# VI. Social Dynamics and the Development of New Pottery Signatures at Çukuriçi Höyük, 7th to 3rd Millennium BC

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**Abstract:** This study illuminates changes in raw material selection and production technology of ceramic assemblages excavated at Çukuriçi Höyük, Western Anatolia, from the Neolithic to Early Bronze Age 1 (EBA 1) (phases ÇuHö IX–ÇuHö III) based on preliminary petrographic analyses combined with a cultural theory approach. A potential interdependence between the reorganisation of social structure at the settlement as indicated by the spectrum of relevant small finds and the changing layout of built structures, and the potting strategies of the local craftsmen at the varying chronological stages of transition will be tested. The results obtained aim to fundamentally challenge the common perception of prehistoric crafts, emphasising highly variable but targeted clay exploitation processes testifying to the excellent knowledge of available local natural resources of the prehistoric potters. From a stylistic and technological perspective, ceramics from Çukuriçi Höyük need to be compared with relevant synchronic sites in Anatolia in order to highlight cultural interactions and dynamics between the regions or rather to reveal contacts with the eastern Aegean islands. Field observations on the geology surrounding the site might offer new insights for the reconstruction of palaeoenvironmental conditions during the chronological periods given. The study will examine whether the particular ceramic traditions of Çukuriçi Höyük are coherent with cultural and socio-economic principles already hypothesised for the Küçük Menderes Valley and the western Anatolian coastal area, or if a certain supra-regional impact on the crafts sector might be recognisable.

**Keywords:** Çukuriçi Höyük, Prehistoric Ephesos, Western Anatolia, Clay Raw Materials, Micro-Scale Provenancing, Petrography, Technological Choices, Social Changes

**Zusammenfassung:** Basierend auf den vorläufigen Ergebnissen petrografischer Analysen, widmet sich der vorliegende Beitrag den Auswahlverfahren von Tonrohstoffen und den Herstellungstechnologien neolithischer bis frühbronzezeitlicher keramischer Hinterlassenschaften des Çukuriçi Höyük (Phasen ÇuHö IX–ÇuHö III) in Westanatolien. Konkret werden mögliche Zusammenhänge zwischen der Neuordnung der gesellschaftlichen Struktur auf dem Siedlungshügel – wie Kleinfunde und die wechselnden Grundrisse der freigelegten Bauten vermuten lassen – und dem lokalen Töpferhandwerk in den unterschiedlichen Siedlungsphasen untersucht. Die bisherigen Resultate der Analysen verdeutlichen eindrucksvoll eine sich verändernde, aber gleichzeitig gezielte Ausbeutung von Ton; dies darf als Hinweis auf die ausgezeichnete Kenntnis der verfügbaren Naturressourcen durch die prähistorischen Töpfer verstanden werden. In gefäßtypologischer und technologischer Hinsicht muss das Keramikspektrum des Çukuriçi Höyük mit zeitgleichen Fundstätten Anatoliens verglichen werden, um eine Identifikation und Interpretation möglicher kultureller Wechselwirkungen und Strömungen auf überregionaler Ebene bis hin zu Kontakten mit der Ägäis zu gewährleisten. Geologische Feldforschungen ermöglichten eine erste Rekonstruktion der den Siedlungshügel umgebenden Landschaft, indem Gesteinsarten und mögliche Tonlagerstätten kartiert wurden. Primäres Ziel des Beitrags ist es darzustellen, ob die unterschiedlichen Keramiktraditionen des Çukuriçi Höyük direkt auf kulturelle oder sozioökonomische Ursachen zurückgeführt werden können, die geografisch auf das Tal des Kleinen Mäander oder die Küstenregion Westanatoliens begrenzt sind, oder ob sich überregionale Einflüsse im Handwerk erkennen lassen.

**Stichworte:** Cukurici Höyük, prähistorisches Ephesos, Westanatolien, Tonrohstoffe, lokal/regionale Herkunftsbestimmung, Petrographie, technologische Entscheidungen, gesellschaftliche Veränderungen

Ceramics and their stylistic attributes can be considered reliable indicators for tracing cultural changes, transfers or adaptions and as such aid in the reconstruction of elemental aspects of premodern societies.[325] The vessels' morphology is a visual response to both functional and aesthetic

[325] Recent papers questioning a relation between stylistic or technological changes in pottery manufacture and socio-economic conditions have been published, for instance, by Çilingiroğlu 2012 and D'Anna – Guarino 2012.

demands of the consumers. Coevally, the shape repertoire and particularly the manufacturing techniques of the pots reflect deliberate choices by potters being influenced by their current cultural milieu. At the same time, the character of the clay raw materials utilised is highly dependent on sediment resources available within the local geology. Specific physical properties of the clays, their firing to particular colours or their regional distribution are factors that need to be considered when dealing diachronically with compositional ceramic studies and their cultural-historical interpretation. Besides being dependent on environmental factors, strategies in clay selection can also be understood as a response to local traditions. Technological progress, on the other hand, seems to be a developing expertise becoming more sophisticated over time. A petrographic approach has uncovered several new aspects of prehistoric craft activities in western Anatolia. These can be linked to broader Anatolian-Aegean phenomena. Thus far, around 400 ceramic samples have been analyzed, including specimens of diverse functional classes of all phases detected at Çukuriçi Höyük.

