultural diversity, indicating how significant ensembles of biological diversity are managed, conserved and created by different cultural groups” (Merçon et al. 2019, p. 1). In the context of the Anthropocene, with biological and cultural diversity threatened by human modes of production and their impact on the Earth, it is essential to promote actions, knowledge and new forms of governance that contribute towards the generation of alternative ways for humans to relate to the ecosystems they inhabit. Taking into account the multiplicity of knowledges and values originating from diverse human communities in relation to their environments is fundamental in this regard (United Nations 2010).

This turn towards a biocultural paradigm for the understanding and management of BRs implies finding new types of human-nature relationships that promote relevant dialogues and behaviours, moving from vertical and centralized management models focused on ecological conservation, towards more effective and affective governance. To develop a kind of governance that is coherent with the development model proposed by UNESCO for BRs, dialogue between different organizations needs to be increased, and networks that secure governance in the long term need to be created (Schultz et al. 2019). By *affective governance* we are referring to the active engagement of communities in conservation, integrating their social practices, specific forms of knowledge and representations of nature and development (Leff 2006; Giraldo & Toro 2020), promoting a *dialogue of knowledges* (Escobar 2011) between diverse social actors, humans and more-than-humans, moving the focus from institutions, and creating and making visible new and multiple perspectives. At a local level, however, this endeavour constitutes a huge challenge, particularly for peri-urban and urban BRs (de la Vega-Leinert et al. 2012).

Aiming to advance in this direction, citizen science as a trend has become increasingly relevant in BRs (Mckinley et al. 2017; Couvet & Prevot 2015), while participatory governance has been widely explored and



Figure 1 – Aspects of communities' active engagement in environmental demonstrations and open-access courses under the slogan "We are biosphere reserve". © A. Moreira-Muñoz

promoted to help improve the legitimacy and re-territorialization of BRs (Price 2017). However, the potential of artistic initiatives in the context of so-called creative geographies and GeoHumanities has been overlooked in this regard (Marks et al. 2017). This is, nonetheless, a crucial aspect of *"staying with the trouble"* (Haraway 2016) or *"living in a damaged planet"* (Tsing et al. 2017) in the context of BRs, or of moving away from a perspective of biocultural diversity towards one of biocultural resistance. Grass-roots resistance initiatives have been defined as *"alternative counter-hegemonic and emancipatory proposals to the global process of ecological and social deterioration that prevails in much of the planet"* (Toledo & Ortiz-Espejel 2014, p. 7). Here, however, we follow Porto-Gonçalves's (2009) notion of *"territorial re-existence"* to make sense of the practices we examine. The idea of *re-existence* emerges as an alternative for practices that are usually understood as resistance; it conveys a sense of creativeness and of the sovereignty of the actions of communities that go beyond resisting extractivist, exploitative capitalist practices, towards the generation of local people's own ways of living and doing. In this view: *"rather than resistance, which implies a reaction triggered by a previous action and so on, [...] we have re-existence. That is, a way of existing, or a certain rationality matrix that acts, even re-acts, in a particular context and according to a particular topos – in a specific time and place, geographical as well as epistemic."* (Porto Gonçalves 2006, p. 165, quoted in Paz 2014, p. 1; own translation).

From a biocultural resistance and re-existence perspective, in this contribution we present and discuss three interrelated initiatives, developed in the context of La Campana-Peñuelas BR (CPBR) in Chile. They exemplify possibilities for developing a biocultural perspective in relation to BRs, with an emphasis on the dialogue of knowledges and on artistic interventions. First, we introduce the results of several courses run in and on BRs, organized by the Biogeoart project (www.biogeoart.cl). Next, we present one of the activities that emerged from these courses – an online participative project mapping environmental conflicts and conservation practices in and around the CPBR. Finally, we discuss one artistic-environmental grass-roots initiative that was identified through the participative mapping project. We present these various projects as examples of dialogues between multiple actors and diverse forms of knowledge and practice

focused on the interdependent aspects of BRs; we also see them as forms of resistance in the context of the environmental tensions faced by local communities in the Anthropocene, specifically in Chile.

We are biosphere reserve: co-creative learning between the community and academia in biosphere reserves

Aiming to strengthen the link between academia and the community, we designed a series of open-access courses on BRs, in which basic concepts of conservation and regenerative development are addressed, in addition to issues specific to individual BR territories. The design of the courses was inspired by environmental education programmes that had been constructed jointly by academics and the community (Cerdeira & Bidegain 2018). Community participation is essential for the management of BRs from a biocultural perspective (Merçon et al. 2019; Stoll-Kleemann et al. 2010). The courses were thought of as a space for dialogue, and therefore as a space that would promote horizontal relationships. As organizers and facilitators, we learned from participants' original and alternative points of view in relation to the difficulties of understanding the concept of the BR and of experiencing it directly. The participants named the courses and the craft initiative that emerged from them *"We are biosphere reserve"* (Figure 1). Their involvement showed a path for transitioning from a disciplinary perspective towards one based on scientific research and transdisciplinary actions (see Sarmiento & Frollich 2020).

The BRs courses encompass aspects of history, environmental values and threats, management tools, public actors, communities, and so on, drawing on our experiences in Chilean BRs and specifically in CPBR (Manríquez et al. 2019). They also expand reflection on the meaning of a BR in the transition towards sustainability, and the manifold aspects of the preservation of the biocultural landscape (Hong et al. 2014). One of the main dimensions of the courses has been the co-construction of a positive vision of the future of BRs. Drawing on the concepts of permaculture and the transition movement, participants envisioned the *"probable, possible and preferable"* (Pot 2019) futures in the transition of BRs towards sustainability.

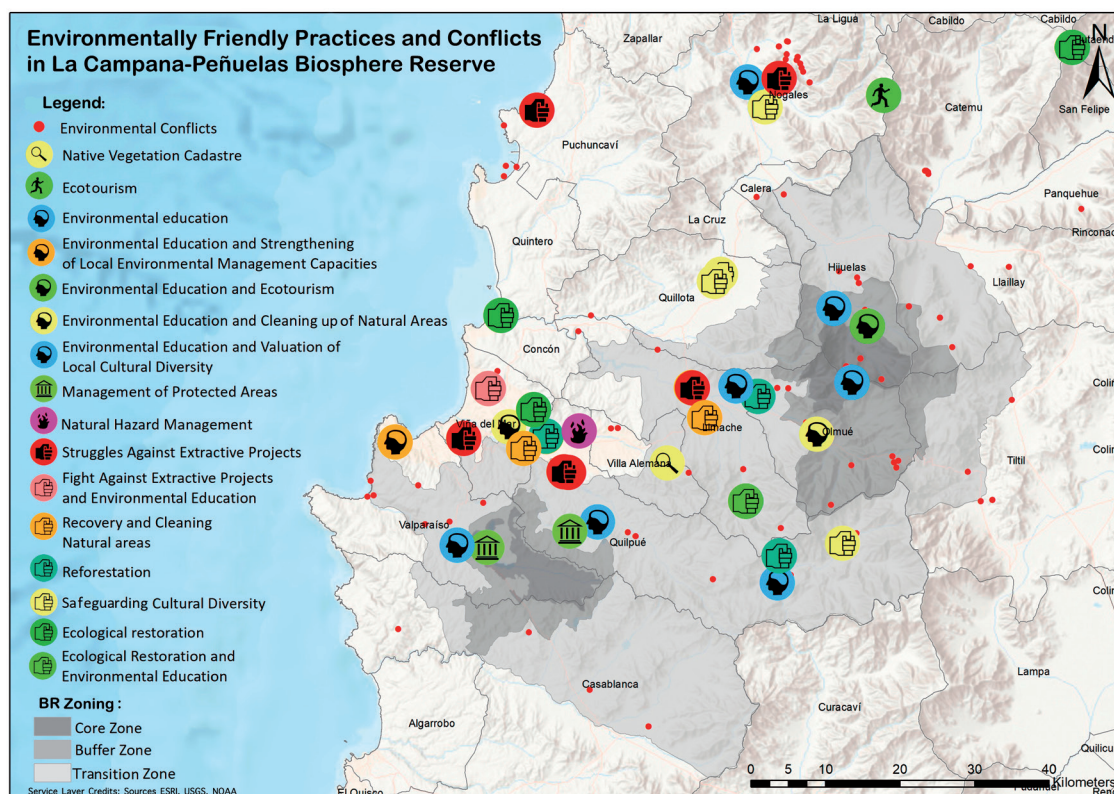


Figure 2 – Environmentally friendly practices in and around La Campana-Peñuelas Biosphere Reserve by means of public participatory-GIS. Map elaborated by Natalia Ortiz and Pablo Mansilla-Quinones on the base of participatory mapping.

This open-access course has been offered every semester since 2019; participation has averaged around 50 people, with participants coming from Chile, Uruguay, Peru, Ecuador, El Salvador and Honduras. The diverse origins of the participants have allowed an enriching dialogue of knowledges among them. For example, comparisons have been made between various BRs in Latin America, and we have all learned about local, regional and national initiatives taken in relation to sensitive landscapes as alternatives for unsustainable development. One of the most important results was the identification of socio-environmental conflicts and good ecological practices in CPBR, through collaborative mapping (Sijtsma et al. 2019), encouraged by reflections that emerged from this dialogue.

Dialogue of knowledges: online Participatory GIS in La Campana-Peñuelas BR

Within the context of the BR course, and in collaboration with its participants, we developed an interactive map using the ArcGis123 Survey platform. The aim of this collaborative map was to record the environmental conflicts affecting the CPBR. The participants suggested including ecological conservation practices developed by communities, as well as conflicts. During August 2020 the initiative was circulated on social media and in the national media, aiming to reach a wide range of communities and to encourage them to participate by adding information about eco-

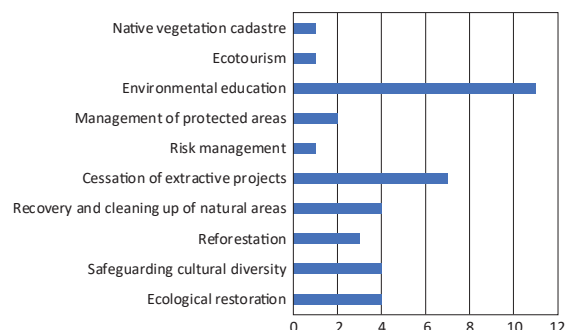


Figure 3 – Environmentally friendly practices and conflicts in La Campana-Peñuelas Biosphere Reserve.

logical conflicts, experiences and practices. This resulted in 180 conflicts being recorded, and 46 examples of environmentally friendly practices or practices for the conservation of common goods (see Figure 2 & 3).

Regenerative initiatives emerged as powerful actions within BRs (Moreno-Ramos & Müller 2019; Moreira-Muñoz et al. 2019), and CPBR was no exception in this regard. An unexpected kind of practice that emerged were the artistic initiatives developed as bio-political artefacts and mediators between local inhabitants and the BR's management. In what follows, we focus on one of these experiences, discussing its potential in relation to BRs.

Biocultural resistance: a collective cartographic textile project

La Dormida is an area in the Coastal Mountain Range in the Region of Valparaíso that has been affected by the installation of pylons (Cardones-Polpaico project) (Paulsen et al. 2019). Neighbours and local organizations came together to oppose the installation, generating a strong social movement against the undertaking. Collective actions were launched, strengthening human links with the territory, acknowledging the ability of local people to make viable concrete proposals for self-governance and ways of inhabiting the territories sustainably. Their proposals included a space for self-directed learning around how to live well from a biocultural perspective. Within this context, a textile map of the CPBR was created. This constituted a pedagogical artefact embodying the virtues of the territory from the perspectives of personal and collective experiences. The initiative was led by local women of different ages, who through threads, wool and fabric focused on portraying each participant's vision and intention in relation to shared territories.

This became the TEJER-NOS (*WEAVE-US*) collective, which allowed women of different ages, united by textile crafts, to come together in difficult times, to sustain their collective view of how to inhabit their territory, and to encourage each other with every stitch, building resistance through this practice of *doing together*. The banner is an excuse to meet, to engage in dialogue, to reflect on and defend the body-earth territory that they inhabit, honouring the heritage of their female ancestors as expressed in the textile practice itself.

The group has created two banners. The first features a phrase that resonated deeply with all participants: “*Somos la tierra defendiéndose*” (“*We are the earth defending itself*”). Each letter was crafted using a different technique, on seven metres of raw fabric (Figure 4). Its length was based on the width of the urban streets, so that it could be an active part of demonstrations for the vindication and protection of the territory and all its inhabitants.

The second banner was a map of the CPBR, from the coastal mountain range to the sea, which made visible the rivers that sustain the BR's biodiversity. It was again created from the perspectives of personal and collective experiences; it questioned cartographic representations based on colonial perspectives. Various pictorial techniques were employed, with soil and natural dyes being used to paint the mountains, valley, forests and fertile land, and also to make visible the territories that were in conflict. The banner is currently still being crafted; it is constantly being transformed, conceived as an artefact that is at once pedagogical, informative and for use in demonstrations.

This textile constitutes a collective prayer, calling for water to return to its course, extractivist greed to recede, forests to get the water they need and grow



Figure 4 – Collective TEJER-NOS (“WEAVE-US”), a space for women of different ages united by textile crafts. © Colectiva Tejer-Nos

strong, and the land to turn green again, become fertile and feed the children. For the members of the group, the ritual of making something together, of crafting together inspired by the territory, invokes a sense of the spiritual. The textile supports the women in times of crisis, extractivist and police violence, social unrest and catastrophes. It has turned into an emotional safety blanket for the group, and the feeling that it generates has expanded beyond them. Collaborative work has enabled the women to learn and communicate about their territory, and to feel empowered (see Figure 5).

Conclusions

As a result of the experiences and actions around the La Campana-Peñuelas territory, its conservation and care, and the social struggle against extractivist projects that threaten it (Paulsen et al. 2019), spontaneous initiatives emerged to create artefacts of political resistance and unique forms of re-existence. These initiatives involved groups of local people communicating with the management of the BR, as an inter-generational practice (Mitrofanenko et al. 2018). This opens up the possibility for “critical conceptual attention to thinking intimate geopolitics through creative performance” (Veal 2019, p. 1). Spontaneous art and its rhizomatic connections, such as environmental arts, have been held up as a real possibility for “living on a damaged planet, limiting the destruction we call [the] Anthropocene” (Tsing et al. 2017, G2). “We will have to break free of that yoke and imagine creative aesthetic interventions to revitalize small [...] settlements in the middle of reclaimed and poetically inhabited lands” (Giraldo & Toro 2020, p. 162).

The experiences of collective environmental arts, collective mapping and the BR open-access course that we have shared here, and the way in which these initiatives became interwoven, are examples of how multiple kinds of actors, knowledge and practice converge around the territories, interests and conflicts that constitute BRs, generating dialogues that cross over traditional disciplinary and academic barriers. This relationship between groups needs to be con-



Figure 5 – Pictorial banner using earth pigments. © Colectiva Tejer-Nos

structive: it must acknowledge and value the territorial and ecological knowledge of the BRs' inhabitants, and its potential contribution to scientific knowledge (Porto-Goncalvez & Leff 2015). The initiatives presented here are also examples of the non-instrumental relationship with nature that a biocultural perspective fosters (Merçon et al. 2019), and of particular, territorialized modes of re-existence (Paz 2014; Porto-Gonçalves 2009). This kind of dialogue and this kind of relationship emerge as potential ways forward in generating an understanding of humanity as part of nature, and of BRs as key territories in our struggle to protect biocultural diversity and re-existence at local scales, from a global perspective. This dialogue between knowledges is also key in the current historical moment in Chile, when a new Constitution is being drafted – one that we hope will prioritize the environment and its biocultural diversity.

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Depopulation and rural shrinkage in Subantarctic Biosphere Reserves: envisioning re-territorialization by young people

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Keywords: landscape-scale conservation, re-territorialization, Patagonia, volunteering, MAB Programme, rural depopulation, biosphere reserves

Abstract

Landscape-scale conservation at the regional level is an important challenge for Biosphere Reserves (BRs), especially those located in areas suffering from depopulation and rural shrinkage. This is the case of the BRs of the southernmost part of Chile, in the Magallanes region. An analysis of the implications of deterritorialization (the radical reduction or disappearance of inhabitants, their traditional ecological practices, and their material and affective links with the territory) is lacking in the literature, particularly in relation to the migration of young people towards other human settlements. This is a critical situation for BRs because there is a tight link between depopulation and the sustainability of socio-ecological systems. Here we discuss, on the one hand, the limitations and negative impacts of repopulation attempts by extractive industries and, on the other, the possibilities of involving rural youth in initiatives that encourage the re-territorialization of ecological practices and knowledge that have been developed by generations of local inhabitants, as a way of promoting bioculturally sustainable modes of re-inhabiting these territories.

Profile

Protected area

Torres del Paine and

Cabo de Hornos BRs

Mountain range

Magallanes and

Cordillera Darwin,

Chile

Introduction

For the last fifty years, Biosphere Reserves (BRs) have aimed to promote the sustainable development of areas with high social and ecological value, bridging the gap between the areas' inhabitants and nature. In doing so, models of socio-ecological interaction have been generated around BRs, so that global-scale challenges for sustainable development can be addressed at a local scale. Despite significant progress in this regard, assessing the difficulties and conflicts currently faced by the management of BRs in Chile (Moreira-Muñoz et al. 2019) reveals considerable challenges in the path towards a balanced relationship between humanity and the environment – a relationship that allows for alternative possible futures to be formulated at a time when the Anthropocene is leaving increasingly strong imprints on BRs.

