434

The Interrelation Between Humans and Their Built Environment in The Early Bronze Age of Bademağacı Höyük, Turkey

AYŞE IRAZ ALPAY

MIDDLE EAST TECHNICAL UNIVERSITY

ABSTRACT

The urbanization of the Early Bronze Age of Anatolia involved the widespread emergence of a radial settlement layout characterized by agglutinated megarons facing a courtyard. Previous studies focused on the cultural and architectural typologies of these settlements over time, and their spatial distributions across Anatolia. Only a few, particularly on Seyitömer and Demircihöyük, aimed to address the relation of this settlement pattern with the social structures that altered during the EBA. This study aims to understand the role that buildings played in the manifestation of the social systems in the EBA of Bademağacı Höyük, in Burdur, Turkey. To address the issue, an integrative approach combining space syntax with artifact distribution and archaeoastronomical analysis is developed to investigate the social system, identify different social classes, if ever existed, and understand whether celestial phenomena influenced the configuration of space.

The results reveal four distinct building types differing based on their locations and plans and suggest social stratification with a social-leadership like authority. Results also lead to the conclusion that buildings played a functional role in establishing and maintaining a general sense of community and social norms by demanding cohesiveness and promoting cooperative interdependence. Bademağacı differs from Demircihöyük and Seyitömer in terms of different configurations and use of space and represents the transformation process between the egalitarian appearance of the material culture and complex societies where elites legitimized their power over the surplus. In this respect, Bademağacı gives some new insight into the relation of this settlement pattern with the social systems of the EBA of Anatolia.

KEYWORDS

Early Bronze Age, Bademağacı, Space Syntax, human-built environment, social systems

1 INTRODUCTION

Spatial analysis has long been used in archaeological research and provided significant insight into location-oriented actions at varying scales. In this respect, Space Syntax brings forth a conceptual framework accompanied by a set of analytical methods, which produce visual and numeric outcomes that enable a comparative investigation to interpret the spatial configuration of the built environment based on a series of postulates (Hillier and Hanson 1984; Hillier, Hanson and Peponis, 1987; Hillier 2007). The burgeoning point of its development is to find a way to generate such a spatial organization that can be combined to form more complex structures that work coherently while representing a specific notion or ideology (Hillier and Hanson, 1984). The primary postulates are that social structures are inherently spatial and the spatial configurations have social reasoning (Hillier and Hanson, 1984, pp.95-97), and they influence the behavior of the people living within them (Hillier, 2007, pp.19-30). The aim, in broad outline, is to understand the underlying social logic behind this particular configuration. The methods are often applied to studies investigating the relationship between society and various space forms, ranging from buildings to landscapes.

Highly symbolic beliefs and rituals of the Neolithic formed through the relationship between the living's houses and their deceased, which served to create placed-bound identities and memories (Mazurowski and Jamous, 2000; Özkaya and San, 2007; Rosenberg and Redding, 2000; Stordeur and Abbes, 2002; Nortoff, Dietrich and Schmidth, 2016; Baird, Fairbairn and Martin, 2017; Hodder and Cessford, 2004; Kuijt, 2001; Özbaşaran, 2012), altered into a new form mediated by portable objects during the Early Bronze Age (Yıldırım and Steadman, 2021; Erdoğu, 2009; Lehner and Yener, 2014). The transition from buildings to portable objects that embodied symbolic expression inherently changed the human-built environment relationship during the EBA.

The urbanization process during the EBA involved the widespread emergence of a radial settlement layout characterized by agglutinated megarons facing a courtyard. Only a few studies, particularly on Seyitömer (Harrison, 2016) and Demircihöyük (Durgun, 2012), aimed to address the relation of this settlement pattern with the social systems that altered during the EBA. In this context, with a pre-planned settlement layout, Bademağacı Höyük stands out as an intriguing case to study for understanding the extent of this change and the social system of the EBA of Anatolia.

This study seeks insight into the role that the built environment played in the manifestation of the social system within the context of social institutions in the EBA society of Bademağacı Höyük. To address the issue, an integrative approach combining space syntax with artifact distribution and

archaeoastronomical analysis is developed to investigate the social system, identify different social classes, if ever existed, and understand whether celestial phenomena influenced the configuration of space within the site border.