The chronological sequences preserved at Çukuriçi Höyük cover several stages of transition being characterised by symptomatic rearrangements in the layout of the settlement structure, on the crafts sector, in dietary practices and associated quotidian tasks, just to mention a few. Elaborating the peculiarities of the individual periods and comparing them diachronically will allow detection of meaningful continuities or discontinuities concerning the ceramic sector. The interpretational value of ceramic compositional data is complex, as multiple parameters need to be taken into account. Investigating strategies of long-term raw material selection in ceramic vessel production might aid in delineating modes of interaction and engagement of humans with their surroundings. Rearrangements in the exploitation and utilisation of particular clays have usually been tentatively assigned either to deliberate technological choices by the craftsmen or to societal reorganisation at the investigated sites. The latter might be applicable here, as there is strong evidence for limited importation of ceramics to Çukuriçi Höyük, attesting to expanding foreign contacts.[326] Thus, circulation patterns of the ceramic vessels need to be assessed and compared to regional patterns.

Methodologically, relevant archaeological contexts at Çukuriçi Höyük will be summarised briefly before dealing in detail with the geological environment surrounding the site. Addressing the composition of the most striking and defining ceramic fabrics in thin section (henceforth petrofabrics) for each period will give a first impression on potential consistencies in pottery manufacture, which we assume must have been taken place in close proximity to the tell. Finally, explanatory models for possible shifts in clay selection and manipulation will be presented under consideration of environmental and cultural circumstances affecting the region.

## VI.1. Site Formation Processes and the Archaeological Record

Reconstruction of site formation processes provides context for detecting and interpreting significant changes at the site. This is particularly important for transitions between the individual settlement phases, when an abandonment and renewal of the building structures is evident (Fig. 1.6). Phases ÇuHö IX, dating to the Neolithic, and ÇuHö VIII of the Late Neolithic, exemplify such a rearrangement.

A cross-section through the tell reveals the stratigraphy between the Neolithic and Late Neolithic phase in the second half of the 7$^{th}$ millennium BC. A sediment layer of several centimetres thickness clearly separates both phases. Indicators for a sudden destruction of the Neolithic settlement are not given. Rather an intentional abandonment can be assumed, as valuable objects have been carefully removed from the floors before the building remains had been levelled. The

[326] For the Late Chalcolithic and EBA periods, contacts to the eastern Aegean island have already been delineated by Bergner et al. 2009, 252 through the importation of Melian obsidian to Çukuriçi Höyük.

archaeological record indicates no hiatus between the settlement phases ÇuHö IX and VIII but implies rather a persistence of daily life activities and subsistence. A smooth transition between those phases is also confirmed by typological ceramic data, even though certain developments are recognisable in the Late Neolithic period. Small finds such as spindle whorls or grinding tools indicate the presence of craft activities in the Neolithic settlement that are of no degree residual, even though having been performed only on the household level. In fact, ceramics of this period can be defined by a certain repertoire of decorative techniques, resulting in visually appealing beige polished or more rarely red slipped surfaces. Typologically, open vessel shapes occur exclusively, to be identified as either bowls or oval-shaped hole-mouth jars.[327] While some ceramic shapes continue from phase IX, the overall vessel repertoire elaborates in the following phase VIII strata. Most characteristically, pronounced s-shaped profiles[328] of the pots are apparent and the quantity of red slipped ceramics increases. Tubular lugs, positioned on the ceramic bodies of bowls and jugs,[329] are diagnostic features for this phase. In these features, Çukuriçi Höyük shows close analogies to the south-west Anatolian Lake District region, as already mentioned elsewhere,[330] but at the same time follows ceramic traditions common in the Izmir region and the western Anatolian coast.[331]

The concept of continuity between phases ÇuHö IX and ÇuHö VIII is contrasted by a hiatus between 6000 and 3400 BC separating the last Late Neolithic settlement (phase ÇuHö VIII) and the Late Chalcolithic (ÇuHö VII) remains[332] on site. The transition to the EBA 1 (phases ÇuHö IV and ÇuHö III), however, initially seems again to be more smooth, as established occupation horizons often are continued. However, there are two major modifications detectable: A technological evolution towards craft specialisation is recognisable at the turn to the 3rd millennium BC, when metallurgical installations are integrated in the former purely domestic settlement structure. Grey polished carinated bowls, jugs, 'Schnabelkannen' and a large amount of functional ceramics such as (tripod) cooking pots, cheesebowls or pithoi constitute the EBA 1 ceramic finds spectrum.[333] This obvious increase of complexity led to the verbalisation of the title of this paper, namely whether these changes in the shape repertoire of vessels is related to developments on the crafts sector concerning the kind of production mechanisms applied, and following the social structure on Çukuriçi Höyük.

A generalised morphological development of Çukuriçi Höyük's ceramic products from the Neolithic to the Early Bronze Age periods is illustrated schematically in Fig. 6.1.

## VI.2. Regional Geology and Raw Material Resources

The area around Çukuriçi Höyük and ancient Ephesos (modern Selçuk) lies in the fault zone between the Cycladic Metamorphic Complex spreading to the west towards the Cycladic islands, and the Menderes Massif to its east.[334] Both are defined primarily by the presence of high-pressure metamorphic rocks, being supplemented by limited sedimentary rocks and sporadic volcanic intrusions.