Some of the most commonly found socio-environmental problems and conflicts in BRs relate to climate change, long-term droughts or devastating wildfires. In the context of human settlements, these are usually related to the impacts of accelerated urban growth, with their blurry and fragmented character affecting BRs' buffer and transitions zones (Moreira-Muñoz et al. 2019). However, one issue that has generally been overlooked in relation to BRs is the geographically specific consequences of global processes of depopulation and rural shrinkage (Feldhoff 2013; Abramsson & Hagberg 2018; Alata et al. 2018; Hill & Nel 2018). An analysis of the implications of deterritorialization (the radical reduction or disappearance of the inhabitants, their traditional ecological practices, and their ma-

terial and affective links with the territory) is missing, particularly in relation to the migration of young people towards urban areas, a movement which is closely linked to issues of overcrowding in towns and cities (Hasbaert 2012; Rey Benayas et al. 2007).

The question that leads our reflection is: what happens to human-environment relationships promoted by BRs that face accelerated rural depopulation? And in relation to this, how do the processes of rural depopulation challenge the biocultural sustainability of BRs, and how can these challenges be addressed in collaboration with local young people, acknowledging them as key actors? These questions are especially relevant in the uncertain political and economic contexts produced at a global scale as the result of globalization, climate change and pandemics. Under these circumstances, it is to be expected that many human settlements might experience socio-spatial reduction and depopulation. Rural shrinkage refers to “[a] wider concept than population decline [...] incorporating not only demographics but also drivers, outcomes and impacts of the process as well as governance, planning and policy response aspects” (Pužulis & Kūle 2016). Therefore, studying the implications of depopulation and rural shrinkage is essential for thinking about current and future challenges regarding the sustainable development of BRs.

González and Vega (2016), in the context of Spain, illustrate the urgency of discussing the problems generated by depopulation in relation to BRs. In Cantabria, the processes of depopulation have been one of the main dynamics faced by management and development plans for rural settlements and BRs. This is critical for BRs because, as suggested by Segundo Méty et

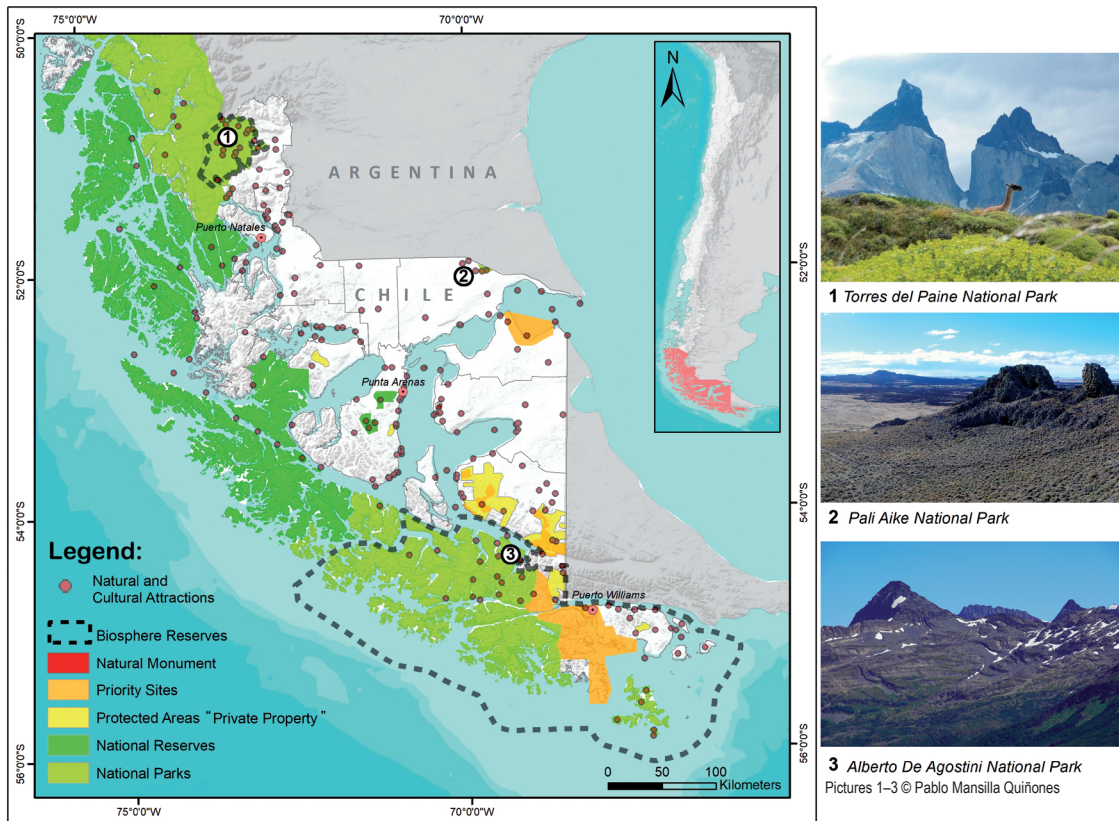


Figure 1 – Conservation areas and landscapes of Magallanes region in southernmost Chile: protected areas and two Biosphere Reserves (Torres del Paine and Cabo de Hornos). Database: Infraestructura de Datos Geospaciales de Chile, IDE Chile. Design: Pablo Mansilla-Quñones

al. (2012), there is a very close link between depopulation and the sustainability of socio-ecological systems: when depopulation occurs, the networks established between human societies and nature are disrupted, and socio-ecological systems disintegrate, for example through the conversion of farmlands into industrialized agriculture, reducing biodiversity and agrobiodiversity (Segundo Méta y et al. 2012), which in turn further reinforces depopulation processes, in a cyclical fashion. An interesting assumption in this regard is that rural depopulation may be beneficial for the recovery of biodiversity in BRs, the assumption being that wildlife will recolonize the ruins of abandoned human settlements. However, depopulation does not guarantee richer biodiversity. On the contrary, it may imply new problems such as invasive species or plagues affecting native wildlife, species traditionally controlled by human agricultural-ecological practices that have a symbiotic character. For example, from an ethnobotanical perspective, Pardo de Santayana and Gómez Pellón (2003) point out that rural depopulation implies the loss of knowledge and cultural practices associated with the use of plants by the local inhabitants, passed down from generation to generation. Human depopulation has a more-than-human impact, and conservation efforts must find ways to “reverse depopulation and support local (traditional) income sources and land uses” (Ibisch et al. 2010, p. 93).

BRs in the Chilean Magallanes Region

BRs are a network of conservation areas integrated at inter- and intra-regional scale, having the potential to constitute sustainable landscapes (Rodríguez-Rodríguez 2012; Romano et al. 2020). They are key for landscape-scale conservation planning (Trombulak & Baldwin 2010). The Southern extremity of Chile, encompassing the Magallanes Region and the Chilean Subantarctic area, harbours two BRs: Torres del Paine and Cabo de Hornos. The regional conservation landscape also comprises a series of other conservation sites (Figure 1).

Torres del Paine was one of the first BRs to be declared in Chile (1978), and is one of the most visited protected areas in the country (more than 300 000 visitors a year). The challenges for its appropriate management relate to its carrying capacity for tourism, wild-fire control, and conflicts with cattle-raising practices (CONAF 2020). Cabo de Hornos encompasses almost five million hectares, including land and sea, with a broad diversity of landscapes, terrestrial, freshwater and marine ecosystems in the Subantarctic region, the Darwin mountain range, and the city of Puerto Williams¹ at the southern tip of the continent. Among the most significant aspects of this BR is its association

¹ Puerto Williams: population 1 868 in 2017 (INE 2019).



Figure 2 – The old (abandoned) San Gregorio Estancia, currently being promoted as a future tourist project. a) Old warehouse that supplied food and other goods to the workers; b) Interior of abandoned house; c) General aerial view of the Estancia San Gregorio. © Pablo Mansilla Quiñones

with the last descendants of the Yagán people (Anderson 2014). The BR includes sites of biocultural value such as Omora Ethnobotanical Park (Rozzi & Schütler 2015), and has been extended to cover the Diego Ramírez Islands and Drake Passage Marine Park (Rozzi et al. 2017). These protected areas together constitute a complex network of research sites (Red LTSER – Cabo de Hornos; Rozzi et al. in press).

The territoriality of ancestral peoples such as the Haush, Aonikenk, Selknam, Yagán and Kawésqar converge in these ecosystems – even if, often, the evidence for them is in the form of very subtle marks left on the landscape. These peoples have historically inhabited these wild territories, where life is made possible thanks to deep ethnobotanical knowledge. These traditional lands have a strong bio-geocultural base that combines geologically interesting landscapes and conservation landscapes (Manríquez et al. 2019).

Extermination and failed repopulation by extractivist activities in the BRs

The first traces of depopulation in these territories bear the marks of the extermination of the indigenous populations during the colonial period, when Patagonia was socio-spatially shaped by internal colonialism promoted by the Chilean state through the auction of lands. This enabled a system of large estates (*estancias*) and sheep farming (Figure 2), which replicated the English model. Indigenous people were seen as an enemy, as they hunted sheep. Their extermination was dramatic, with landowners even paying a bounty for the ears of indigenous people, promoting hunting of human beings. In this colonial relationship, nature and its inhabitants were seen as objects of colonization, and sustainability was seen only from an economic perspective (Martinic 2006). This same logic still exists today, embodied by large Patagonian estates that adjoin BRs, where the power and interests of landowners clash with the interests of conservation, generating conflicts (Meynard 2014).

A second process that shapes the history of population and depopulation in the Magallanes region is the exploitation of oil in the 20th century. Even though oil exploitation promoted the development of rural settlements and population increase, workers were mobile, hindering territorial rooting processes. They were also mainly men, configuring a social geography from which women and children were almost absent. In addition, fracking generated subsoil pollution and industrial waste, with severe negative impacts. The area has also seen coal mining, for example the Mina Invierno project in Riesco Island (Milesi 2016). The mine's closure due to its highly negative environmental impact resulted in the mass lay-off of hundreds of workers who had increased the rural population of the area. There are also traces of logging, which accelerated deforestation and desertification.

Finally, one of the main extractivist dynamics in this area relates to salmon farming, an activity that has become increasingly present in the region, putting pressure on BRs and the traditional rural lives of inhabitants. The Yagán community of Bahía Mejillones opposed and prevented the installation of Norwegian salmon farming companies in the area, arguing that they would affect local ways of life, human and non-human, and the territorial and cultural rights of Yagán people (Mundo Acuicola 2019).

The touristic potential of the BRs has been equally unsuccessful in terms of encouraging repopulation, especially in relation to young people: the local tourism industry is highly elitist, oriented towards international high-income tourists, and operated mainly by big companies. At the same time, the intense tourist activity in the region, with thousands of annual visitors, has put significant pressure on ecosystems, notably by increasing the occurrence of forest fires, such as the catastrophic events that occurred in 2005 and

2011 (Meynard 2014). Tourism activities of this kind are unable to retain inhabitants within these territories, while the activities that do retain (a certain) population within the area are of an extractivist character, with serious detrimental environmental impacts.

Young people and repopulation in BRs

In the context that we have described here, a key question emerges: how can we advance towards landscape-scale conservation where processes of rural depopulation are under way? We believe that it is essential to design strategies that involve younger generations who are living within the BRs, through innovative and creative actions that encourage ecological improvements and a sense of belonging to the land (see Figure 3). Most young people who are native to these areas migrate towards urban centres, disenchanted with rural life, mainly due to geographical isolation and the lack of educational, work and social opportunities. In this regard, we can take inspiration from initiatives designed to encourage young people to return to (or stay in) their traditional lands. Fuentes Acuña and Marchant (2016), for example, describe agro-ecological initiatives that seek to promote family and community-based collective actions (see Figure 3) and a sustainable relationship with nature through non-extractivist alternatives.

An important aspect to consider here is the promotion of educational models driven by sustainability as a way to motivate young people's territorial attachment (Sabaini & Moreira-Muñoz 2014). It is particularly important to generate actions within networks of educational institutions in BRs, involving local students in BRs, for example through volunteering, as in BRs in Africa (Salu 2013) and Italy (Santi et al. 2019). It is also interesting to consider initiatives that seek to involve young people in new and traditional crafts, encouraging forms of working that are closely related to nature. An example of this is the basket-weaving or wickerwork developed by the Yagán and Kaweskar peoples. This craft involves using and managing peat bogs and native vegetation present in Subantarctic BRs. In a similar vein is the hand-crafting of harpoons and traditional navigation tools, such as those made by Martín Gonzalez, a traditional Yagán craftsman who died in 2020. These kinds of crafts require strategies for knowledge to be passed on from one generation to another in order to survive.

From a transdisciplinary perspective, we suggest the potential of Creative Geographies, which open up interesting possibilities for connecting arts, science and nature with the biocultural landscapes of Patagonia, enabling people to re-explore their life-places through their senses, and to re-learn how to observe their connections with place and nature (Tsing et al. 2017). Some remarkable experiences in this regard include activities developed by BRs in association with museums, such as the Rio Seco Natural History Mu-



Figure 3 – Young inhabitants of rural areas in traditional activities: competitions in horsemanship. © Pablo Mansilla Quñones

seum, which has a rich and varied collection of marine animals and where biological and artistic values are promoted; or Martín Gusinde Anthropological Museum in Cabo de Hornos BR, where the ecological and archaeological history that has shaped the area is narrated. Here, the inhabitants of the territory, especially the Yagan community, have been actively involved. Artistic activities have also been developed in Villa Dorotea, where the artist Álvaro Pavéz Cataldo led the creation of the Dorotea Popular Museum, involving the local community in recovering their memory of this place. There are also artistic-cultural groups such as Liquenlab, which works to promote the dialogue between the arts and science, questioning in a creative way their relationships with the environment in Patagonia.

It is key to bear in mind, however, that if we seek to generate profound changes, educational / artistic / scientific initiatives need to develop an understanding of humanity and nature that does not further deepen this ontological divide – an understanding of humanity as part of nature and its ecosystems, rather than as beings more or less connected to an external nature.

Final reflections

Accelerated depopulation in Magallanes (see Table 1) implies human demographic changes, but it may also have a profound impact on the ways in which all its denizens, human and non-human, inhabit a territory in interdependent ways. Depopulation brings in

Table 1 – Demographic trends of young people and depopulation processes in the Magallanes region. Source: Census of Population and Housing in Chile, years 1992, 2002 and 2017 (INE 1992, 2002, 2017). *Young people: 18–24 years old.

Scale		Total young population*	Total population	Young people (%)	Relative intercensal variation 1992–2017
Districts	Punta Arenas	13 260	131 592	10.1	15.61
	Laguna Blanca	16	274	5.8	−35.68
	Rio Verde	60	617	9.7	98.39
	San Gregorio	38	799	4.8	−36.13
	Cabo de Hornos	176	2 063	8.5	27.66
	Porvenir	802	6 801	11.8	35.64
	Primavera	56	1 158	4.8	−21.70
	Timaukel	37	405	9.1	61.35
	Puerto Natales	1 805	21 477	8.4	25.19
	Torres del Paine	179	1 209	14.8	216.49
National		1 897 114	17 574 003	10.8	31.66
Regional		16 431	166 533	9.9	13.84

its wake the loss of knowledge in relation to nature, of the social meanings attached to the ways of naming and narrating nature, of the ways of imagining and seeing the territory, and of collaborative and spatial practices (Mansilla Quiñones & Melin Pehuen 2019). The close relationship between the dynamics of the human population and the exploitation of natural resources in the context of fragile ecosystems will result in time in human-nature relations becoming unsustainable. Public and private institutions seek to increase populations while exploiting and endangering natural resources, promoting extractivist economies. However, this extractivist model does not succeed in keeping people in their traditional lands, such that depopulation becomes an imminent dynamic. As argued by Güler and Kâhya (2019, p. 98), “many of these abandoned rural settlements have invaluable vernacular assets that bear the traces of past rural life and comprise the spirit of these cultural landscape areas”.

Young people need to be included in rural contexts (Trivelli & Morel 2020), and within BRs. This implies generating actions to promote the re-territorialization (Price 2017) of centuries-old ecological practices and traditional forms of local knowledge, including how to read bio-geocultural landscapes and valuing them (Price 2017). It also requires paying attention to the new and original ways of learning and of relating to their territories that young people have adopted (Muñoz et al. 2006; Barraclough et al. 2020). This is particularly relevant in territories such as the Cabo de Hornos and Torres del Paine BRs, where modes of inhabiting Patagonia are rooted deeply in fragile and political perceptions of nature.

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Keeping the landscape open – challenges and successful strategies in the Black Forest Biosphere Reserve

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Keywords: maintaining the landscape, Allmendweiden, Hinterwälder cattle, Marketing hub, enhancing biodiversity, wild fields, sustainable land-use of mountain pastures

Abstract

In this policy article, we identify challenges for maintaining the Black Forest Biosphere Reserve's diverse cultural landscape and present the efforts undertaken to address these. Set in a land-use context that is rich in tradition, featuring common pastures and an indigenous cattle breed, landscape preservation today is threatened by fundamental changes in the agricultural community as well as of land-use systems. As part of the MAB network, the UNESCO Black Forest Biosphere Reserve provides collaborative arenas to address these issues and propose action in concertation with local actors and communities. To illustrate this, we describe the ALLMENDE 2.0 applied research project, the creation of a commercialization hub for the local Hinterwälder cattle, and support for the modelling of more extensive ecologically-orientated agriculture.