2 BADEMAĞACI HÖYÜK

Bademağacı Höyük is a mound type site located on the southern border of the Lake District region of Burdur, Turkey. The settlement encompasses an area of 1.59 ha and has an altitude of 7 m above the plain level, 9 m above the bedrock. The site was excavated annually from 1993 to 2010. By the end of the excavation project, almost %65 of the total surface of the mound had been excavated (Duru and Umurtak, 2019, p.8).

The earliest occupation phase is the Early Neolithic Period, dated to 7030 - 6710 cal.B.C., and continued until the Late Neolithic Period (Duru and Umurtak, 2019, pp.8-9). The Chalcolithic and the Early Bronze Age I periods were presented solely by small finds and ceramic remains. The EBA II settlement was established around 2800 B.C. on fire debris, which ended the Neolithic phase (Duru, 1997, p.152), and occupied without interruption for about four centuries (Duru, 2000, p.205; Umurtak and Çongur, 2021, pp.4-6) that created approximately 4.5-5m habitation debris (Duru and Umurtak 2015, p. 75).

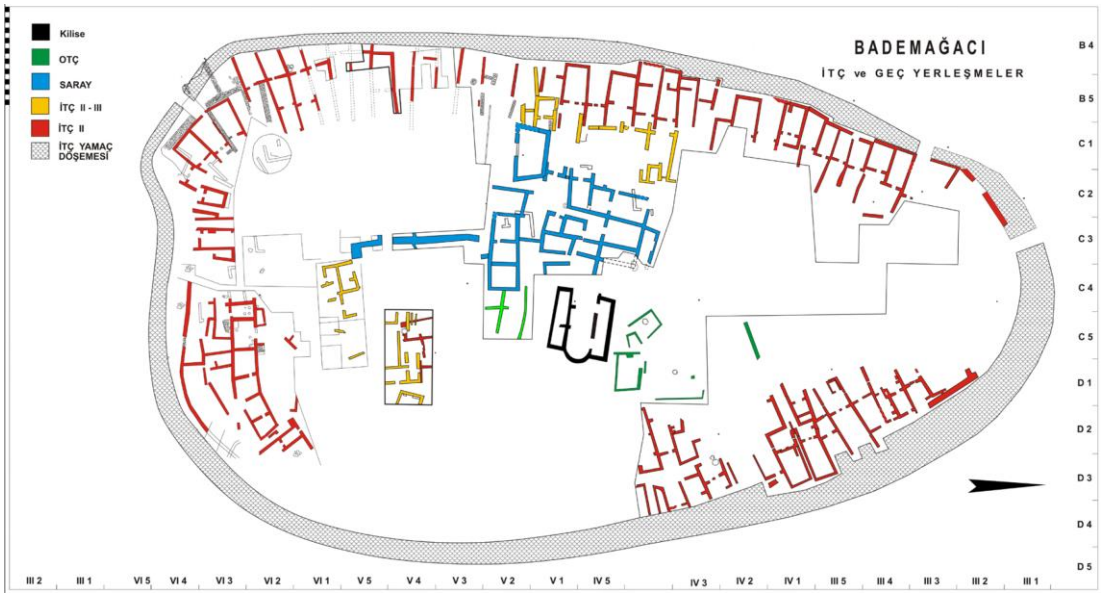

Figure 1: Bademağacı the Early Bronze Age settlement plan, after Duru and Umurtak (2011, p.31)

The settlement was surrounded by a 3-8 m wide stone pavement running along the mound slope. The randomly placed varying size of stones gives the impression that the aim was not to flatten the surface or protection of the village, but rather to build a barrier against the spate (Duru, 2000, p 200-201). In the north, three village entrances were uncovered. The location of the village entrances appears to have been changed during the pavement repairs; one of them (KG3) had been

used during the early phases of the site and was covered with stone pavement during the later phases (Duru and Umurtak, 2006, pp.639-646). According to excavators, agglutinated buildings created wall-like protection preventing the entrance into the village (Duru and Umurtak, 2016, p.76).

The EBA buildings were primarily constructed side by side, perpendicular to the stone pavement along the eastern and western sides of the site, around the Neolithic remains found in the middle of the mound according to a plan suggesting the existence of a powerful authority (Duru and Umurtak, 2002, pp.561–562; 2005, pp.437-440; 2007, pp.187-191; 2008a, pp.255-260). The northern section was left empty, possibly as a place to keep animals. The agglutinated buildings often had various wall thicknesses indicating different construction or repairment times for each. According to excavation results, the buildings that were used for a long time underwent repairs many times while maintaining their construction plan (Duru and Umurtak, 2010a, pp.438-445; 2010b, pp.20-21). The building entrances were facing the mound centre. During the EBA II-2, additional ante walls were built towards the centre at both sides of the building (Duru and Umurtak, 2005, pp.437-440).