A. Çakmakoğlu's research facilitated a quite detailed differentiation of the area under investigation. He described the geological units of Efes Nappe and Şirinçe Metaflysch that merge in the Derbent valley with the Debentdere river commencing around Acarlar, just to the south of Çukuriçi Höyük. All exposed areas west, northwest and southwest of the settlement mound,

327 Horejs 2012, 121. S. detail description of phase ÇuHö VIII pottery in Horejs in preparation.
328 Galik – Horejs 2011, 87.
329 Horejs 2012, 119.
330 Bergner et al. 2009, 249.
331 For example Ulucak, compare Galik – Horejs 2011, 88.
332 Horejs 2012, 119.
333 Horejs et al. 2011, 42.
334 Okay 2001, 709.

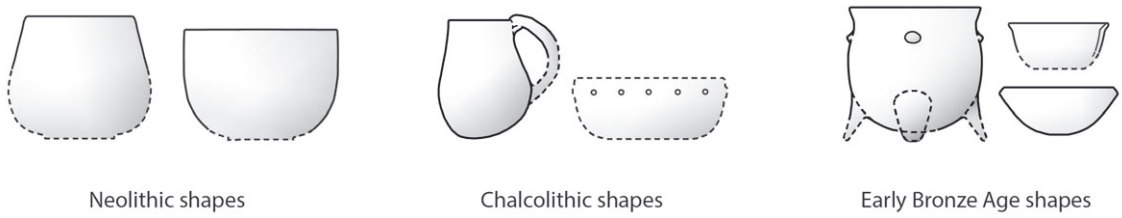


Fig. 6.1 Developments in the shape repertoire of the ceramics from the Neolithic period to the EBA 1 (drawings: M. Röcklinger)

including the slopes of Bülbüldağ and Panayirdağ, relate to the Efes Nappe. The hills and mountains to the east of the Derbent Valley encompassing Selçuk are assigned to Şirinçe Metaflysch.[335] Rock species of both formations are primarily schists, comprising the mineral species quartz, epidote, clinozoisite, chlorite, garnet and albite, as well as carbonates.[336] Notable is the absence or rare occurrence of biotite micas in schists. Marble outcrops are widely dispersed in the broader region, while serpentinite, amphibolite and metadiorite are rarely identified. Specifically, the Efes Nappe is characterised by marbles and schists, the latter covering epidote schists, gneiss, chloritoid and amphibole-bearing schists, particularly alongside the modern road to Meryemana.[337] The characteristic geological fingerprint of the Şirinçe Metaflysch, on the other hand, is defined by serpentinites, meta- and ultrabasics, actinolite-bearing schists and serpentinised dunite or peridotite.[338] Relics of the Cycladic Metamorphic Complex have been recognised in the region, including eclogites and blueschists.[339]

The first detailed insights into the kinds of local rocks that were exploited by the prehistoric occupants of Çukuriçi Höyük had been gained through the determination of rock species used in the construction of the foundations of the EBA 1 building structures on site by D. Wolf.[340] Primarily serpentinite, quartz, quartzite, mica schists, gneiss, marble, limestone and amphibolite were observed. Recent field surveys aiming to localise potential clay extraction sites based on the mineral and rock species previously identified in ceramic thin-sections confirmed and refined the knowledge of regional geological formations. Less than 1.5km to the southwest of Çukuriçi Höyük, on the slopes of Bülbüldağ (site location: Kuburçeşme), major outcrops of mica schist (muscovite) are deposited combined with chlorite, actinolite, sporadic sandstone and amphibolite. Associated with those rocks are reddish clay sediments defined by a high plasticity that might be appropriate for pottery production[341] (Fig. 6.2.1). On the other side of the alluvial basin surrounding Selçuk, more precisely to the southeast of the modern city at the slopes of Kireccilliyelesitep hill, serpentinites and serpentinised peridotite have been detected (Fig. 6.2.2). Due to intensive weathering, serpentinite can show different stages of alteration to talc and asbestos fibres. The area of the survey was extended to the modern village of Selatin, about 13km distance east of Selçuk. Amphibolitised eclogite[342] and volcanic rocks (andesite, trachyte) form part of this particular geological landscape, along with lithologies similar to those known around Çukuriçi Höyük, such as mica schist, serpentinite and talc. In principal, it must be stressed that calcareous clay and marly clay sediments are rather rare in the Küçük Menderes Valley. A major outcrop, for example,

335 Çakmakoğlu 2007, 5–7.
336 Okay 2001, 727.
337 Çakmakoğlu 2007, 6.
338 Çakmakoğlu 2007, 7.
339 Candan et al. 1997.
340 Österreichisches Archäologisches Institut 2011, 28.
341 Research on the clay materials, including thin-section petrography, heavy mineral analyses and X-ray Fluorescence analyses, are ongoing.
342 Okay 2001, 721–723.


Fig. 6.2 Clay and rock resources of the area around Çukuriçi Höyük: 1. Clay deposit rich in mica schists, measuring point no. 19; 2. Calcareous clays, measuring point no. 28; 3. Serpentinite, measuring point no. 29 – Locations of the measurement points indicated in Fig. 6.4 (photos: L. Peloschek)

is located at the mouth of Arvalya valley close to Pamuçak (site location: Çanakgöl Tepe) with the occurrence of chert and silex related to marl. Closer to Çukuriçi Höyük, at the east slopes of Bülbüldağ, calcareous sediments can be intercalated as small bands with mica schists (Fig. 6.2.3).