Profile

Protected area

Black Forest Biosphere

Reserve

Mountain range

Low mountain range

Black Forest, Germany



Figure 1 – ALLMENDE in Schönan. © Florian Brossette

Introduction

As the international Man and the Biosphere programme has clearly stated, the UNESCO Biosphere Reserves (BRs) are eminently well qualified to implement measures in line with UNESCO's guidelines. For more than 40 years, BRs have helped to identify ways of addressing user-driven conflicts, and have worked constructively towards general knowledge-based solutions. BRs are specially designated spaces where conflicts will inevitably arise in pursuit of the BRs' aims – conflicts between profit orientated economic systems, societal cooperation, and the preservation of natural resources. To resolve the conflicts, sustainable development must be established. This means in real terms that the desire for economic well-being must not be compromised by the preservation of natural resources (and vice versa).

This article focusses on the special features of the landscape within the Black Forest BR and how the area's typical open spaces can be prevented from becoming overgrown. The main role of the BR's staff is supporting local communities and actors to identify challenges, and drawing up successful strategies. Positive examples presented here are an applied research project (ALLMENDE 2.0), the creation of a commercialization hub for the local *Hinterwälder* cattle, and modelling an ecologically-orientated form of agriculture.

The Black Forest BR (47° 47' 21" N–7° 57' 27" E) was officially recognized by UNESCO in 2017 and covers more than 63 000 ha. The reserve is situated in the centre of the Southern Black Forest and is characterized by mixed mountain forests, colourful flower meadows and pastures, gorges, fens, raised bogs and geological, faunistic and floristic ice age relicts. More than two-thirds of the surface area are covered with near-natural mixed mountain forests; only three per cent of the land are settlement areas. The altitude ranges from 310 m to peaks of over 1 400 m a.s.l.

Special interest topics

- Commonly owned grassland
- Forest landscapes and open fields
- *Hinterwälder* cattle as the special race of the Southern Black Forest
- Commercialization of the Hinterwälder cattle

The Allmendweiden: a form of common pasture

Allmendweiden (common pastures) are the most important feature of the Black Forest BR. These fields are unique and differentiate the Southern Black For-

est's landscape from the rest of the mountain chain. The *Allmendweiden* are large, interconnected areas of extensive pastureland, ranging from valleys to mountaintops. *Allmenden* were established in the Middle Ages and have been preserved to this day thanks to the local communities' insistence and active communal tradition. Cattle have played a vital role in forming the landscape over the centuries, supported today by goat and sheep herds. The herds have contributed to the creation of the unique biodiversity which exists only in the Black Forest BR.

Hinterwälder cattle: the traditional local breed

An endemic livestock breed, the *Hinterwälder* cattle, is the typical and historic race which grazes on the steep slopes of the pastures (Hinterwälder Förderverein e. V. 2020). Their numbers have declined from more than 30 000 in the historic *Land* of Baden in 1900 to just over 2 300 in 2018. A special association, the *Hinterwälder Zuchtverein*, aims to promote the spread of this heritage breed, which was the best choice over centuries due to the cattle's small size and sturdy nature. They weigh up to 480 kg only, making the most of the relatively poor quality of their grazing, but nevertheless producing milk for many years. *Hinterwälder* have been bred since 1859, but due to changes in the milk production process, the cattle are now classified as *highly endangered*, figuring on the red list of the Society for the Conservation of Old and Domestic Animal Breeds (GEH 2020a,b).

Helping the commercialization of the Hinterwälder cattle

A specially conducted market study brought to light that the *Hinterwälder* cattle were suffering from a lack of official recognition, and that the prices paid to farmers were too low for many to maintain the traditional breed. Therefore, a marketing hub was set up by the BR where farmers, chefs and other professionals were brought together to help commercialize the *Hinterwälder* cattle. In October 2019, over a period of two weeks, more than ten restaurants offered special menus based on the meat of the local breed. The initiative aimed to help preserve the *Hinterwälder* cattle by helping the farmers to sell their meat at a better price, and by participating in the creation of a regional chain of added value for the benefit of all participants.

The BR team invested greatly in marketing, public relations, setting up logistics and complex communications to ensure networking with all the partners. The logistic chain included selection criteria for the animals, managing their slaughter, processing the meat, and a quality-control system based on sustainability, the welfare of the livestock, and a fair price supported by the *Hinterwälder Förder- und Zuchtverein* (the association guarding the preservation of the breed).

In 2019 the *first culinary Hinterwälder weeks* were a success, a success which led to the number of participating chefs doubling, to 21, for the second iteration of the event. In 2019, eight entire animals were sold. In 2020, 16 head of cattle were processed. As a side-effect, through close partnership, a growing number of animals are being sold online via the start-up *Con-funding*. Here, the consumer can choose which part of the animal he/she wishes to order; care is taken that all parts of the animals' carcasses are properly used. During the Covid-19 pandemic, consumers have been demanding higher-quality products, higher standards in animal welfare, and locally and regionally grown food.

New federal law inspired by forms of cultivation inside the Biosphere Reserve

Around 14 200 hectares within the BR are cultivated as meadows and pastures, of which around 10 000 hectares are extensively used farmland. The small scale of local farming allows cultivation according to recognized ecological criteria or participation in funding programmes for agricultural management, climate protection and animal welfare. Nine out of ten farmers refrain from using artificial fertilizers and pesticides. The outgoing minister for the environment of the federal state of Baden-Wuerttemberg, Franz Untersteller, stated at the start of his *biodiversity tour* in August 2020 that the BR had been the forerunner for rules implemented in new legislation on *enhancing biodiversity* for the whole of Baden-Wuerttemberg. Traditionally, farming is not the main occupation of the local agricultural population, more than 90 per cent of whom have another seasonal job or rely on other sources of income, such as tourism.

Wild fields attract interest because of their unique flora and fauna

Traditional farming on the commonly owned land has survived in the Southern Black Forest to this day. Until the 1960s, the cattle of each individual village were watched by local herdsman. Then, as elsewhere, the pastures were fenced off. The practices have maintained an active landscape, and the common pastures consist mainly of grassland with large single trees such as pasture beeches (i.e. beeches that have been grazed on by livestock), copses, boulders, scree and rock piles. These *wild fields* differ greatly from the *tame fields* in the valley bottoms and attract interest because of their unique flora and fauna, including relicts from the Ice Age.

Some of the plants typically found on the common pastures include Arnica (*Arnica montana*), Winged broom (*Genista sagittalis*), Silver thistle (*Carlina acaulis*), and even Swiss Dandelion (*Leontodon helveticus*) and Small white orchid (*Pseudorchis albidus*) in the highest areas, which approach a subalpine climate zone. Characteristic animals are Wartbiter (*Dactylus verrucivorus*),

Table 1 – Findings of ALLMENDE 2.0.

Parameter	
Surface area (ha)	7 860
Agricultural area (grassland, ha)	2 600 (16% of Black Forest Biosphere Reserve)
Protected biotopes (ha)	1 050
Farm businesses (number) 2016	120 (approx. 240 in 1979)
Farms refraining from use of artificial fertilizers/pesticides etc. (agri-environmental scheme FAKT D1) (number)	98
Organic-certified farm businesses (number) 2019	20
Bovine animals (heads) November 2019	Approx. 1 540
Goats (heads) 2019	Approx. 1 000
Share of active farmers > 50 years old (%)	67
Agricultural subsidies (EU co-financed measures only) 2018	1.7 million Euro (corresponding to approx. 720 Euro/ha/annum)

Mountain grasshopper (*Stauroderus scalaris*), Meadow and Tree pipits (*Anthus pratensis* and *A. trivialis*), and fritillary species like the Niobe fritillary (*Argynnis niobe*).

But this biocenosis is threatened in some parts by the side-effects of insufficient grazing intensity. These species require small open areas of level ground, not overgrown by other plants, and breaks in the vegetation as found on common grassland. One plant on the verge of disappearing is the Mountain Everlasting (*Antennaria dioica*), which survives only in the highest parts of the BR. The exact causes of its decline are yet to be determined; in 2020, scientists set up a special monitoring and research project to study the question.

ALLMENDE 2.0. – Identifying pathways for sustainable land-use of mountain pastures

ALLMENDE 2.0. is an applied research project funded by the federal state of Baden-Wuerttemberg and initiated by the ministry of the environment. Its objectives are to identify strategies that will enable the long-term maintenance of the open landscape within the Black Forest BR, and to assist farmers and policy makers by creating possible future scenarios. The project is designed to last three years (from spring 2019) and is set in nine small local communities in the Upper Wiesental around Schönanau.

The project manager initiated discussions with farmers, local decision makers and scientists. The next step was a thorough analysis of the data available on the land-uses of the common pastures, including agricultural, ecological and socio-economic aspects. The first results are given in Table 1.

Conclusions of the analysis

- The number of part-time farmers has halved in the last 40 years.
- Most of the farms cultivate and maintain between 15 and 30 hectares of grassland.
- Two-thirds of the grassland (mostly pastures) is owned by the local communities, one third (mostly meadows) is private property.

- Most farmers rely on agricultural subsidies for sustaining pastoralism. They use agri-environmental schemes (FAKT) or conclude nature-protection contracts with local communities.
- Two-thirds of active farmers are fifty or older.
- Most of the common pastures are under three levels of protection: EU environmental law (EU Habitats Directive), German federal law and Baden-Wuerttemberg law.
- Farmers cannot afford modernization of cowsheds because of low income.
- Drought conditions have reduced the quantity of feed available, brought shorter grazing seasons, dried up natural wells on pastures, increased spending on feed, and reduced the numbers of animals which can be fed with natural resources.

How can the Black Forest Biosphere Reserve help to maintain the land-use system?

At the halfway point of the project, in October 2020, we are testing support measures to assist farmers and land owners:

- a. model lease for renting out municipally-owned high nature value grassland;
- b. decision-making tool, based on aerial imagery, to deal with unwanted landscape changes (e.g. shrub encroachment) on pastures;
- c. framework of common rules and goals for renting out pastures to successors;
- d. research on new models and concepts for future part-time farming (including by exploring the perceptions and perspectives of young members of the farming community).

Conclusion

One of the biggest challenges within the BR and the region is to manage expectations. Often, the natural landscape is taken for granted, but it can only be maintained through the considerable efforts of local communities, farmers and authorities. The preservation of societal structures within the farming and local

communities will be vital, requiring every support possible. The Biosphere team works in close cooperation with local and regional authorities to bring together people with common interests, attention-worthy ideas, and the will to engage positively in securing the future of structures – societal, agricultural and topographical – that would all otherwise be threatened over time.

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Insights from 20 years of research in the Entlebuch UNESCO Biosphere Reserve

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Keywords: UNESCO Biosphere Reserve, Entlebuch, research, impact, practice

Abstract

The 50th anniversary of UNESCO's Man and the Biosphere (MAB) Programme coincides with the 20th anniversary of the Entlebuch UNESCO Biosphere Reserve (EBR) in Switzerland. While the MAB research framework has remained fairly constant since the EBR was established, the role of research in our institution and the ways it has been managed and implemented have changed significantly. After 20 years of research in the EBR, this is an opportune moment to highlight outputs, outcomes and impacts, and to draw conclusions regarding future challenges and developments for parks and their managements.

Profile

Protected area

Entlebuch Biosphere Reserve

Mountain range

Alps, Switzerland

Introduction

Entlebuch was endorsed as a UNESCO Biosphere Reserve in 2001. In the past 20 years, the area, the Biosphere Reserve management and research have all interacted continuously with each other while also developing independently. This article reviews this process, shedding light on the evolution, outputs and outcomes, and on the impacts that research has had in the Entlebuch UNESCO Biosphere Reserve (EBR). The review is based on personal experience and gives insights from three senior staff members working in the EBR for 20 (Annette Schmid, AS), 12 (Florian Knaus, FK) and 8 (Engelbert Ruoss, ER) years.

As a part of the UNESCO mandate, science was a prominent aspect of Biosphere Reserves (BRs) from the beginning of the Man and the Biosphere (MAB) Programme in the late 1970s (Batisse 1997). Driven by innovative scientists, the programme's first action plan (drawn up by Minsk in 1983) was at the forefront in terms of interdisciplinarity, long-term research, monitoring and remote sensing (UNESCO 1984; Reed 2020). However, the crucial framework for research in BRs was stipulated in the Seville Strategy in 1995, in which guiding principles relevant today were defined, such as research on sustainable development, local knowledge and transdisciplinarity (UNESCO 1996; Bouamrane et al. 2020). Further content was added, and some aspects given more priority in follow-up strategies and action plans, such as Ecosystem Services and Climate Change in the Madrid action plan (UNESCO 2008). New aspects for research are largely missing in the most recent strategy (2015–2025), which is defined in the Roadmap for the MAB Programme and includes the Lima Action Plan and Lima Declaration (UNESCO 2017). Based on our interpretation of past strategies and action plans, BRs are required to conduct interdisciplinary, transdisciplinary, collaborative, basic and applied research, as well as monitoring. These activities aim at providing a basis for evidence-

based management for BRs, mutual learning by stakeholders, scientists and the public in the region of a BR, and within the world network of BRs.

Implementation, evolution and outputs of research in the EBR

The EBR adopted a BR research approach with the above-mentioned priorities along with the Seville Strategy. In the setting-up phase of the EBR, its management consisted of three site managers, one of whom (ER) was appointed director and scientific coordinator. As an active researcher himself, he was deeply engaged in the Swiss scientific community and had strong links to cantonal and national authorities, which attracted vast research interest for the Entlebuch area even before it was endorsed as a BR by UNESCO. In this first period, research was mostly driven by a strong network of scientists, universities and research institutions supported by cantonal and national authorities. The EBR was the first BR in Switzerland to apply a bottom-up approach, involving local communities in the BR's development and decision making. By contrast, the Swiss National Park (established in 1914) was a BR of the first generation (endorsed in 1979), covering exclusively conservation, research and education functions. This resulted in additional research interest for the EBR, which offered new research opportunities in contrast to the National Park research priorities. Public participation and land-use activities in the buffer and transition zones opened up opportunities for research in social, economic, transdisciplinary and sustainability sciences. Indeed, the EBR attracted many Swiss research teams in human geography and sustainability whose work continues today (e.g. Norman Backhaus, University of Zurich; Thomas Hammer, University of Bern).

The early research activities were strongly shaped by management questions that arose during the establishment of the EBR (Wymann von Dach 2001). It was the scientific coordinator who translated the

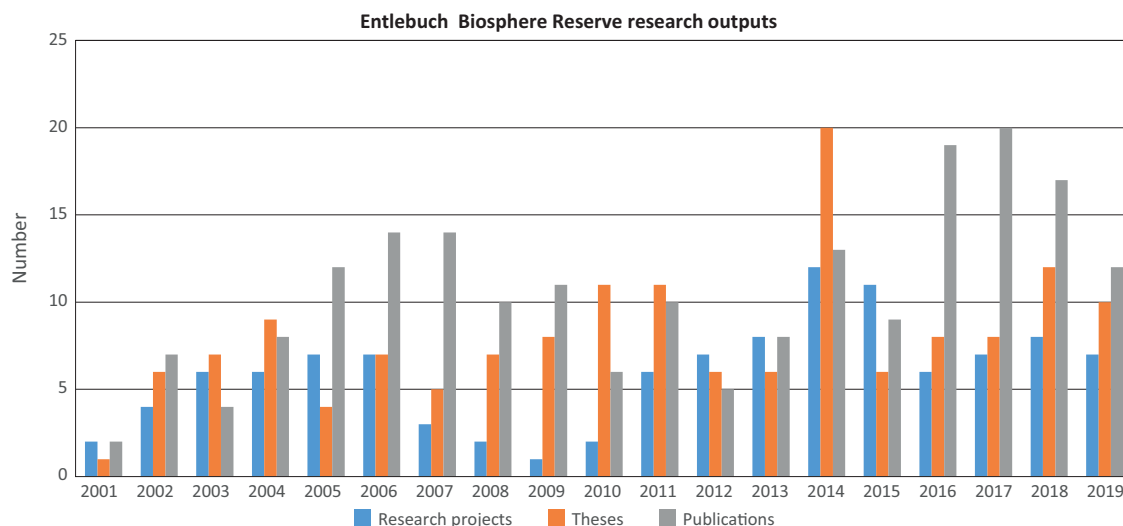


Figure 1 – Number of research projects, theses and publications related to the EBR between 2001 and 2020.

EBR's needs into research questions, sought additional information and support from established research programmes, and linked BR research interests with research teams at national and international levels. One important task was to connect universities and researchers with each other and with local people, making sure that investigations were well adapted to the area, and that the local communities were not overwhelmed by scientists from all over the world. In this period, participatory research principles were introduced, for example through the EU-funded project Visuland headed by ETH Zurich, which involved local communities in designing 3D scenarios for the future development of the EBR (Schroth et al. 2006). The start-up phase was a process of mutual learning between local people and scientists, and of adjustment of the BR concept to local realities (Ruoss & Alfari 2018). Another important task was information and communication: existing scepticism and resistance towards research had to be reduced and confidence established.