## VI.3. Clay Pastes of Çukuriçi Höyük in a Diachronic Perspective

Initial statistical evaluations showed that 7 clay pastes are simultaneously in use in the Neolithic period (phase IX), as opposed to 11 in the Late Neolithic phase VIII, followed by 8 in the Late Chalcolithic (phase VII) and 18 in the EBA 1 period. A few clay pastes indicate continuation of raw material use between the periods, but most are exclusive to the respective chronological periods.

There is evidence for only one clay paste that had been recorded for all occupation horizons at Çukuriçi Höyük, namely Petrofabric EPH-METAMORPHIC_01[343] (Fig. 6.3.,1). Besides muscovite schists, rock inclusions are distinctively quartz-mica schists, albite, and epidote grains that sometimes form aggregates, and sporadic micrite. This petrofabric has been denominated ‘Main Petrofabric’ of Çukuriçi Höyük as, firstly, it appears in all periods from the Neolithic to the EBA 1, and secondly, always forms the bulk of the analysed samples. It is a natural coarse-

[343] This clay paste, formerly denominated EPH-CW001, from Çukuriçi Höyük had first been noticed in Österreichisches Archäologisches Institut 2013, 45 (“Petrographisches Hauptfabrikat der Frühbronzezeit”). It continues to be used at least until the Late Antique periods in Ephesos, see also Sauer – Ladstätter 2008, 178–179 for selected Late Antique examples (Petrofabric H).

grained clay paste, with potential sources easily accessible and distributed widely in the area around Çukuriçi Höyük. Field investigations in the region identified the closest clay deposits of a visually matching and compositionally related sediment just less than 1.5km from the site on the eastern slope of Bülbüldağ (compare Fig. 6.2.1), located beneath amphibolites. Certain variants of this clay sediment are well known, for example being defined by an increased epidote-content (Petrofabric EPH-METAMORPHIC_02, Fig. 6.3.2). The raw material source in this case probably differs from that of the 'Main Petrofabric' but also occurs close to Çukuriçi Höyük.

A comprehensive description and overview of all petrofabrics hitherto identified at the prehistoric tell-settlement is not attempted here. Instead, focus is given to the most representative examples of each chronological period that best contribute to the designated research questions.

### Neolithic Period (Phase IX)

Apart from the 'Main Petrofabric', a highly distinctive petrofabric defined by the presence of mostly actinolite schists with few additional clinopyroxene and epidote grains (Petrofabric EPH-ACTINOLITE_01) appears in the Neolithic period as the second most represented clay paste (Fig. 6.3.3), continuing also in the Late Neolithic phase VIII. A geological source of clay with this composition is known from the north-eastern slopes of Bülbüldağ alongside the modern road to Meryemana, as well as from the opposite side of the alluvial plain. Noteworthy is that a variant of this clay (Petrofabric EPH-ACTINOLITE_02, Fig. 6.3.4) can contain additional volcanic rock fragments, most likely particles of glassy andesite or volcanic glass. In the immediate region under discussion, however, no obvious deposits of extrusive volcanic rocks have been reported, making a regional or foreign provenance more likely for this petrofabric, even though we have to consider the existence of small lenses of volcanic composition in the broader area. Another model that might apply is the intentional addition of volcanic particles found elsewhere to actinolite-rich local clay. Extensive volcanic outcrops of a matching composition located in central western Anatolia are reported in the Çeşme peninsula and around Izmir. More analyses and comparative studies are required for making conclusions about the provenance and possible exchange systems related to this petrofabric. Visually, these two petrofabrics correspond to ceramic wares of beige and creamy colour, often showing burnished surfaces.[344]

Actinolite evidently can co-occur with serpentinite in the Neolithic ceramic assemblages of Çukuriçi Höyük (Petrofabric EPH-SERP_03), pointing to an origin other than Bülbüldağ where serpentinite is rare to absent. Based on field studies, their provenance from the south-eastern part of the basin (around Bereket Tepe) surrounding the prehistoric settlement mound is more favourable. The geological relationship of Neolithic ceramics to serpentinite is most significant to stress. A petrofabric densely enriched with asbestos fibres (Petrofabric EPH-ASBESTOS_01, Fig. 6.3.5), a weathering product of serpentinite, is unique to Çukuriçi Höyük. Other petrofabrics contain talc (also associated to the transformation of serpentinite, Petrofabric EPH-SERP_02). The provenance determination stated above applies to those as well.

Another diagnostic petrofabric excavated at Çukuriçi Höyük is easily recognisable due to its dense enrichment with fine-grained siliceous rock fragments (Petrofabric EPH-SILICEOUS_01, Fig. 6.3.6). Shape, size and abundance of the rock fragments attest to intentional tempering. They are composed of fine interlocking quartz grains with sporadic K-feldspar phenocrysts and a limited amount of small opaques. The parent rock might possibly be an altered volcanic rock (rhyolite?), its transformation product being represented in this petrofabric. Its provenance remains uncertain, but a local origin is certainly excluded. An association with the highly volcanic area to the south and southwest of today's Izmir is more likely. This is significant for ideas about ceramic exchange systems, as this petrofabric and variations continue to be distributed to Çukuriçi Höyük

[344] This ware had been described by Galik – Horejs 2011, 87 particularly for phase VIII, but petrographic analyses confirmed a tradition of this paste from the Late Neolithic.

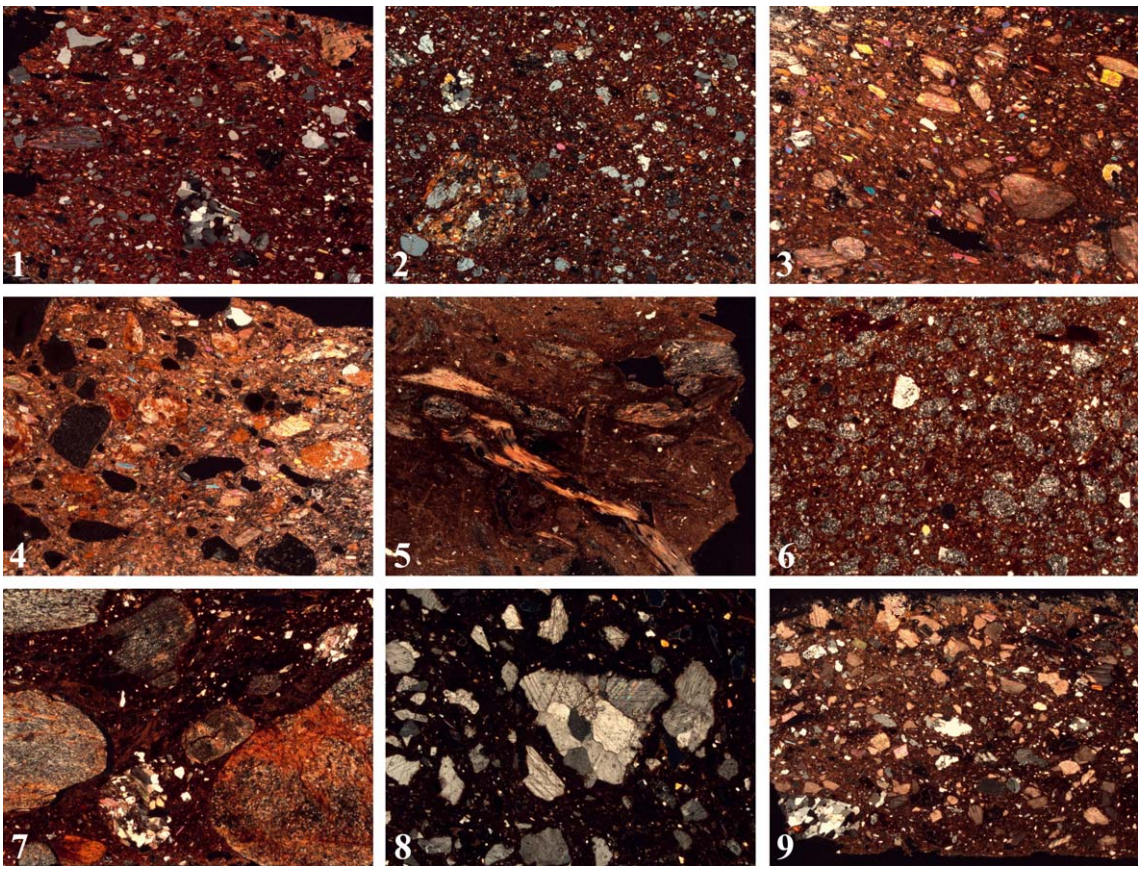


Fig. 6.3 Photomicrographs of selected clay pastes in crossed polarised light (XPL). 1. Petrofabric EPH-METAMORPHIC_01, 2. Petrofabric EPH-METAMORPHIC_02, 3. Petrofabric EPH-ACTINOLITE_01, 4. Petrofabric EPH-ACTINOLITE_02, 5. Petrofabric EPH-ASBESTOS_01, 6. Petrofabric EPH-SILICEOUS_01, 7. Petrofabric SERP_01, 8. Petrofabric MARBLE_01, 9. Petrofabric MARBLE_03. (photos: L. Peloschek)

until the Late Chalcolithic period (phases VII and VI), suggesting the existence of long-term exchange systems within western Anatolia.

### Late Neolithic Period (Phase VIII)

In conjunction with the continued use of actinolite-rich clays and Petrofabric EPH-SILICEOUS_01 in the Late Neolithic period, albeit now represented in lower numbers than in the Neolithic phase IX, new developments on the ceramic sector are recognisable. Highly micaceous clay pastes come into use, being defined by a visually silvery sheen due to the considerable amount of white micas. Varieties of Petrofabric EPH-METAMORPHIC_01, defined by finer grain sizes and changing accessory minerals,[345] are common. Two potentially imported petrofabrics need to be mentioned: The first one contains andesitic inclusions in combination with (micritic) limestone fragments, and the second one is defined by abundant granitic components. Igneous and volcanic rocks are not found in the immediate environs of Çukuriçi Höyük, but rather point towards imports from the broader Izmir region or the Karaburun peninsula.[346]

[345] For example, regarding the amount of epidote particles and micritic limestone.

[346] Day et al. 2009, 341 mention the existence of petrofabrics containing andesitic inclusions in the settlement of Liman Tepe. The closest granitic outcrops to Çukuriçi Höyük in Western Anatolia are known from the Izmir region and Çeşme peninsula.