Research was carried out as theses (BSc, MSc, PhD), or as larger projects financed by the Swiss National Fund, EU Research Frameworks (FP 5 and 6) and Interreg Programmes. Research funds were never made available by the EBR management itself, except for logistical support in relation to data, networking and literature, assistance in planning (e.g. with GIS), or involving cantonal and national administrations. This lack of research funds within the EBR itself persists today, despite the legal obligation to carry out research in BRs introduced in 2007 at national level (BAFU 2014).

Early research activities were coordinated by an EBR research platform, where research offers, needs and priorities were discussed, and stipulated in the first research framework in 2002 (Ruoss et al. 2002). Research at this time was not planned or implemented in any systematic fashion, but depended on funding

opportunities and the motivation of scientists to conduct research in the EBR. This is demonstrated by the fact that monitoring baseline-data are partly missing for the pre- and early phases (1997–2001, and 2001–ca. 2006 respectively). Ecological and socio-economic data were gathered systematically at this time only by cantonal and national institutions (e.g. peatland, flora, fauna and forest inventories, and socio-economic statistics). Other data were gathered in research projects that served as a valuable database for many researchers who themselves expanded this database further. To make data available, a local GIS model was established in cooperation with the cantonal administration. This model served simultaneously the BR management in elaborating maps for the management and research activities, and the municipalities as a database for territorial planning. These were important first synergies between the EBR, research and local communities, using what at the time was state-of-the-art technology. It is one example of research introducing innovations in the rural area of Entlebuch.

In the early years of the EBR, an important foundation for research was created by introducing participatory research and attracting a wide range of researchers. This approach generated interesting results and promoted the EBR as an area for research at the interfaces of society, the economy, ecosystems, nature and biodiversity. The outcome was an increasing number of research projects, theses and publications up to 2007 (Figure 1).

After ER left in 2006 and a phase of transition with vacancies and changes in personnel, FK was appointed scientific coordinator in 2008. At this point, collaborations, theses and research projects were resumed, leading to a relatively steady output (Figure 1), but there was also a need to restructure the research management. The earlier research framework was therefore revised. The resulting research concept subsumed the most important strategies for investigations, research

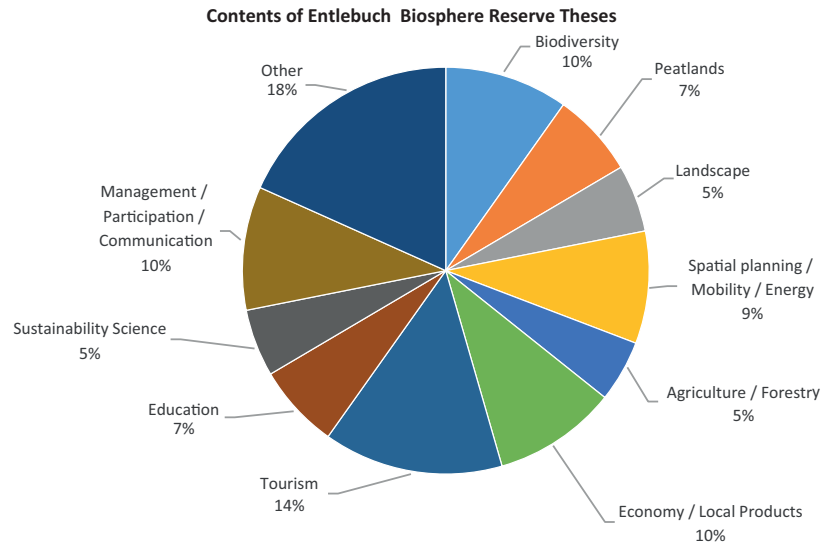


Figure 2 – Topics of MSc, BSc and semester theses between 2001 and 2020 by category (N = 224). Only main topics are considered; many theses covered more than one topic.

fields and gaps, organization, collaboration and knowledge transfer (Knaus 2016), and provided the basis for a more systematic research approach. Subsequently, many gaps in the knowledge that are of high importance for the EBR have been systematically tackled in recent years, e.g. relating to the EBR's impact on the development of the area.

Another aspect of restructuring was a more rigorous approach to an integrated monitoring scheme and a return to evidence-based management, similar to the one during the setting-up phase of the EBR. In the context of the first 10-year management plan for the EBR (Schmid & Schnider 2017) and the recurring 4-year project / funding plans (Swiss NFA financing rounds), research results and monitoring data were used systematically to identify and tackle gaps in the EBR's management activities. One final aspect of restructuring was the introduction of databases for past and current research activities, outputs and outcomes. These have already proven very useful, indicating the crucial importance of saving raw data for repeat investigations at later stages to gain insights into the transformation processes of specific aspects of the EBR. Unfortunately, however, data was not archived systematically in the early phase of the EBR, leading to a loss of data, a loss compounded by changes in data storage systems, retirement of scientists and institutional reorganizations. Hence, interpreting the role of a BR as a site of long-term sustainability research requires a serious and meticulous approach for monitoring, data storage and data management in order to allow quick and simple reviews of research outputs, e.g. which topics have been covered by theses in the EBR so far (Figure 2). The results indicate a fairly even distribution among the three pillars (ecological, social and economic) of sustainability.

Outcomes and impacts

Restructuring research management was triggered by the 10th anniversary of the EBR in 2011, when the question of the EBR's impact in the region arose. In spite of a substantial quantity of research results and monitoring data, and even a concept for monitoring success (Schmid et al. 2004), it was difficult to attribute changes in the region directly to the EBR or the EBR's management (Knaus 2013). This lack of knowledge was a starting point for systematic impact assessment activities that directly tackled the question of the EBR's contribution to regional development (Schmid et al. 2004). Hence, in 2011 the impact of the EBR on summer tourism was assessed. The analysis revealed that 16% of tourists visited the region because of the EBR, and these tourists generated an added value of CHF 5 million (Knaus 2012). The investigation will be repeated in 2021. In 2015, the economic impact of park-labelled products was investigated, revealing that a similar added value (CHF 5.8 million) was created by EBR-labelled products in agriculture and forestry (Knaus et al. 2017). In 2017, an international research project on acceptance, identification and commitment of local communities in BRs was launched, enabling for the first time a comparison of BR impacts in different settings and countries (von Lindern et al. 2019; von Lindern et al. 2020). As well as a strong acceptance and identification, the results indicated gaps in the EBR's communication strategy, especially in targeting individual groups of society, and reaching younger generations. Finally, a long-term research programme in the ecological domain was started in 2019 to monitor the quality of peat bogs over the next 20 years. These investigations are designed methodologically to serve the EBR's monitoring function. They generate insights in the social, economic and ecological domains and provide systematic information on the



Figure 3 – The Alpabfahrt in autumn attracts over 10 000 visitors, who buy local cheese and meat products. © UNESCO Biosphäre Entlebuch

impact of the EBR in the most relevant fields of activity over the long term. This information will be crucial for political decision-making processes in the EBR, but also within Switzerland and potentially abroad.

On the more specific question of impacts emanating from *research* carried out in the EBR, a review of now-historic research results revealed some tangible examples. The most prominent is the *Alpabfahrt*, where the alpine farmers walk their cattle from the mountain pastures back to the lower villages. This traditional activity almost disappeared, as in many other areas, and was suggested as a possible tourist event in an early research project (Lacope). The idea was discussed and approved by local agriculture associations and promoted as a folkloric event for the first time in 2004. Today, it is one of the largest events in Entlebuch, attracting over 10 000 visitors every year (Figure 3). The same research project generated the first cadaster of alpine farms in Entlebuch and suggestions for hiking routes. Based on another research project (Biologic@), a sales platform for organic products was established in 2008. Investigations carried out in the context of BSc and MSc theses led to other developments: a study on the acceptance of windmills served as a basis for a bottom-up installation of a wind farm; mapping of ant hills by volunteers served as a basis for their conservation; species protection projects within

the EBR were launched following a systematic review of species of conservation concern; the assessment of the quality of urban green areas led to activities in biodiversity conservation in one of the villages. Numerous MSc theses in didactics have served to enlarge the pool of teaching materials that are used by local teachers in their mandatory classes on the EBR.

EBR research has also influenced practice elsewhere, and the scientific community. A first review of possible monitoring variables for the EBR was picked up by various other Swiss parks, for which it served as a basis for identifying their own sets of indicators. The investigations on added value generated through tourism attracted a lot of attention in the media and the Swiss park management community. With the support of Swiss Park Research / *Parkeforschung Schweiz*, the findings were developed into a *how-to* guide for carrying out studies on the economic impact and potential added value of tourism in other protected areas (Knaus & Backhaus 2014); the guide has since been further developed methodologically (Knaus 2018). Additional improvements will be made following the next assessment of the EBR in 2021. The continuous work on the monetary impacts of tourism in PAs has led to scientific innovations that have served and will serve other parks in their own management and research activities.

Based on data from eight different BRs, the most recent study on acceptance, identification and commitment of local people (von Lindern et al. 2019; von Lindern et al. 2020) established an initial basic understanding of the inter-relatedness of these three factors. This international research project, including the constitution of an advisory board of relevant researchers, was enabled by the logistic and financial support of Swiss Park Research. The project's results were well received by national MAB committees. Finally, the project aimed to contribute important and so-far largely missing fundamental insights into social monitoring, following up early ideas of UNESCO's integrated socio-economic monitoring (BRIM, Lass & Reusswig 2002). There have been many positive and unintended side effects of this highly collaborative project, including stronger future collaboration between the managements of the BRs involved, collaborations in follow-up research projects, and the understanding that many BRs share the same challenges in attracting the interest of society as a whole (von Lindern et al. 2020).

Future challenges and conclusions

Research in the EBR has created many tangible results for local people, as well as for the EBR's management and for important stakeholders such as local, cantonal and national authorities. It is one of the main tasks of the scientific coordinator and his team to translate scientific results and to direct and disseminate the information in readily accessible form to target au-

diences. Research in the EBR has also advanced various scientific fields, by providing highly relevant questions, sharing data, and supporting researchers with both practical and theoretical insights and experiences. This has helped many researchers to get in touch with local realities, thus improving the applicability of their results. Bridging the gap between science and local people will remain a challenge: after two decades of setting up collaborative and transdisciplinary research, many early local enthusiasts involved in participative processes have retired or moved on. The significance of the EBR for younger generations is not as evident as for the pioneer generation, making it more difficult to motivate them for active participation.

Global challenges such as climate change, biodiversity loss, socio-economic transformation or limited natural resources, all part of the UN Agenda 2030 and further defined in the SDGs, are research fields of increasing significance also for the EBR. BRs are seen as ideal places to establish new research interactions and to explore and test innovative solutions to overcome these challenges. Adopting new governance and management approaches will be crucial to advance research and its implementation, and to find ways to progress effectively in balancing conservation and development in protected areas (Alfarè & Ruoss 2020). Using transdisciplinary research projects in which research questions from global challenges are transferred and adapted to local evidence relevant to local stakeholders will be key. To achieve impacts through research, the community needs to be more closely involved in project planning as well as implementation, and co-learning / co-creating processes need to be introduced (Alfarè et al. 2019). Hence, strong, active participation remains a central challenge for research in the EBR.

To foster long-term research in the EBR, it will be crucial to formalize cooperation with universities and research institutes. It needs to be explored whether a forum-type approach like the EBR's first research platform is suitable and feasible, or whether closer cooperation and institutional ties with just one or a small number of universities should be sought, as happens in other countries (Walk et al. 2020). Generally, turnover of staff and affiliated researchers, and internationalism have increased enormously in Swiss universities, making a forum-type organization challenging. Further, there is growing competition for park-related scientists, since the number of Nature Parks is high and increasing in Switzerland. However, the vast amount of data that already exists, the wealth of publications, the numerous networks from local up to international level, and the free logistical services are unique to Switzerland and maintain this area's strong attraction for research.

Moreover, funding opportunities attract research and scientists. It would be an advantage to have institutionalized research funding in BRs, at national and international levels, as postulated by others (e.g. Scheurer 2020). By this means, the impacts of the di-

verse sustainability approaches implemented in BRs could be investigated more deeply and systematically, creating valuable knowledge regarding key factors in the transformation of regions and societies towards sustainability (see Reed 2016; Ferreira et al. 2020). The potential of BRs in serving as models for attaining regional sustainability pathways could finally be taken better advantage of.

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A Man and the Biosphere Reserve as a natural and socio-economic laboratory for the sustainable future of small rural communities

Sara Di Lonardo & Andrea Cinocca

Keywords: Collemeluccio-Montedimezzo-Alto Molise, UNESCO, MAB Programme, management

Abstract

The UNESCO Man and the Biosphere Reserve Collemeluccio-Montedimezzo-Alto Molise was established in 1977 in Molise Region (Central Italy) to safeguard local natural and managed ecosystems in two separate areas administered by two different municipalities. An association of seven small municipalities with various local bodies, the ASSOMAB Alto Molise Consortium, was established in 2006 to expand and zone the Reserve in order to promote innovative and environmentally sustainable approaches to economic and social development, by setting in place a new model of sustainable and integrated management in the area. In the renewal step of 2014, UNESCO agreed the expansion of the old protected areas into a single, larger reserve, to be managed by the Consortium. Today it covers nine Natura 2000 sites, seven of which are included in the European Habitats Directive, and two in the Birds Directive. Local administrators and stakeholders see the Reserve as an opportunity to develop sustainable actions while protecting and enhancing the extraordinary environmental richness, including the remarkable biodiversity. In this paper, the authors discuss the current situation and the socio-economic opportunities in this rural landscape, which is affected by population ageing, outmigration and a diminishing economy, all of which are significant drivers of land-use changes, particularly land abandonment and forest expansion.

Profile

Protected area

Collemeluccio-Montedimezzo-Alto Molise

Biosphere Reserve

Mountain range

Central Apennines

Country

Italy



Figure 1 – Part of the Collemeluccio-Montedimezzo Alto Molise Biosphere Reserve. © Sara Di Lonardo

Introduction

In 1977, UNESCO established Italy's first Man and the Biosphere (MAB) Reserve, the Collemeluccio-Montedimezzo Alto Molise Biosphere Reserve (BR). It was located in the Central Apennines (in Molise Region; Figure 1 & 2) and initially comprised 637 ha, covering two separate, uninhabited, nuclei of woods.

In order to implement the enlargement and the zoning of the area, the Area di Sviluppo Sostenibile – (ASSO) MAB Alto Molise Consortium was established in Autumn 2006.

To date, the members of the Consortium are the small villages of Carovilli, Chiauci, Pescolanciano,

Pietrabbondante, Roccasicura, San Pietro Avellana and Vastogirardi, the University of Molise, the Territorial Office for Biodiversity of the National Forest Service, and the Molise Region. The members of the Consortium shared the priority objectives of submitting a review of the BR and its strategies, with a view to updating them, and of putting into practice a new model of sustainable management. The new model (or models) was to take into account the variety of ecosystems found in the biogeographic region and the various human activities taking place at local level. Hence, in June 2014, after the periodic review, the BR was expanded to 25 268 ha, which includes the territories of seven neighboring municipalities; the interesting landscape heritage of the whole area is now under the care of the expanded BR. The enlargement of the BR, following a voluntary process, brought into being the first homogeneous area of sustainable development in Molise Region, enhancing both the area's environmental characteristics and its socio-economic activities.

Biodiversity and its conservation as a driver for educational involvement and for restarting the economy

The elevation in the BR ranges from 450 to 1 730 m a.s.l. (Figure 2). The BR covers nine Natura 2000 sites (33% of the whole Reserve); seven of these are covered by the European Habitats Directive (European Council Directive 92/43/EEC) and two by the Birds

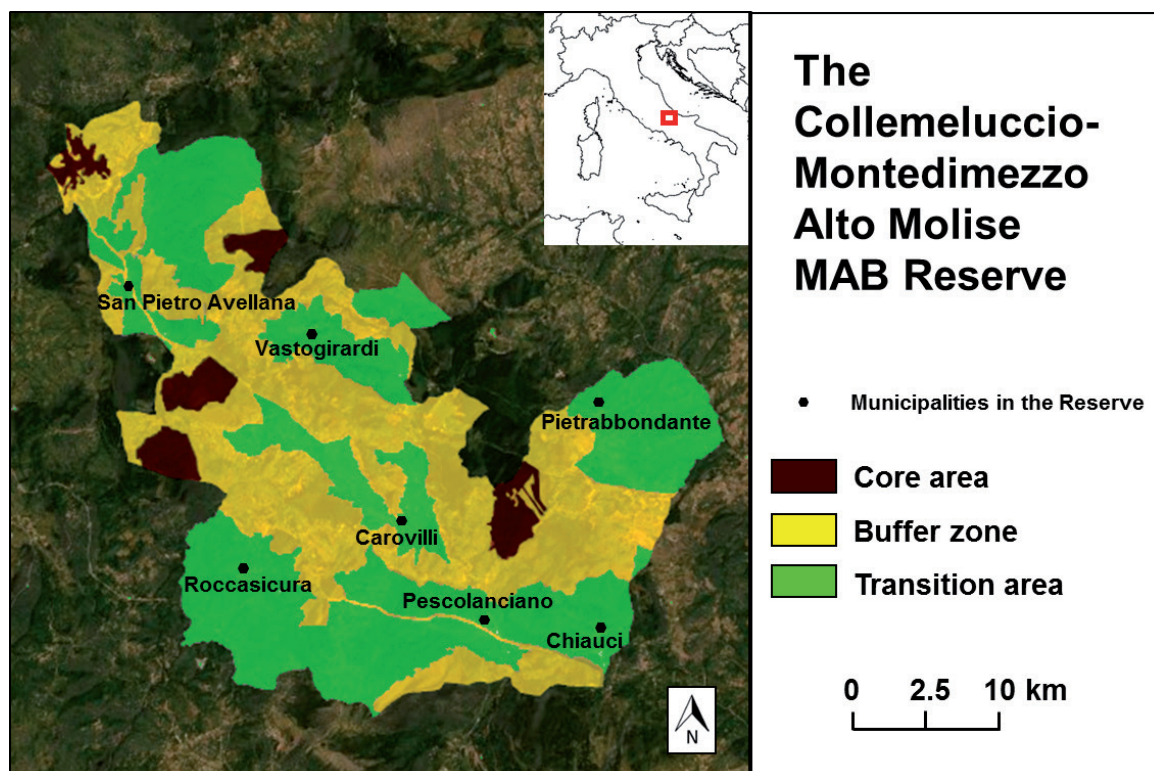


Figure 2 – The Collemeluccio-Montedimezzo Alto Molise Biosphere Reserve today © Sara Di Lonardo

Directive (European Council Directive 2009/147/EEC) (Table 1).