Late Chalcolithic Period (Phases VII and VI)

Regarding clay raw materials, coarse- grained clay pastes seem to gain popularity in the Late Chalcolithic period. Of particular interest is a petrofabric densely enriched with large (up to 3mm) fragments of serpentinite in different stages of oxidation (EPH-SERP_01, Fig. 6.3.7). Moreover, clays containing a higher frequency of micritic limestone were preferred in this period. Both clay raw materials match the geology of Kireccilliyelesitep hill/Bereket Tepe. The intentional addition of crushed marble fragments (Petrofabrics EPH-MARBLE_01, Fig. 6.3.8 and EPH-MARBLE_02) and marble powder (calcite, EPH-MARBLE_03, Fig. 6.3.9) to clays used in the production of specific vessel types (storage vessels respective bowls) are a technological novelty.[347] In this period the clay paste containing siliceous rock fragments (Petrofabric EPH-SILICEOUS_01), which can be traced back to the Late Neolithic, was used quite extensively, testifying to the possible intensification of suggested exchange systems. Moreover, a variant of this clay paste characterised by the additional presence of sporadic mica schists (Petrofabric EPH-SILICEOUS_02) is characteristic for this period.

Early Bronze Age 1 (Phases IV–III)

An enormous variety of clay pastes is symptomatic for the 3rd millennium BC at Çukuriçi Höyük. Micaceous wares dominate, compositionally following Petrofabric EPH-METAMORPHIC_01, but with varying grain sizes and amounts of quartz and micas. The utilisation of fine clay suspensions corresponds to the production of dining wares, which gain importance in this period. Marble-tempered wares continue to be utilised in the EBA 1 and are applied even more systematically and extensively in pottery production than in the Late Chalcolithic. While clay sediments related to mica schist and serpentinite had been exploited by the prehistoric potters in earlier periods, it is in the EBA 1 that raw materials deposited close to marble rock formations come into use. This is evidenced by a clay paste containing a few calcite grains and rarely single fragments of marble (EPH-MARBLE_04), obviously being natural ingredients of the raw clay. Marble formations and as such appropriate clays similar to those described are widely dispersed in the whole Küçük Menderes Valley and neighbouring regions, making a local origin of this clay paste plausible. In general there is a tendency towards intentional (routine) tempering, often for functional reasons, as illustrated for instance by the addition of sand to cooking pot fabrics or clay mixing.[348]

## VI.4. Interpreting Clay Paste Variability from the Neolithic to EBA 1 Periods

Comparing the differing modes of raw material selection and use diachronically, it is apparent that the major clay paste of which most vessels were produced, namely Petrofabric EPH-METAMORPHIC_01, continued to be exploited. Its physical and optical properties seem to have been appropriate for the needs of the local inhabitants irrespective the given cultural milieu. The composition of EPH-METAMORPHIC_01 was appropriate to form coarse and fine wares, and promoted burnishing and polishing of surfaces to suggest the presence of red slips. Potters of Çukuriçi Höyük were able to imitate red polished wares known from the entire central Aegean region by employing their local clay pastes. Another advantage of EPH-METAMORPHIC_01 is its multifunctionality. Due to its natural high silica content relating to quartz-mica schists, this clay was adequate for the production of ceramics exposed to fire, but also fit the requirements needed for storage containers and dining wares. A final and the most logical reason for the selection of

[347] First presentation of clay tempering methods in Peloschek 2016. More detailed analyses, particularly in marble temper, are planned, see Peloschek in press.

[348] Clay manipulation practices in the EBA 1 settlement have been described in Peloschek 2016.

this clay paste is simply the fact that the sediment can be found in a high abundance in the tell's surroundings.

Looking at the span of use or rather 'life cycle' of the discussed petrofabrics at Çukuriçi Höyük over a period of about 4000 years, the following conclusions can be drawn. Interpreting the evolving patterns, it is evident that very frequently clay pastes of the Neolithic period continue in the Late Neolithic. The same is true for the Late Chalcolithic and EBA 1, where again ceramic traditions clearly seem to have been transferred.[349] Yet, each individual chronological period owns distinct ceramic wares that find no parallels in the previous or subsequent horizons. However, an observation that needs to be highlighted is the evident gap in local clay paste selection and processing between the Late Neolithic and Late Chalcolithic period that can be interpreted as a direct reflection of the hiatus observed in settlement history. The most significant link between these periods by means of ceramic composition is the continuing presence of the potentially imported Petrofabric EPH-SILICEOUS_01.

### Palaeoenvironmental Changes and Clay Availability

Considering the geographical setting of Çukuriçi Höyük, today located about 8km off the shores of the Eastern Mediterranean, it would be manifest to assume that a shift of the coastline from the 7th to 3rd millennia BC might be a striking and plausible reason for the observed changes in raw material selection. A successive and coherent silting of the Küçük Menderes Delta and as such displacement of the shore towards the west had been the subject of palaeogeographic investigations over the last decade.[350] One might assume that some clay deposits were inaccessible due to the upper sea water level in the earlier periods of Çukuriçi Höyük and potters were only able to acquire raw materials from newly evolved and approachable places once aggradation of the Küçük Menderes displaced seawater. However, such a scenario can be excluded for Çukuriçi Höyük, as at any period under study the plain surrounding the tell was dry ground, with the shoreline located in the Artemision area and spreading north-eastwards towards Belevi[351] (see Fig. 6.4 for the site location, an indication of the prehistoric coastline and the regions investigated in the course of the geological field survey in May 2014). Clay mining areas related to weathered schist, serpentinite and marble rock formations as such were accessible during the entire prehistoric period, demanding other explanatory models for the initially formulated research questions.