A survey carried out in 2012–2013 updated the checklist of the animal species of interest in the BR (Abbate & Giovi 2002) to include 48 species of mammals, 112 species of birds, 10 species of amphibians, 8 species of reptiles, 5 fish species and 9 invertebrate species included in the EU Habitats Directive. Where flora is concerned, there are over 900 species and sub-species, about 30% of the flora of the entire Molise Region. Collemeluccio forest is a relict stand of the last post-glacial period, typical of the fir forests currently widespread in the Mediterranean and Anatolian regions, dominated by *Abies alba* Mill., mixed with *Quercus cerris* L., *Fagus sylvatica* L., *Carpinus betulus* L. and *Ilex aquifolium* L. Its structure and composition are similar to those of woodlands which were common in the past throughout the Apennines, but which nowadays survive only in small areas throughout the Italian peninsula (Santopuoli et al. 2016). Currently, silvicultural interventions are limited to *naturalistic* silviculture methods aimed at favouring the return of the forest to a *natural* state, and balance with local conditions, an equilibrium which is not easily or quickly achieved for this kind of forest. All these areas have become real *field laboratories* for research on forest ecosystems in the core area (e.g. silviculture and climate change adaptation, area of expansion of plant species and of rare or endangered animals, alien species monitoring, and conservation and improvement of natural grasslands). They are also the site of various programmes (ecotourism, environmental education, recreational

activities). In 2003, for example, an educational programme created the Colle S. Biagio path in the Montedimezzo core area. Here, there are now facilities such as audio devices and electric wheelchairs, and an eco-museum designed to be accessible by mobility- and visually-impaired visitors, one of the first examples in an Italian protected area; moreover, a wheelchair-friendly, level, surfaced path about 2 km long and 2 m wide has been created. Along the path, there are also educational panels in Braille with information on trees and environmental features. These educational and environmental facilities and elements of public awareness, which present the cultural heritage of the BR, are now being enhanced by environmental, traditional and cultural associations. One of these associations is involved in organizing weekly tours from Abruzzo to Molise, returning via the historic Carpinone-Sulmona railway. The trains stop at four stations in the BR and allow *slow* tourists to appreciate the rural landscape and villages affected by different social and economic issues, such as population ageing, outmigration and decreasing economic activities. According to the last population census (ISTAT 2020), the area is characterized by a depopulation rate of 28.5% (from 1991 to 2020), with currently 4612 inhabitants and a population density of 18.2 inhabitants / km². The presence of a MAB Reserve could be an opportunity to boost the local economy and to promote awareness of the dynamic interrelationships between natural and near-natural ecosystems, and the traditional practice there of transhumance (Ballacchino & Bindi 2017; Figure 3). Adopting new socio-economic processes could

Table 1 — Natura 2000 sites in the Collemeluccio-Montedimezzo Alto Molise Biosphere Reserve (SCI: Site of Community Interest; SPA: Special Protected Area).

Municipality	SCI/SPA Code	SCI or SPA	SCI/SPA name	Municipal area (ha) within the SCI/SPA	Municipal area within the SCI/SPA (%)
Carovilli	IT7212133	SCI	Torrente Tirino (Forra) – Monte Ferrante	138.54	3.33
	IT7212125	SCI	Pesche – MonteTotila	0.86	0.02
	IT7212134	SCI	Bosco di Collemeluccio – Selvapiana – Castiglione – La Coccozza	662.80	15.95
	IT7221131	SPA	Bosco di Collemeluccio	0.71	0.02
Chiauci	IT7212134	SCI	Bosco di Collemeluccio – Selvapiana – Castiglione – La Coccozza	301.92	19.04
	IT7211129	SCI	Gola di Chiauci	110.20	6.95
Pescolan- ciano	IT7221131	SPA	Bosco di Collemeluccio	467.81	13.47
	IT7212134	SCI	Bosco di Collemeluccio – Selvapiana - Castiglione – La Coccozza	1580.12	45.49
	IT7212125	SCI	Pesche - MonteTotila	266.22	7.66
	IT7212133	SCI	Torrente Tirino (Forra) – Monte Ferrante	6.73	0.19
Pietrabbon- dante	IT7211120	SCI	Torrente Verrino	29.43	1.07
	IT7221131	SPA	Bosco di Collemeluccio	1.73	0.06
	IT7212134	SCI	Bosco di Collemeluccio – Selvapiana – Castiglione – La Coccozza	912.25	33.24
Roccasicura	IT7212124	SCI	Bosco Monte di Mezzo – Monte Miglio – PennataroMonte Capraro-Monte Cavallerizzo	0.17	0.01
San Pietro Avellana	IT7212124	SCI	Bosco Monte di Mezzo-Monte Miglio – PennataroMonte Capraro – Monte Cavallerizzo	1400.48	31.16
	IT7218213	SCI	Isola della Fonte della Luna	863.17	19.20
Vastogirardi	T7212124	SCI	Bosco Monte di Mezzo – Monte Miglio – PennataroMonte Capraro – Monte Cavallerizzo	1609.51	26.51
	IT7221132	SPA	Monte di Mezzo	313.28	5.16
	IT7212134	SCI	Bosco di Collemeluccio – Selvapiana – Castiglione – La Coccozza	397.90	6.55

harmonize sustainable development issues with conservation, since the local population plays a key role in decision-making processes in management and planning (Van Cuong et al. 2017).

Community-based cooperatives, management of rural areas, and green tourism to counter depopulation

Population ageing, outmigration and a decreasing economy were recently addressed throughout Italy by the 2014 National Strategy for Inner Areas (Dipartimento per lo Sviluppo e la Coesione Economica 2014), in which significant socio-economic challenges were identified as drivers of land-use changes, particularly land abandonment and forest expansion. In order to act as a driving force for development, this national strategy to help inland areas whose vocation is to protect or to promote nature but which have shortcomings in services and development has been adopted in the Alto Molise area with the establishment of a Local Action Group consisting of 18 municipalities (*GAL Alto Molise*; Labianca et al. 2020). The funds they are now managing are aimed precisely at the development of agriculture (including livestock) and tourist activities within the BR, while safeguarding the natural environment. The implementation of development strategies relies both on horizontal and vertical co-planning processes, the former involving local communities, associations and institutions. The latter responds to the relationship between local and global demands (Barca et al. 2018), considers that the re-appropriation of abandoned land has a profound effect on local citizens, and promotes the social frame-

work of rural landscapes (Atkociuniene et al. 2015). In this framework, the participation of local administrations is very important both for direct support (e.g. leases on public buildings for use by local groups), and for the purchase of goods and / or assignment of services (Bandini et al. 2015). In this mountainous area, recoverable uninhabited buildings could be devoted to tourist activities, in particular to comfortable *dispersed hotels* (*alberghi diffusi*) offering experiential, cultural tourism based on the classic themes of rural life (food and wine, landscape and the environment), as has already happened in the village of Castel del Giudice in Molise Region (Presenza et al. 2019). Moreover, the newly established, so-called *community-based cooperatives* could offer collective services (e.g. welfare, land care, management of urban green spaces) and carry out economic activities like mountain farming, tourism services, and craft enterprises. These community-based cooperatives could take advantage of existing but unexploited or *sleeping* regional resources (Mastronardi & Romagnoli 2020), such as forest biomass (in line with local forest management plans) through the creation of strategic partnerships, both inside and outside the community (Venturi & Zandonai 2016). Moreover, the development of activities might require new expertise and, consequently, serve to enhance the educational level of local people, thus helping to limit the depopulation of the area. Municipalities could outsource to local cooperatives some services, such as land maintenance, urban green care, care of the elderly, school canteen management, and the promotion of environmental and heritage resources of tourist interest. Rural tourism could be a real development



Figure 3 –The Collemeluccio-Montedimezzo Alto Molise Biosphere Reserve © Sara Di Lonardo

factor for these inner areas (Lupi et al. 2017) since it satisfies people's need to enjoy nature, a feature which differentiates rural tourism from traditional tourism, and therefore requires suitable policies, which are currently being developed in Italy (Salvatore et al. 2018). Hence, the development of new forms of tourism in these inner areas could favour a *proactive conservation of landscape* (Salvatore 2015), arresting demographic decline, particularly the decay of working-age groups. A new community-based governance might promote the transition from a *culture of emergency* to a *culture of prevention* in the territory (Mastronardi et al. 2020) in order to achieve and support the three MAB Reserve aims – biodiversity, conservation and sustainable development – thereby, in the longer term, affecting landscape, environmental and cultural heritages for the better.

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The Julian Alps UNESCO Biosphere Reserve

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Keywords: UNESCO MAB, Triglav National Park, Julian Alps Biosphere Reserve, identity, management, networking, education, sustainable development, depopulation, wellbeing

Abstract

The year 2023 will mark the 20th anniversary of the proclamation of the Julian Alps Biosphere Reserve (JABR). When awarded the prestigious title, the Triglav National Park (TNP) Authority was already the managing body of TNP, which constitutes the core and buffer zones of the then-newly designated area. Over the course of time, it has become clear that buffer zone management is instrumental in securing the objectives of the TNP and JABR. This paper discusses aspects of management relating mostly to visitation, education and training, cross-border cooperation, and enhancing the local economy through the collaboration of providers. A bottom-up approach and multi-stakeholder networking as essential components of modern policy-making are the key to success, particularly since sustainable development in sensitive areas is reliant upon fostering a strong and broad community identity and local support for protected areas.

Profile

Protected area

Triglav National Park
& Julian Alps Biosphere Reserve

Mountain range

Alps, Slovenia

The Julian Alps and Triglav National Park – a single area of shared geography and identity

On 10 July 2003, the UNESCO office in Paris adopted a Decision to include the Julian Alps, Triglav National Park (TNP) (see link in the References for Triglav National Park) and part of the Karavanke mountains in the international network of UNESCO Man and the Biosphere (MAB) Reserves. The Julian Alps thus became part of a world network of model regions of sustainable development. The application was submitted by the TNP Authority, the long-term manager of Slovenia's only protected area of national importance, in cooperation with the Slovenian National Commission for UNESCO. When the park was included in the MAB network, the TNP Authority was nominated as the administrative authority of the Julian Alps BR.¹

Presentation, location and municipalities

The Julian Alps Biosphere Reserve (JABR) is located in the north-east of Slovenia and covers the high-altitude mountains of the Julian Alps, the north-western part of the Karavanke range, and the Julian Pre-alps (Prealpi Giulie). It extends to the state border with Italy (see Figure 1). The area is characterized by outstanding biodiversity and landscape features, and a rich cultural heritage.

The JABR comprises 10 municipalities: Bled, Bohinj, Jesenice, Radovljica, Žirovnica, Kranjska Gora, Gorje, Bovec, Kobarid and Tolmin. In terms of management regimes, there are three zones: the core zone, the buffer zone, and the transition area. The core and buffer zones of the biosphere reserve (BR) coincide with the same designation zones of TNP, which falls entirely within the MAB network, whilst the transition area provides supporting functions to the core and buffer zones. The transition area also has an important influence on the core zone. The management model – a single administrative authority to manage both the protected area and the BR – has several advantages, since it ensures that nature protection and sustainability measures are coordinated throughout the planning and implementation processes. The model has been effective in establishing new tourist offers located both within and outside the TNP area (e.g. the Juliana Trail), although coordinated management does require the active engagement of other stakeholders with regard to some issues, such as the management of state roads. The legal framework for the involvement of stakeholders is found in the TNP Management Plan 2016–2025, which was based on the TNP Act (see Načrt upravljanja Triglavskega narodnega parka 2016–2025). The TNP Management Plan comprises the following general chapters: nature conservation, preservation of cultural heritage, sustainable development, visitation, and management and administration.

Vignette 1: The Julian Alps BR in figures

Surface area: 195 723 ha (11% of Slovenia's territory), population 83 517 (2019). A recent survey shows that the population is declining slightly (–1% in the

¹ UNESCO uses *biosphere reserve* as the official term. Because *reserve* may be understood as a protected area which excludes people, the term has been translated into Slovene as *območje* (area or region).

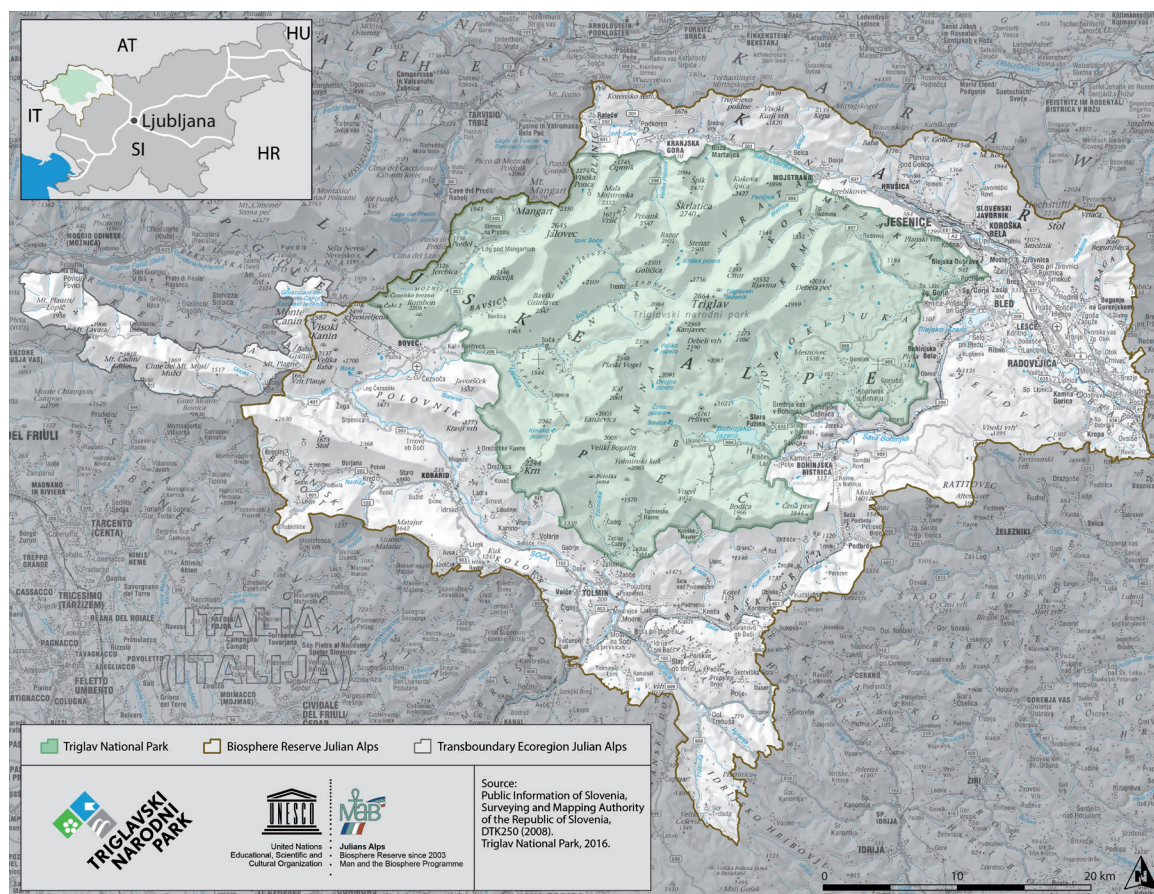


Figure 1 – MAB Julian Alps.



2019 it recorded 1 624 128 visits by Slovenian and foreign tourists (26% of all visits to protected areas in Slovenia), and generated 4 002 443 overnight stays (25.35% of all overnight stays in Slovenia). Tourism is the main driver of sustainable development of the settlements in the JABR, and the single most important source of income for people living there. In 2020, the number of overnight stays barely reached 60% of the 2019 figures due to COVID-19, but over the same period certain destinations reported an increase in daily visitors of over 30% (compared to 2019), due to the proximity of the capital and restrictions on crossing national borders.