Ongoing archaeozoological and archaeobotanical research on Çukuriçi Höyük manifest a dramatic change of vegetation between the Neolithic period and EBA 1 caused by deforestation of the region.[352] Deforestation of the hill slopes in particular might promote erosion of rocks and loose sediments, leading to the formation of clay deposits. However, its impact on no accounts can be as dramatic as to lead to the emergence of new clay mining areas and accompanying potting traditions.

When mapping potential areas of clay extraction for the Neolithic, Late Neolithic, Late Chalcolithic and EBA 1 periods around Çukuriçi Höyük based on geological maps and observations in the course of field walking, it seems apparent that at any time clay had been mined from both Bülbüldağ and its north-eastern slopes, as well as from the opposite side of the Derbent valley south-east of modern Selçuk around Bereket Tepe and further up the hill. Only the combination of rocks and minerals varies between the periods, indicating different clay sources or sites within the same geological landscape. However, it is not before the Late Chalcolithic period that clay pastes associated with marble are being exploited with potential clay extraction sites around Panayirdağ and the plain diffusing towards Belevi.

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349 Most importantly, the tradition of marble tempering had been continued and even elaborated in the EBA 1.

350 Recent analyses by Stock et al. 2013 were able to refine silting scenarios.

351 See Stock et al. 2013, 58, fig. 1.

352 Galik – Horejs 2011, 91.

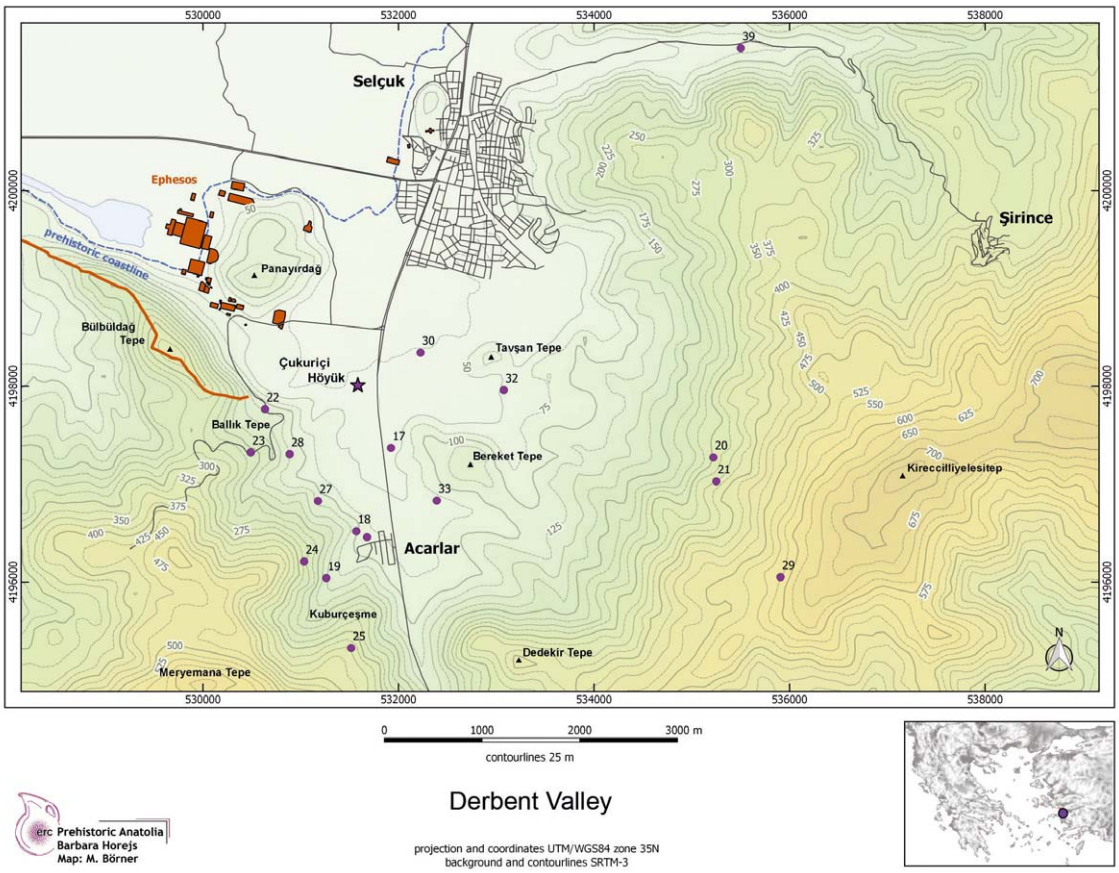


Fig. 6.4 Geographic map of the Derbent valley, indicating in purple dots the measuring points set in the course of geological field surveying and the names of places mentioned (map: M. Börner)