Our path to acquiring MAB designation

The nomination was based on the 10-year research programme *UNESCO – MAB 3000 years of iron industry and pastoral economy in the Julian Alps and the impact of traditional activities on the changes in ecosystems*, which the TNP Authority began in 1997 with the financial sup-

port of the Slovenian National Commission for UNESCO. Alongside this research programme, the TNP Authority carried out a series of high-profile activities: they published a booklet, *UNESCO MAB and TNP*, acquired a protected designation of origin for *tolmenc* cheese (see Pravilnik o označbi geografskega porekla Tolmenc 2003), and won the Henry Ford European Conservation Award for reconstruction of the dairy in the organic village of Čadrg (see Ogrin 2012).

period 2015–2019), while the area is also one of the most popular tourist destinations in Slovenia. In

Presentation of good practice

The sustainable tourism development plan

The Julian Alps community (see link in the References for Julian Alps) is an informal association of managing authorities of tourist destinations in the Julian Alps. Some (Bohinj, Kranjska Gora, the Soča Valley, Bled) are among the most visited destinations in the country. The pilot case of sustainable tourism management was based on the *Development Plan for MAB Julian Alps as a Sustainable Tourism Destination* (see *Razvojni načrt Biosfernega območja Julijske Alpe kot trajnostne turistične destinacije* 2016), which was devised in 2015 and implemented in the years that followed. The first sustainability-based plan at a national level, it focused on re-directing visitors from high-impact areas where nature conservation is at risk to lower-exposure locations. The development plan does not consider tour-



Figure 2 – Juliana Trail offering bikers spectacular views of Slovenia's highest mountain, Triglav. © Mitja Sodja



Figure 3 – Slovenia's highest-lying road – to the Mangrtsko Sedlo Pass (2122m). © Boštjan Odar

ism as a *stand-alone* activity but rather as a *product* of an environment that is both favourable to its inhabitants and attractive for visitors in terms of nature conservation, and environmental, social, cultural and economic aspects. Several successful products developed within the framework of the Development Plan have been introduced in recent years (e.g. the Juliana Trail), while other locations like Bled and the Vršč Pass require further procedures and measures to be put in place.

Vignette 2: The Juliana Trail



JULIANA TRAIL 270/16

The top priority project in the Development Plan was the Juliana Trail, which was launched and opened to the general public in 2019 and has since attracted considerable attention. The idea of the new hiking trail was to reduce the impact of hiking tourism on Mt. Triglav by offering hikers a panoramic circular trail that runs through the transition area of TNP, opening up spectacular views of Slovenia's highest mountain and motivating hikers to choose to enjoy the magnificence of Mt. Triglav from afar (see Figure 2).

The Juliana Trail mostly runs outside the borders of TNP, through villages whose populations are shrinking due to out-migration and falling birth rates. This further increases the importance of (hiking) tourism and sales of local products (primarily foods) as a source of revenue. The 16 stages of the Juliana Trail cover 270 kilometres along existing paths, mostly

through alpine valleys with well-developed infrastructure that is ideal for hiking (see link in References for Juliana Trail).

Vignette 3: Encouraging sustainable mobility in alpine valleys and over mountain passes

The traffic-reducing measures imposed in 2020 on Slovenia's highest-lying road – to the Mangrtsko Sedlo Pass (2122m) (see Mlekuž & Mojca 2020; Triglav National Park, Public Transport in Biosphere Reserve Julian Alps 2020) – focused mainly on limiting the number of motorized vehicles (more than 20 000 in 2019, which fell to less than 15 000 in 2020) and available parking spaces (only 80 parking lots), organizing public transport (over 1 800 passengers in the summer season of 2020, the first year of operation), and promoting hiking (see Figure 3). The project was very well received despite initial reservations, and it now provides an example of good practice for other over-utilized areas. In the Lake Bohinj area (see link in the References for Tourism Bohinj), a systemic approach to encouraging sustainable mobility is already underway: motorized vehicles (primarily passenger cars) are being moved further away from the lake; pressure on the (over-)utilized starting points for high-altitude mountain hikes has been reduced; public transport connections for visitors and local inhabitants in remote locations have been improved. The innovative and comprehensive approach implemented in Bohinj is an example of sustainable mobility management in an area that is under great pressure from the volume of Slovenian and foreign visitors.

The Triglav National Park quality mark

The JABR and TNP deliver added value in terms of nature conservation, appreciation of cultural heritage, the quality of life of local inhabitants, and the local economy. Sustainable tourism can play an important role in preserving and expanding other economic activities, primarily agriculture and crafts, while promoting self-sufficiency. Developing collective trademarks aims to enhance the creation of added value and to improve the quality of life in montane areas. The aim of the TNP Quality Mark (see link below) is to connect providers within the existing certification systems who meet the objectives of the park – i.e. who are committed to sustainable practices and ensure the high quality of their products and services (see Figure 4).

The TNP Quality Mark is awarded to the products and services of providers who understand the need to preserve nature and the environment for generations to come. It enables consumers to support the local economy and tradition; it is a sign of respect for nature and trust in people who have lived and worked here for centuries. The Quality Mark supports indigenous breeds of domestic animals such as the Drežnica goat, Bovec sheep and Cika cattle, as well as the holders of the EU protected designation of origin: the piquant *mohant* cheese, *tolminc* cow's milk cheese and



Figure 4 – TNP Quality Mark, Eco tourist farm Gorjup. © Archive Eco Tourist farm Gorjup



Figure 5 – Julian Alps Transboundary Ecoregion – Alpine Ibex, Archive TNP. © Aleš Zdešar

Bonški sir sheep's cheese, which all boast a long tradition and a strong local importance, and are renowned and well-loved in Slovenia and abroad.

Vignette 4: Trademarks and the TNP Quality Mark



The trademarks of producers within the Julian Alps aim to improve their marketing positions, especially when the producers have been awarded the TNP Quality Mark.

As was demonstrated in 2020, collaboration among different branches of the economy (in particular in remote, sparsely populated areas) is key to the prosperity and continued balanced development of the local community. Another strong contributing factor is the merging of existing nationally and internationally recognized environmental standards, provided they comply with the objectives of UNESCO MAB and the TNP.

The standards are merged through the TNP Quality Mark certification system.

Cross-border cooperation – towards a transboundary UNESCO MAB area

The JABR is mainly a rural and montane border area. Its collaboration with cross-border areas that have similar challenges (relatively small populations and high visitor volumes) is crucial and requires a clear vision for long-term collaboration (see Transboundary Ecoregion Julian Alps, Triglav National Park with UNESCO MAB Area Julian Alps Area – Prealpi Giulie Nature Park, a new vision 2018).

Cross-border cooperation between two adjoining protected areas – TNP and the Parco Naturale Prealpi Giulie (see link below) – began soon after the Italian park was established and has grown stronger with every EU project which the parks have jointly implemented (Interreg: Palpis, ERA, Climaparks, Nat-

2care, Alpine Space: Alpencom, Alp.Bio.Net). In 2007 an initiative was launched to establish a transboundary park (stretching across national borders); two years later the Europarc Federation proclaimed the *Julian Alps Transboundary Ecoregion* (see link below), which includes the entire territory of the MAB Julian Alps in Slovenia and the territory of the Parco Naturale Prealpi Giulie on the Italian side of the border. The Transboundary Certificate was renewed in 2014 and 2020. The recertification, along with the observations and recommendations given, is an important recognition of what has been achieved, and a motivation and inspiration for further efforts in relation to the protection of natural and cultural heritage, visitation management, new development options, and cultural exchange among educational institutions.

Vignette 5: A transboundary biosphere reserve – a biosphere reserve for the future

The political systems that developed after World War II separated nations on both sides of the Slovenian-Italian border for decades. Reintroduction of the ibex in the border area of Kanin / Canin in the late 1990s laid the foundation for long and fruitful cooperation between the two border protected areas. The visionary attitude of their managing authorities, unaffected by the language barrier and different political systems, put the Julian Alps area on the map as an ecologically distinct region that actively supports ecological connectivity between BRs, and as the first transboundary area to be awarded the European Charter for Sustainable Tourism (see Figure 5).

In 2019, the Slovenian JABR was joined by the newly designated Italian JABR, with the aim of establishing a single transboundary BR.

The vision of a single transboundary BR is to ensure even better connected and better aligned management of the entire (cross-border) Julian Alps.



Figure 7 – Community of Schools of MAB Julian Alps - Nature Day in Kranjska Gora region. © Mojca Odar



Figure 6 – Community of Schools of MAB Julian Alps - Raised beds to encourage the production of locally grown food © Mojca Odar

Educating the young – bringing future leaders together

Environmental education of children and young people has been a constant focus of TNP since it was established. The designation of the JABR enabled educational activities to be included in systematic programmes for primary school children, which were conducted on-site (in the natural environment), at schools, and at TNP's information centres in Bled, Bohinj and Trenta. In 2018, the Community of Schools of the JABR was founded. This was the first large-scale association of primary schools and a protected area managing authority, and in a well-recognized area (the JABR). The Community of Schools is made up of 45 primary schools and brings together over 7 000 pupils and teachers (Figure 6).

The TNP Authority acts as the coordinator of the Community of Schools. The long-term goal is to connect the TNP Authority with the young generation as the future leaders for the development of the JABR. The priority objectives are to raise the community's awareness of the importance of MAB, and to achieve the goals of the UNESCO network of schools.



Vignette 6: Education and networking in the 2020 MAB Julian Alps Community of Schools.

Digital learning content: The Triglav Treasury (see link below Triglavska zakladnica) is an online classroom that offers free-of-charge materials related to

the BRs in Slovenia, sustainable development, climate change, etc. The project's website recorded more than 50 000 visits in 2020, when it was founded.

On-site activities: Due to COVID-19 restrictions, the 2020 summer nature science camp took the form of Nature Days (a total of 100 participants) with experts from the TNP Authority and external providers. Nature workshops are not only held for educational purposes: they are also intended for networking and building the JABR identity.

Didactic tools: each member of the Community of Schools (45 schools) received a raised bed with young plants and a plum tree sapling to encourage the production of locally grown food (see Figure 7).

Networking and collaboration: In 2020, just before the school lockdown, an online interactive event was broadcast for all pupils in grades 1 to 3 (more than 100 classes). The event was financed by the Slovenian National Commission for UNESCO.

Publication: every pupil receives the Community of Schools' newsletter. This allows the message to be spread to the pupils' parents and beyond, to an extremely wide audience.

Conclusion

The bottom-up management approach and participation of various stakeholders from the fields of tourism (destination managers), agriculture (local farmers and food-producers) and education (teachers) plays a crucial role in managing our common space – the JABR. From a historical point of view, this is a montane area subject to long-term depopulation and abandonment of settlements, but it is also a tourist destination of more than 100 years' standing. Today tourism is one of the most important industries; however, in many areas, high visitor volumes are already causing environmental and social problems. The added value of the JABR is its ability to connect the visitor management authorities and traditional economic activities of the area with educational programmes for children and young people that focus on the area's natural assets and, above all, responsible interventions in nature.

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Links

Ecoregion Julian Alps: <https://www.tnp.si/en/learn/julian-alps-ecoregion/>

Julian Alps: <https://julian-alps.com/>

Julian Alps Biosphere Reserve: <https://www.tnp.si/en/learn/balance-between-people-and-nature/>

Julian Prealps Nature Park: <https://www.parcopre-alpigiulie.it/>

Juliana Trail: <https://julian-alps.com/en/p/juliana-trail/42271466/>

TNP Quality Mark: <https://www.tnp-kakovost.si/>

Tourism Bohinj: <https://www.bohinj.si/>

Triglav National Park: <https://www.tnp.si/>

Triglav Treasury: <https://triglavskazakladnica.si/>

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About borders and limits: experiences with UNESCO Biosphere Reserves for transboundary cooperation in Ukraine and neighbouring countries

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Keywords: biosphere reserves, Eastern Europe, Ukraine, transboundary cooperation

Abstract

In Eastern Europe, several UNESCO Biosphere Reserves (BRs) have been important promoters of transnational and transboundary nature conservation and sustainable development. Nevertheless, political and institutional barriers and scarcity of resources have hindered successful cross-border cooperation. The prospects for BRs in Eastern Europe are mixed, especially in relation to the challenges of ecosystem degradation and climate change, as well as socio-economic and (geo)political crises. Based on our own experience of one and a half decades of growing cooperation between partners in Ukraine and Germany, we conclude that transnational cooperation between BRs and science is particularly rewarding and mutually beneficial.

Introduction

Many protected areas and biosphere reserves (BRs) are located along political borders, which are often drawn through less densely populated areas such as mountainous regions or larger forest areas, or follow ecologically relevant systems such as river courses (Westing 1998; Fall 2003). This predestined BRs to be motors of cross-border cooperation. In 1995, the Seville Strategy was launched, which included recommendations for the world network of BRs (UNESCO 1996). In 2000, the Seville+5 meeting was held in Pamplona, Spain. The so-called Pamplona Recommendations explicitly addressed the establishment of Transboundary Biosphere Reserves (TBRs) as a new framework for international conservation (Fall 1999).

However, few studies so far have investigated the extent to which TBRs have really succeeded in initiating a new quality of cross-border cooperation in nature conservation and sustainable development, and the studies' results show a mixed picture (e.g. Stein 2008; Taggart-Hodge & Schoon 2016; Trillo-Santamaria & Pael 2016; Romano et al. 2020; Weber & Weber 2020). The main obstacles are found in the various institutional, legal and historical development processes, which have not yet been used as learning opportunities (Romano et al 2020). Moreover, too much emphasis is often placed on gaining international recognition, the development of tourism, and the acquisition of funding (Trillo-Santamaria & Pael 2016), instead of on endogenous development towards sustainable practices in collaboration with local stakeholders (Romano et al. 2020). Overall, it appears that effective management is not the automatic consequence of establishing a TBR, and that more research on interrelations between the legal conditions, governance structures, and knowledge management is needed. Eastern Europe seems to be a particularly suitable region for the investigation of such issues.

After the break-up of the Soviet Union and the Cold War, the successor states, such as Ukraine and its neighbouring countries, generally tied in with previous nature conservation efforts, but they also endeavoured to test and use multilateral and international formats of cooperation in the midst of a spirit of optimism shaped by the new global environmental agreements, such as the Convention on Biological Diversity. While many Eastern European countries such as Poland or Romania were given the chance to associate with Western European countries, Ukraine suddenly found itself in a new kind of border situation - some actors perceived the border with the European Union as a kind of new Iron Curtain. Accordingly, nature conservation actors, especially in western Ukraine, made efforts to systematically link up with partners in neighbouring countries, such as Romania, Slovakia, and Poland. This included the development and expansion of BRs as well as the establishment of UNESCO World Heritage sites, or regional environmental agreements such as the Carpathian Convention.

Transnational and transboundary conservation promoted by biosphere reserves: mixed experiences and lessons learned

In post-Soviet countries, the designation as a UNESCO BR was often seen as an international recognition of, or even an award for, outstanding natural features – more in the sense of a UNESCO World Natural Heritage Site. At the same time, it is often observed that BRs are essentially seen as instruments of nature conservation and less as model regions, or even laboratories, for sustainable development (e.g. Těšitel & Kušová 2020). It is also problematic that BRs are not, as the MAB programme's goals would wish, anchored in national legislation. Normally, there is no additional budget to meet the obligations associated with BR status and the activities that would distinguish the areas from ordinary protected areas. At the same

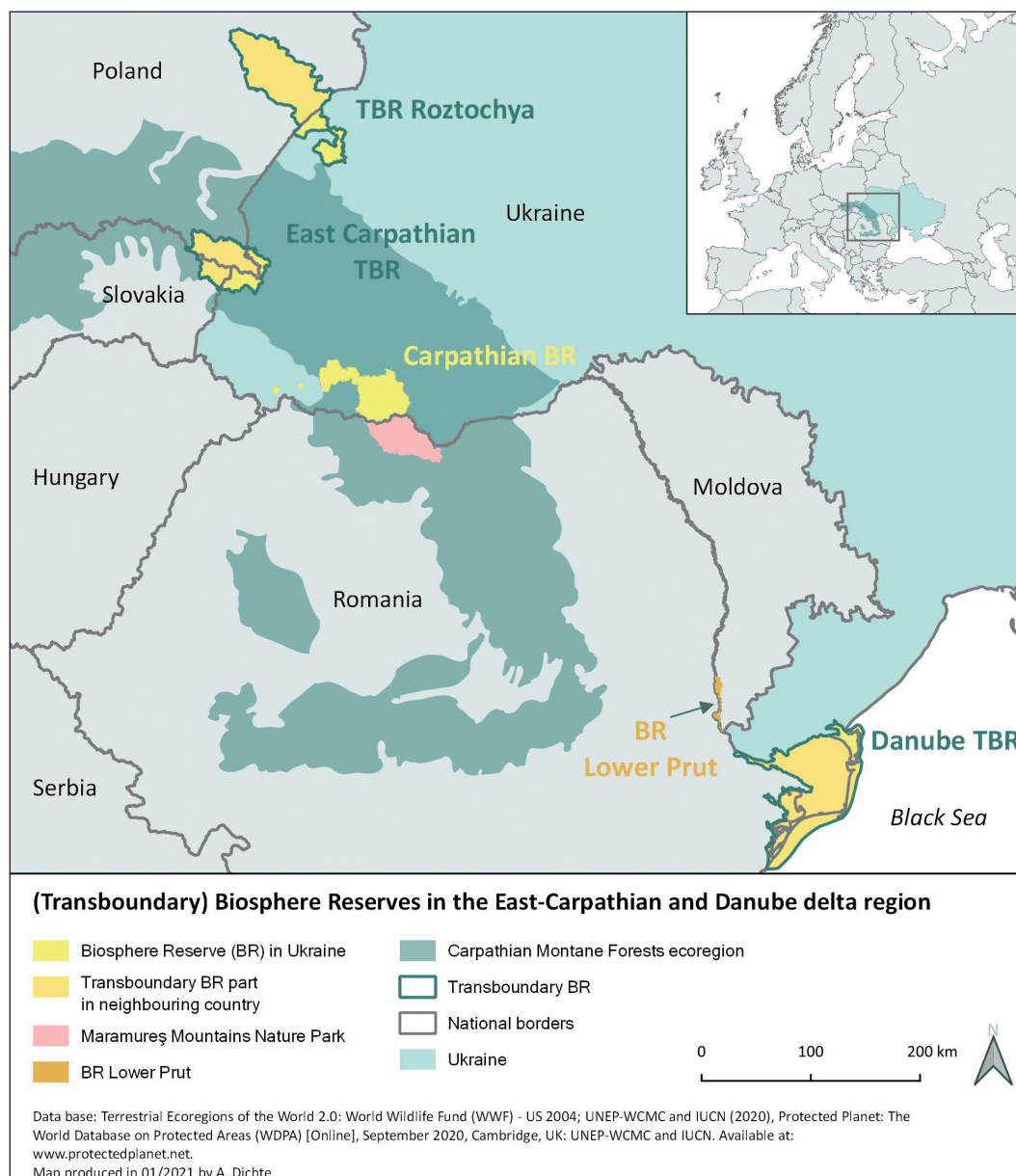


Figure 1 – (Transboundary) biosphere reserves in the East-Carpathian and Danube delta region.

time, demands and expectations regarding modern management of BRs have been growing, including participatory approaches (compare Geyer et al. 2009) and integrated management of complexly zoned territories, where frequent conflicts of interest have to be mitigated (Ibisch et al. 2011).

Nevertheless, even in the most difficult times of economic and political crises, some BRs demonstrated creativity and great commitment and became the driving force of international processes. For instance, from the 1990s onwards, protected areas in Ukraine and Slovakia, including the Carpathian Biosphere Reserve (CBR), discussed whether their old growth and primeval beech forests could be considered for nomination as UNESCO World Natural Heritage sites (Britz et al. 2009; Vološčuk et al. 2013; Ibisch et al. 2017). The importance of these unique wilderness areas was presented at international level and recognized

in 2007 by the inclusion of 10 component parts of a transnational site in Ukraine and Slovakia in the UNESCO World Natural Heritage programme. Intensive exchanges between German and Ukrainian partners resulted in the addition of 5 more sites in Germany in 2011 (Knapp 2013). This in turn led to a pan-European screening process in 2017 and the inclusion of a further 63 sub-areas in 9 more countries, thus creating a more complete picture of the postglacial expansion processes of beech forests in Europe within the serial World Heritage Site *Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe* (Ibisch et al. 2017). In 2021, further areas in 8 additional countries were added. This outstanding example of transnational cooperation is based on the work and commitment of many people, but a pivotal force in this process has been and still is the CBR, which comprises several component parts of the serial Site, including the single

Table 1 – Exchanges between UNESCO Biosphere Reserves and academic partners from Germany and Eastern Europe: timeline of selected cooperation activities between the Centre for Ecnics and Ecosystem Management (CEEM) at Eberswalde University for Sustainable Development (EUSD) and the Ukrainian partner institutions Carpathian Biosphere Reserve (CBR) and Ukrainian National Forestry University (UNFU).

Year	Milestone
2005	First visit of students from EUSD to the CBR (motivated by Swiss-Ukrainian travel guide)
Since 2006	Integration of annual visits to CBR in context of delivering modules on biosphere reserves, ecosystem and natural resources management in transformation countries (such as the post-Soviet states) (Bachelor's and Master's programmes: International Forest Ecosystem Management, Global Change Management)
2008	Memorandum of Understanding for cooperation between EUSD and CBR
2009–2011	German Environment Foundation (DBU)-funded project between CEEM/EUSD and CBR for the development of a new management concept for the CBR; joint book publication
Since 2010	EUSD and CBR cooperation related to the extension and management of the UNESCO World Heritage site dedicated to primeval and ancient beech forests (projects funded by the German Ministry for Environment, Nature Conservation and Nuclear Safety)
2012–2014	European World Heritage Beech Forests Research and development project implemented by EUSD with CBR, funded by the German Ministry for Environment, Nature Conservation and Nuclear Safety
Since 2014	Involvement of Ukrainian National Forestry University (UNFU) and Roztochya Biosphere Reserve in annual student excursions to biosphere reserves, joint student symposia, and exchanges of students and staff
2016	German Academic Exchange Service (DAAD) project on the involvement of civil society in sustainable forest management in the Ukrainian Carpathians (EUSD, CBR, UNFU) Round table in Ukraine on anniversary of Man and the Biosphere programme (incl. Lima Action Plan)
Since 2016	Erasmus+ projects between EUSD, UNFU and CBR for student and staff mobility
2017	DAAD project on transboundary cooperation for ecosystem-based sustainable development with partners from Moldova, Romania and Ukraine
2018	DAAD project on biosphere reserves and ecosystem services with partners from Moldova, Romania and Ukraine
2018–2021	Project on ecosystem-based adaptation to climate change in and with Ukrainian biosphere reserves (funded in the framework of the International Climate Initiative)
2019	DAAD project on biosphere reserves and transboundary cooperation with partners from Moldova, Romania and Ukraine, including a study trip and summer school with BR representatives and students from Germany, Ukraine and Moldova in Lower Prut Biosphere Reserve, Moldova
2020	DAAD project on Eastern Europe in a VUCA* world with partners from Moldova, Romania, Ukraine and Germany
Since 2020	Erasmus+ project between EUSD and Moldovan State University for student and staff mobility
2021	DAAD project on biosphere reserves and forests with partners from Ukraine, Moldova and Germany

*characterized by Volatility, Uncertainty, Complexity and Ambiguity (Schick et al. 2017)

largest one of the now truly pan-European property. As well as the CBR, two other Ukrainian BRs, also located in transboundary regions, contribute component parts to the serial World Heritage Site: Roztochya BR and the trilateral Eastern Carpathians Transboundary Biosphere (ECTB).

The ECTB, comprising protected areas in Poland, Slovakia and Ukraine, is the East-European pioneer for transboundary conservation involving BRs (see Taggart-Hodge & Schoon 2016). Established as early as 1998, currently it is an example of a *paper* BR, which is suffering from a lack of resources; it does not dispose of a central office, a common management regime, or any active coordination. Nevertheless, it was a natural aspiration of the CBR, which had successfully strengthened itself in international cooperation, to try to reach out to protected areas beyond the national border and to strive to establish a TBR in the Maramarosh region in northern Romania and southwestern Ukraine. Not only do the same ecosystems extend over the borders between Ukraine and Romania, but the region also comprises important ecological migration routes for large predators such as brown bears. In addition, in the course of the region's dynamic history, ethnic minorities such as the Hutsuls, who are intimately connected with particular ecosystems, were forced into two different national territories (Romania

and Ukraine) after World War I. The natural candidate for formal transboundary cooperation would be the Maramureş Mountains Nature Park in Romania (see Figure 1). The topic of a potential TBR was raised after CBR obtained its status as a UNESCO BR, and was included in the *Strategy for the implementation of the Carpathian Convention*, as well as adopted at the level of the Ukrainian Cabinet of Ministers in 2007. A large-scale EU project was carried out in the Carpathians (BioRegio, 2011–2014), targeting the establishment of a TBR in the Maramarosh region, but unfortunately the Romanian partners could not achieve the nomination as a UNESCO BR as they lacked the approval of local communities, who saw an international BR as a threat to their development aspirations.

More than a decade ago, Bihun et al. (2008) stated: “In practice transboundary cooperation in the management of Ukraine's protected areas is informal, fragmentary, and poorly planned.” We feel that substantial progress has been achieved, at least in some areas. Nevertheless, establishing and maintaining effective TBRs in Eastern Europe remains challenging.

In a decade and a half of growing cooperation between partners in Ukraine and Germany, including the CBR in Transcarpathia, the Eberswalde University for Sustainable Development (EUSD) and the Ukrainian National Forestry University in Lviv (UNFU), we have

experienced cooperation between BRs and academia as particularly rewarding and mutually beneficial. In the context of annual study trips since 2005 and other projects, the potential of BRs in Ukraine and adjacent regions is analysed on a regular basis (see Table 1). Every year since 2016, EUSD together with CBR and UNFU have been conducting year-long projects, which are supported by the German Academic Exchange Service (DAAD). In 2017, the framework was extended to include partners from Moldova and Romania, and the focus on involving civil society in ecosystem management was enriched by the topic of cross-border cooperation. In our experience, academia and BRs can jointly initiate thematic and regional networks and successfully combine transnational education, research and development. Academic ambitions and teaching activities can help to put particular topics on the BRs' agendas, and to foster dialogue across sites.

Prospects

The need for Eastern European BRs that can show the way to sustainable development and peace-building transboundary cooperation is greater than ever. At the same time, the framework conditions are not always improving. In the midst of a crisis of multilateralism, the geopolitical situation (for example in Ukraine) between a weakened European Union and an unpredictable Russian Federation remains extremely difficult (see e.g. Allison 2014, Sanders & Tuck 2020). The BRs have also been catapulted into a world characterized by increased Volatility, Uncertainty, Complexity and Ambiguity (VUCA) (Schick et al. 2017). Not only are further unforeseeable economic and political crises or ruptures to be expected in a region which has long been subject to these, but climate-change-related weather extremes, and dramatic changes in ecosystems and ecosystem services can also be anticipated, which may in turn contribute to emergency situations and further over-exploitation of natural resources. Unfortunately, in the last decade, earlier worst-case scenarios have come true or been exceeded by reality. For example, Geyer et al. (2010) stated that “*Development will increase the pace of forest exploitation including old growth forests and forests in protected areas as a result of better access, weak law enforcement and a lack of funds for conservation and forestry management*”, and that “*Climate change also causes increased drought stress to forest ecosystems such as spruce stands, resulting in possible mass die-offs facilitated by bark beetle infestation.*”

Consequently, to fully embrace the function of model sites for ecosystem-based sustainable development and to act as change agents through transboundary cooperation, state and regional policies and legislation will have to be revised in compliance with the strategic Lima Action Plan, which was endorsed for the World Network of Biosphere Reserves in 2016. (T)BRs as legal entities need to be strengthened and equipped with distinct competencies that set them

apart from other protected areas. In times of global and national crises, they can play a role in developing ecosystem-based *safety nets* (for example by securing the delivery of ecosystem services like food and climate regulation) for the local populations (Geyer et al. 2010). Adequate political and stakeholder support as well as legal backing and law enforcement are necessary, as well as alliances between BRs and academia.

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Table S1 – List of typical culinary products from Austrian BRs.

BR	Product	Use
Grosses Walsertal (BRGW)	Cheese: <i>Walserstolz</i>	One success story of this region is the founding of the Walserstolz cheese brand (Walserstolz 2018). Typical of the region are the many high-altitude alpine dairies, which are difficult to manage and have considerably higher production costs compared to their competitors. In the 1970s and 1980s, the situation was exacerbated by low milk prices, so there was a risk that many of these small farms would be abandoned. In 1998, Walserstolz created a common regional brand under which three alpine dairies produce high-quality mountain cheese made from silage-free hay milk. The construction of a modern cooperative dairy in the village of Sonntag has greatly facilitated independent milk processing, with milk being bought at a reasonable price, and ensuring lower production costs and thus higher added value. The involvement of a larger company (Emmi Österreich GmbH) increased the supra-regional sales opportunities, such that many products have been available throughout Austria for a number of years. This has also increased the level of awareness of the BR throughout Austria. As a result, both jobs and traditional agricultural practices have been preserved. Traditionally, the summer months in the high alpine pastures play a major role in mountain farming. In the BRGW, 47 such pastures are currently being farmed, and on 20 of these the milk is transformed into various products directly on site during the summer (Rumpold & Klenovec 2019). Since 1997, Walserstolz cheese has been protected by EU schemes of geographical origin, such as <i>Vorarlberger Bergkäse PDO</i> .
	Herbs: <i>Alchemilla</i>	The herbal initiative Alchemilla, founded in 2006 by women who love and are knowledgeable about herbs, aims to impart herbal knowledge and the special value of the region's plant diversity (BRGW 2018a). The members of the initiative, who offer seminars on herbal knowledge in the region that has been handed down over centuries, and convey the sensitive interactions between man and nature during herbal walks. The women also produce high-quality handcrafted products made from local herbs and raw materials, including body-care products and culinary delicacies such as herbal tea, herbal syrups and wild herbal salt.
	Herbal tea: <i>Bergtee</i>	The <i>Bergtee</i> (Mountain tea) initiative creates awareness of the richness of herbs growing in the natural environment as well as in the herb garden, and uses this diversity to create mountain tea: a story, not a product, as the collectors emphasize (Burtscher et al. 2012). The aim is that knowledge of the power of plants should be passed on from one generation to the next (Grasser et al. 2012, 2016; Schunke et al. 2015). Many BR partner businesses, which are important multipliers for the BR management and whose status is awarded according to criteria drawn up jointly, offer mountain teas alongside other regional products.
	Biscuits: <i>Walser Kekse</i>	Cookies made by hand from regional ingredients such as fresh butter, berries, spelt flour, oat flakes and hazelnuts (BRGW 2018b).
Salzburger Lungau & Kärntner Nockberge (BRS&KN)	Potatoes: <i>Lungauer Eachtling</i>	Thanks to its particular climatic and soil characteristics, the Lungau region is one of the best potato-growing areas in Austria. In the Lungau dialect, the word <i>Eachtling</i> means <i>potato</i> and is used by the local farmers as a brand name for a total of eight cultivated potato varieties. The traditional form of cultivation has been handed down through the generations and produces excellent table potatoes with high-quality vegetable protein, many vitamins and valuable minerals. The farmers also specialize in the production of first-class seed potatoes, which are characterized by their particular vigour and resistance to disease.
	Rye: <i>Lungauer Tauernroggen</i>	A success story from the Salzburg part of the BRS&KN is the conservation of Lungauer Tauern Rye, a heritage cereal that was typical of the region. This variety is well adapted to the harsh climatic conditions of the Lungau region and very well suited for cultivation in the marginal areas of grain cultivation due to its undemanding nature. Until the 1960s, Lungauer Tauern Rye was the most important cereal variety in the Upper Enns Valley (BMLRT 2017a). By the middle of the 20 th century, the original seed was being propagated and marketed by more than 100 mountain farms in the Lungau. In 1954, the distribution of Tauern Rye reached its peak, with 122 hectares under cultivation; in 2005, the rye accounted for only about 2 ha (Kulinarisches Erbe 2018). However, a Slow Food initiative launched in 2006, which led to the creation of the Lungauer Arche Association, has quadrupled the area of Tauern rye, certified by the Austrian Food Safety Agency as now covering 8 ha (Löcker 2020 pers. comm.). The cultivation of this variety makes an important contribution to the preservation of ecological diversity, the enrichment of the cultural landscape, and the development of a typical regional food culture. This rye is used in the production of bread, pasta and beer and for traditional Lungau pastries such as <i>Roggenger Krapfen</i> and <i>Hasenöhrl</i> . The first is a type of flatbread, sprinkled with cheese or filled with roast meat or even jam, and then rolled up like a pancake. The latter are flat, rhombic or triangular pastries made with lard, traditionally served with sauerkraut. The name is derived from the fact that the dough rises during baking in such a way that the pastry resembles long, thin rabbit ears (<i>Hasenöhrl</i>). If prepared from Tauern rye flour, it is said that the pastry is tastier than when it is made using conventional flours.
	Dessert: <i>Lungauer Rahmkoch</i>	This rich sweet dish (also called <i>marzipan from the Lungau</i>) is produced in the Lungau, where it has been preserved as a part of the rural tradition. It is made by slowly cooking flour, butter, cream and raisins and sugar, flavoured with rum and spices, such as cinnamon and aniseed. While this type of dessert used to be widespread in the Alpine region, nowadays it is produced only in the Lungau. It is certainly the most traditional dish in the region, and is protected by the Ark of Taste Slowfood Initiative.
	Milk: <i>Reine Lungau</i>	The promising <i>Pure Lungau Biosphere Milk</i> BR project, launched in 2017, has unfortunately not met with the success that was originally expected. Initiated by the dairy company SalzburgMilch, products using exclusively organic milk, made by almost 60 farmers from the Lungau region, were marketed under the premium brand <i>Reine Lungau</i> (Köck 2019). Since these top-quality products, for which the farms were able to sell their milk at a significant premium, were not as popular with consumers as had been hoped, the multiple award-winning project unfortunately had to be discontinued after three years, in October 2020, for economic reasons.
	Cattle: <i>Nockberge Almrind</i>	The region has a centuries-old tradition of extensive livestock farming on the mountain pastures, which are located at between 1500 and 2440 m a.s.l. The high quality of the meat of the Nockberge Almrind cattle is the result of the cattle being raised outdoors, including the obligatory summer grazing on the alpine pastures in the Nockberge area. The grazing of the alpine pastures up to the summit areas is a special feature of the region. The environmentally conscious and soil-conserving management of the farms and alpine pastures contributes significantly to the sustainable maintenance of the alpine landscape in the region. The 'Bäuerliche Vermarktung Nockfleisch' cooperative of 14 farms ensures the production of high-quality and luxury foods, making beef, pork and game dishes according to traditional farm recipes (BRS&KN 2018).
	Honey: <i>Nockhonig</i>	<i>Nockhonig</i> , a high-quality honey produced in the BR, may be sold under this label only if it is produced exclusively by a pure-bred regional subspecies of honey bee, namely the Carnica bee (<i>Apis mellifera carnica</i>). The marketing of this brand of honey thus contributes to promoting the Carnica bee, which is endangered by the use of mixed breeds and hybrids. In this way the local beekeepers and their bees make a significant contribution to the preservation of the biodiversity of the region's flora and fauna (BRS&KN 2018).
	Fish: <i>SIGI'S natural char</i>	Slow growing high-quality char from Carinthia's highest situated fish farm, at 1300 m a.s.l. The particularly long rearing period in ponds with the cleanest mountain water flowing through them and the year-round cold temperature of the water are the basis for the exceptionally high quality of the fish and the delicacies produced from them (NaturaSailing 2020).
	Milk products: <i>Kaslabn</i>	In the <i>Kaslabn</i> dairy, founded in 2016, organic hay milk from goats and cows from the Nockberge region is made into cheese and butter under the slogan <i>Organic. Regional. Good</i> . (Kaslabn 2018). Founded as a cooperative by four farms in the region, 20 farms now deliver their milk to this showcase dairy, where cheese production can be observed directly.
	Ice cream: <i>Nockberge Bauernhof-Eis</i>	Since 2009, on a mountain farm located at 1600 m a.s.l., around 160 flavours of ice cream are produced from exclusively farm milk and sold direct to restaurants, the retail trade and customers (BRS&KN 2018).
	Hay from alpine pastures: <i>Almheu</i>	The hay is mowed on mountain slopes between 1800 m and 2000 m a.s.l. Due to the extreme steepness of the terrain (the gradient can be over 100%), cutting the hay has to be done by hand. The hay contains about 100 different plant species and is therefore very valuable. This high biodiversity can only be maintained by constant cultivation. Since some plants are biennial, the areas are divided into two halves, so that each area is mowed only every two years. This gives the flora the chance to reproduce in a species-appropriate way. In addition, this method of cultivation is also an active form of landscape and nature conservation, as the danger of avalanches is greatly reduced on these cultivated areas. As well as for fodder, the hay is also used for medicinal purposes thanks to the presence of various plants, and to make liqueur and bath products (BRS&KN 2018).