## Technological Choices and Cultural Influences

When clay raw material availability was constant in all settlement periods of Çukuriçi Höyük, then clay selection must be the result of a specific technological choice, eventually generated by interaction with the wider cultural periphery. Integrating potting practices of Çukuriçi Höyük in a strictly technological sense in wider Anatolia the lack of one common tradition noticed at synchronic habitation sites in eastern and western Anatolia needs to be illustrated. From the 6th to the 3rd millennia BC, chaff or straw tempering is a common phenomenon, while at Çukuriçi Höyük only few individual ceramic fragments contain sporadic plant fibres (naturally or by accident). As this clay manipulation method is testified on different archaeological sites being defined by varying geologies (e.g. Neolithic Ulucak,[353] EBA Iasos[354] but also EBA Kaman Kalehöyük,[355] Late Chalcolithic Arslantepe[356] or Neolithic Çatalhöyük[357]), the use of heavy organic temper cannot be understood as effort to alleviate any undesired properties of the individual native clays. Referring

353 Çilingiroğlu 2012, 65, 82.
354 Momigliano 2012, 44.
355 Bong et al. 2008, 300.
356 Angle et al. 2002, 44.
357 Akça et al. 2009.

to Akça et al.,[358] the initial idea to add organics to ceramic fabrics was to increase the temperature during firing, the organics functioning as extra fuel in open firings. In fact, we can assume that the firing procedure had been performed in open or pit fires in the prehistoric periods and temperatures generated did not exceed about 800°C.[359] For this reason, misfired ceramic wasters or kiln structures used in ceramic production, as later on evidenced in Ephesos, are and probably will remain unreported at Çukuriçi Höyük. The lack of intentional tempering with organics sets Çukuriçi Höyük apart from other prominent sites in Anatolia, thus not following one of the major overall phenomena in prehistoric pottery production.

Çukuriçi Höyük accommodates a high variety of clay pastes and clay paste recipes, at first sight appearing very heterogeneous, but after detailed assessment pointing to an origin from a very restricted geographical area. As delineated, the prehistoric craftsmen supplying the inhabitants of the settlements with ceramic objects possessed a sound knowledge of available clay sediments deposited in several areas and hill slopes around the mound. Based on the preliminary data evaluation, the author of this article offers three likely explanatory models for clay selection behaviour:

a) Potters were aware of the properties of clays and knew which kind of sediment to extract in order to be able to achieve particular stylistic attributes now diagnostic for individual chronological periods. For example, the surfaces of petrofabrics EPH-ACTINOLITE_01, EPH-ACTINOLITE_02 and EPH-ASBESTOS_01 in the Neolithic were best appropriate for polishing in order to create an even, almost glossy creamy visual effect.
b) The shifts in clay extraction sites might also relate to issues concerning land ownership or traditions within single potting units or clans.
c) The obvious hiatus in habitation of the site between the Late Neolithic and the Late Chalcolithic, recognisable by completely differing ceramic traditions, needs to be further analysed. A first idea might be to suspect the infiltration of new societies or increasing influence from the Aegean. In addition, the neglect of the autochthonous clay mining sites during the interruption of occupation at Çukuriçi Höyük might apply, as might also the deliberate re-orientation of the population and potters on site in this new period.

Technological evolution in terms of advanced potting techniques starts around the 3rd millennium BC, first and foremost with marble/calcite tempering (EPH-MARBLE_01, EPH-MARBLE_02, EPH-MARBLE_03) and sand tempering (EPH-SAND_01), the latter indicating a specialised production as this paste had been exclusively utilised for cooking vessels. Marble tempering at Çukuriçi Höyük begins at a time when cultural influences of the Aegean islands on Western Anatolia increase.[360] Along with the orientation of Çukuriçi Höyük towards the Aegean, the emergence of specialised production and the emergence of metal working industries without doubt lead to the high number of clay paste recipes and the experimentation of tempering materials in the EBA 1.

## VI.5. Conclusion

By presenting the range of clay pastes and clay recipes from Çukuriçi Höyük and conducting provisional micro-scale provenancing of the parent clays, the economic resources of the settlement site had been illuminated. Social dynamics linked to the settlement history or events are inevita-

[358] Akça et al. 2009, 624 offered another explanatory model for the intentional addition of coarse organic temper to prehistoric ceramics: The straw should facilitate the stability of the vessels during drying thus keeping them in shape.

[359] Similar conclusions have been presented by Çilingiroğlu 2012, 70.

[360] Evidence for exchange of ceramics with Aegean islands has been recognised in the later EBA in Liman Tepe, see Şahoğlu 2011, 137.

bly involved, if not fully responsible for, the diagnostic developments observable in the ceramic materials. Defining characteristics of social dynamics, such as interaction between groups, apply to Çukuriçi Höyük as well: Communication, transfer of skills and know-how certainly existed between the potting groups themselves, but also with related crafts (metalworking, other ceramic products). Influences from the regional level, as well as from supra-regional and foreign areas, are evident (compare the potential importation of petrofabric EPH-SILICEOUS_01). The economic component is determinative in the reconstruction of social interaction and Çukuriçi Höyük doubtless was active in this category. The site was self-sufficient in terms of ceramic production and disposed an assortment of clays appropriate for any kind of functional and aesthetic habits with regard to the vessels production. The naturally existing multiplicity of appropriate clay materials, combined with supra-regional influences affecting the region might ultimately be responsible for the detected changes in ceramic manufacture.

In order to explore these questions in more detail, it is planned to compare the ceramics from Çukuriçi Höyük and their mineral component to ceramics uncovered on a tell in the neighbouring Arvalya valley. This will be a first step in reconstructing possible circulation patterns of Çukuriçi Höyük-related ceramic production on a regional scale before moving to the supra-regional level, and in determining the economic and social attitude of this prehistoric site.

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