BR	Product	Use
Wienerwald (BRWW)	Fruits	Fruits from the Wienerwald and the products made from them offer high potential for culinary enjoyment. Unfortunately, the high-stem fruit trees that used to be typical of the traditional cultural landscape, such as vineyard peaches, almonds, cherries, apples, cornelian cherry (<i>Cornus mas</i>), nuts or the service tree (<i>Sorbus domestica</i>), have become rare in the orchards of the Wienerwald. However, since orchard meadows with several thousand different animal and plant species are among the most species-rich habitats in Central Europe, the management of the BR has launched an action to support the planting of new fruit trees (BRWW 2020). This successful initiative thus not only contributes to the preservation of the cultural landscape, but will also lead to the preservation of traditional fruit varieties and make them more readily available to consumers in the medium term. In this way, the campaign also contributes to increasing and securing the creation of economic value in the region.
	Wild service tree: Wiesenwienerwald Elsbeere	The Wiesenwienerwald Elsbeere region contributes to the preservation of the huge wild service tree (<i>Sorbus torminalis</i>), which can be up to 200 years old. The freestanding, large-crowned trees, which are used for both wood and fruit, are typical of the western Wienerwald (Kulinarisches Erbe 2018b). The wild service tree produces brownish, thumbnail-sized fruit, which have a high vitamin-C content, taste slightly acidic, and develop a unique almond-like aroma. The fruits have been harvested by hand for generations, and are eaten fresh or dried, or processed into various specialties such as jam. The most sought-after product is probably the Elsbeere-brand distilled from the fruits. This expensive, noble brandy has a unique flavour characterized by an almond-like aroma.
	Wine	The Wienerwald has a share in three outstanding wine regions. On its northern and eastern foothills, there are excellent wine-growing areas with a high landscape diversity. These species-rich viticultural landscapes were one of the reasons for the designation of the Wienerwald region as a UNESCO BR. Each of the three areas grows grape varieties typical for the region – such as Zierfandler or Rotgipfler – or produces the traditional wine known as <i>Wiener Gemischter Satz</i> , listed as a Slow Food Presidium since 2008. In contrast to a <i>cuvée</i> , for <i>Wiener Gemischter Satz</i> up to 20 different grape varieties are planted in the same vineyard, and harvested and pressed together. Originally, growers used the varying degrees of ripeness and acidity as a way to ensure consistent quality and guard against the risk of poor harvests (Wiener Wein 2020). In February 2020, an application was submitted for Wiener Gemischter Satz to be included in the EU Register of Protected Designations of Origin (PDO) was submitted (European Commission 2020).
	Honey	Several partner companies in the BR produce high-quality organic honey in the natural meadows and forests of the biosphere reserve. Most of the beekeepers are engaged in educational programmes for children and adults and offer courses for schools.
Lower Mura Valley (BRUM)	Styrian Scarlet Runner Bean PDO (Protected Designations of Origin)	The scarlet runner bean (<i>Phaseolus coccineus</i>) found its way from the New World to Europe in the 16 th century and over time developed into an unmistakable Styrian speciality. Approximately 200 Styrian farmers produce almost 95% of the Austrian scarlet runner bean harvest on 550 hectares of cultivable land – around 550 tons per year (LSG 2019). The bean is mainly cultivated together with maize, which serves as a supporting plant for it, or in pure culture supported by poles. The maize and beans are threshed together in late autumn. This is followed by mechanical separation, drying, and finally manual sorting. The exceptional quality of the Styrian scarlet runner bean is the result of the interplay between the ideal conditions in south-eastern Styria, the expertise in cultivation and harvesting methods passed down for generations, and the varieties, which are optimally adapted to the environment. In the regional catering businesses, the black-violet pied, a relatively large scarlet runner bean, is processed into delicious dishes such as the traditional beetle bean salad with Styrian pumpkin seed oil. Since August 2016, the Styrian scarlet runner bean has been protected by its inclusion in the EU register of PDO (BMLRT 2017b, European Commission 2020).
	Styrian Pumpkin Seed Oil PGI (Protected Geographical Indications)	No other foodstuff is so inextricably linked to Styria as Styrian pumpkin seed oil. Already at the beginning of the 18th century, oil was pressed from pumpkin seeds, but at that time the seeds still had husks. About 100 years ago, Styrian farmers started to cultivate soft-skinned varieties and finally bred the <i>skinless Styrian pumpkin seed</i> (<i>Cucurbita pepo</i> var. <i>styriaca</i>). These are first ground, mixed with salt and water, then gently roasted and finally pressed. The tasty, dark green, nut-scented oil, which in recent years has become a figurehead for Styria in international speciality cuisine, has been approved by the EU since 1996, when it entered the register of PGI as Styrian Pumpkin Seed Oil PGI (BMLRT 2017c; European Commission 2020). Since then, more than 3 150 local pumpkin seed producers and 40 oil mills have joined forces in the Styrian Pumpkin Seed Oil PGI Producer Ring, founded in 1998, in order to jointly implement the protection of origin. A control system guarantees that only pumpkin seeds from the protected area and pressed within the region can be labelled <i>Styrian Pumpkin Seed Oil PGI</i> .
	Styrian Horseradish PGI	Southeast Styria, and thus also the BR region, is also the traditional area of cultivation for another regional speciality, namely Styrian Horseradish PGI. At present, about one hundred farms cultivate around 300 hectares to produce about 3,000 tons of this speciality annually. The predominant Illyrian climate with its high humidity and high temperatures during the growing season, and the heavy, deep loamy soil in the region provide excellent growing conditions for horseradish. Freshly grated, it refines many regional specialties. Since 2008, Styrian horseradish has been listed in the EU register of PGI (BMLRT 2017d, European Commission 2020, Steirische Spezialitäten 2019).
	Wild garlic	A further contribution to the regional culinary potential is wild garlic (<i>Allium ursinum</i>), which is abundant in the BR's alluvial areas in spring. It is collected by locals and tourists alike, and figures in delicious dishes in the restaurants.
	Wine from historical double ownership	High-quality wine production is an important economic sector in the region. A leading grape variety is the Traminer, which matures in the volcanic Styrian soils which give it outstanding qualities. In the BR itself, however, the areas under wine cultivation are considerably smaller than in the surrounding region. An interesting initiative is the marketing of the so-called wine from <i>historical double ownership</i> . Due to the shifting of international borders after the First World War, a number of wine producers developed who had vineyards in both Styria and beyond the national border, in today's Slovenia. In the Gleichenberger Agreement of 1953, it was decided that all dual vineyard owners were allowed to cross the border between the former Yugoslavia and Austria using a special passport so that they could cultivate their vineyards in both countries. This agreement, which remained in force until 2015, also stipulated that only historic dual owners had the right to bring grapes that had been harvested in Slovenia to Austria and to produce Styrian wine from them. However, the validity of this agreement has ceased to be valid with the accession to the EU. However, since the 2018 vintage, the historic dual owners have again been allowed to bring the grapes harvested from their Slovenian vineyards to Styria, where they are processed. These particular wines are now identified clearly by a logo that includes a swallow, which symbolizes the trans-national nature of the wines (Weinzeitung 2020; G. Pock 2020 pers. comm).
	Rice	In 2012, the Fuchs farm had the innovative idea of growing rice using the dry rice cultivation method (Fuchs 2020). After several years of learning and teaching, several farmers in the region were finally convinced and brought on board, and the first rice was launched on the market in 2014. 100 tons of rice are now harvested from about 30 hectares of land (some of which is located in the BR), processed by contractual partners using Austria's most modern rice-processing plant, and marketed under the brand <i>SteirerREIS by Fuchs</i> (Fuchs 2020 pers. comm). In a second farm, that of the Fröhlich family, about 6 tons of rice per year are harvested from some 15 hectares in the BR area (Fröhlich 2020 pers. comm.). The rice is then de-husked and polished in Styria's first farm-owned rice mill, and sold in 100% biodegradable packaging to gastronomic establishments and the retail trade (Fröhlich 2020).

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Supplementary Table 2 – Examples of the conservation, development and logistical support functions from Borsdorf et al. (2020).

Biosphere reserve (BR)	Support function		
	conservation	development	logistical
Berchtesgaden (D)		The transition area was extended to meet the requirements of sustainable regional development (Weixlbaumer et al. 2020).	
Oberslausitzer Heide- und Teichlandschaft (D)			Preservation of traditional cultural heritage species (Braun et al. 2020).
Pfälzerwald-Nordvogesen (D)	Managing biotope trees, old trees and dead wood to preserve biological diversity in the forest (Braun et al. 2020; Weber & Weber 2020).	Action priorities are measures to safeguard biodiversity, landscape conservation and development (Weber & Weber 2020).	Offering education and information on nature and landscape (Weber & Weber 2020).
	Rewetting, regeneration and restoration of the natural character of the peatlands (Braun et al. 2020).	Increase organic farming within BR (Braun et al. 2020).	Citizen participation in the BR on the following topics: zoning, nature conservation, sustainable regional development (Weber & Weber 2020).
	Rehabilitation and improvement of standing waters. (Braun et al. 2020; Weber & Weber 2020)	Franco-German farmers' markets are organized, with stall-holders having to meet sustainability criteria in order to distinguish themselves from other markets (Braun et al. 2020).	Work on specific topics concerning the German and French offices: research, monitoring, education, public relations, tourism and regional products (Weber & Weber 2020).
	Conservation of open landscapes (Braun et al. 2020; Weber & Weber 2020).		
Rhön (D)	Increasing the proportion of native deciduous tree species, which leads to the development of stable forest stands adapted to climatic changes (Braun et al. 2020).	The origin of the Rhön brand goes back to various marketing initiatives in the region at the beginning of the 1990s. Since 2008, these initiatives have been working together under the umbrella of the Trägerverein Dachmarke Rhön e. V, which covers the entire BR and other neighbouring areas, increasing the regional added value (Weixlbaumer et al. 2020).	
	Protection of borage grass biotopes through extensive use (e.g. as pasture for suckling cows) in cooperation with farmers, the BR management and the provincial authorities (Braun et al. 2020).	Renewable energies are promoted, and a local approach involving citizen energy cooperatives has been implemented (Braun et al. 2020).	
Schwäbische Alb (D)	A comprehensive nature conservation strategy (<i>Biodiversity Checks</i>) was developed for vulnerable ecosystems and endangered species (Braun et al. 2020).	The creation of a brand to which the UNESCO award contributes establishes the BR as a destination and makes added value perceptible. The Schwäbische Alb BR's logo can be used for marketing purposes, both for municipalities and within the framework of the partner initiative for officially recognized tourism providers (Runst & Stoll Kleemann 2020).	The acceptance of the population is very positive (Runst & Stoll-Kleemann 2020; von Lindern et al. 2020). Regarding the participation of citizens, some see still a lot of need, others emphasized the existence of opportunities for citizens if they want to get involved (Runst & Stoll Kleemann 2020).
Schwarzwald (D)			The acceptance is relatively high considering that the BR is still in the process of being established; the population has not had much direct experience with the BR (von Lindern 2020).
Spreewald (D)			Preservation of traditional cultural heritage species (Braun et al. 2020).
Salzburger Lungau and Kärntner Nockberge (A)	Development of indicators as a basis for management decisions, e.g. deadwood development; numbers of capercaillie and meadow-nesting birds; development of ecological habitats; land-use development (Huber & Köstl 2020).	The organic milk initiative Reine Lungau an integral part of the internationally recognized Genussregion Lungau. It is a model of a successful sustainable development initiative (Weixlbaumer et al. 2020).	Universities' support for the BR in the implementation of its mission as well as the long-term promotion of innovation was contractually established in the region. This includes the support of scientific public relations work and promoting the identification of a broad public with the BR. The financial resources are provided by the BR (Falkner & Rauch 2020).
		Development of indicators as a basis for management decisions, e.g. development of agricultural land, municipal tax, tourism tax (Huber & Köstl 2020).	Development of indicators as a basis for management decisions, e.g. demographic development, acceptance of the BR, possibilities for participation of citizens in the BR (Huber & Köstl 2020).

Großes Walsertal (A)		Energy-efficient community (Braun et al. 2020)	Acceptance by the local population is very high; the inhabitants' willingness to engage in future BR projects or working groups is present and even increasing. BR residents receive frequent updates on research projects and can be involved in them directly (Rumpolt 2020).
		Study of innovations and innovative projects: non-profit women's initiative for the production of organic cosmetics, ensuring the preservation of herbal knowledge; alternative transport to hiking areas; regional wooden houses and furniture; initiative for the production of organic tea, ensuring the preservation of cultural heritage and knowledge; local initiative for sustainable broadband supply to households, businesses and public institutions to reduce the digital divide between urban and rural areas; exchange of firewood via online platform helps ensure new collaborations between residents and forest owners; label for tourism enterprises in the BR; new cooperation between milk producers, dairies, stores and label for dairy products (Kratzer 2020).	Civil commitment and volunteer work is particularly high. The protected area management as well as the other decision makers draw on an extensive network of associations and organizations when it comes to finding forward-looking strategies for sustainable regional development. (F Borsdorf 2020). Local art and culture festival, which also serves as an exchange platform and for encounters between local and outside creations (Kratzer 2020).
Wienerwald (A)	Analysis and digital recordings of all paths in the core zone (Braun et al. 2020).		Transfer of traditional knowledge, e.g. of fruit trees species (Braun et al. 2020). Cultural exchange among BR schools (Braun et al. 2020).
Engiadina Val Müstair (CH)	Lightening of scrubby dry pastures by goats (Braun et al. 2020).		Acceptance of, identification with, and commitment to this particular BR are more limited and less widespread, maybe because of the unclear differences between BR, national park and regional nature park (von Lindern et al. 2020).
Entlebuch (CH)		Biosphären Markt AG and <i>Echt Entlebuch</i> are two important economic brands (Kratzer 2020). Certified energy region (Braun et al. 2020).	Since the beginning, the main focus of activities has been on economic development, e.g. through the increase of nature-based tourism or the certification of products; on education, e.g. through the introduction of school projects on Entlebuch BR in collaboration with local teachers; on participation and cooperation, e.g. by means of forums where technical discussions take place and projects are developed; and on internal and external communication (Hammer et al. 2020).