There is no information on the wall construction technique, use of wood and the construction of a roof. Only the floor of one house was identified during the two-decade-long excavations. For this reason, the information about the floors is also limited. There were no portable objects or immovable property that indicates inner installation in these megaton buildings.

In terms of their complex architectural plan, two distinct building constructions were uncovered: one in the centre and the other in the south section. These two building complexes have different architectural plans. The Multi-Room Building 1 (MRB1), found in the center of the mound, consisted of 17 rooms, which were possibly connected (Duru and Umurtak, 2008a, pp.255-260). Excavators suggested an additional 10 more rooms that extended beneath the church construction (Duru and Umurtak, 2015, p.76). According to excavators, the building was used as a residence of the most powerful families of the village while being an administrative building (Duru and Umurtak 2008b, pp.17-19; 2011, p.11). The Multi-Room Building 2 (MRB2), found in the south, is composed of a line of rectangular rooms built side by side (Duru and Umurtak, 2009, pp.261-268).

The stone-circles are another architectural elements noteworthy. The total number of stone circles or their places that were uncovered during the excavations is unknown. One of them was identified as a storage facility. Another, however, was identified as a grave marker and beneath it, a pithos was uncovered within a skeleton carefully placed E-W direction. A total of 30 pithoi graves were found either in the streets, in empty spaces or beneath the house floor. Unfortunately, only four of them were represented on the maps. Consequently, the association of these stone-circle architectural elements with burials is not clear. The pithos graves are well-known burial traditions

of the EBA Anatolia. Some EBA sites where pithoi burials were uncovered include Demircihöyük-Sarıket (Seeher, 1992; Massa, 2014), Gavur Evi Tepesi (Vandam et al., 2013) and Karataş-Semayük (Wheeler, 1973; Angel, 1976). It appears to have been a preference for the direction of pithoi toward the east and southeast, respectively.

3 THEORY

Despite its widespread use in various disciplines, due to the fragmented nature of data, Space Syntax has, thereby, theoretical, methodological and epistemological limits when it is applied to an archaeological study while filling the lacuna of the need for a method to investigate the relationship between social systems and spatial organizations. Critics share a common concern that the complexity of social systems is underestimated. Because data is reduced to a graphical form and most of the attention is given to accessibility, the analysis does not take account of architectural characteristics and inner installation of the place or artifacts placed in it that could embody symbolic expressions with a specific meaning in a social context that might vary culturally (Leach, 1978; Hodder and Hutson, 2003 pp.47-49; Parker Pearson and Richards, 2005; Bafna, 2003; Fisher, 2009; Osborne, 2012; Montello, 2007). Graphical representation also fails to acknowledge such connectivity provided through visual, auditory and olfactory features of the place (Osman and Suliman, 1994; Fisher, 2009) as well as the function of place that might change over time (Leach, 1978; Foster, 1989; Shapiro, 1997; Fladd, 2017). Yet, the main challenge is the applicability of the analysis that depends on a well-identified architectural plan, which is rarely the case in archaeology (Cutting, 2003; Foster, 1989; Fisher, 2009). The presence of an upper floor or a roof-top entrance makes applying the analysis even more complicated.

Nevertheless, the method is highly flexible and open to modification. Combining with other theoretical approaches helps strengthen the theoretical frame of studies (e.g. Rapoport, 1990; Blanton, 1994; Hodder and Pels, 2010, pp. 163-186; Tringham, 1994; Clarke, 1977, pp. 1-32; Dobres and Robb, 2000, pp.3-17). The physical characteristic of space and/or its function can be, indeed, included in calculation by assigning a new scoring system to each (Fisher, 2009) as well as in access graphics by employing a notation system (Fisher, 2009; Verhoeven, 1999, cited in Cutting 2003, p.18; Benech, 2007; Harrison, 2016; Fladd, 2017). The effectiveness of the technique in producing meaningful results, on the other hand, can be only ensured if and only if current data provide a minimum level of information to represent the configuration of space (Osman and Suliman, 1994; Cutting, 2003).

In this study, following Brück and Goodman (1999, p1-19), the issue is conceptualized from the environment-behavior perspective that recognizes a systematic interrelationship between the built environment and the patterns of human behavior. As argued by Thomas (1996), place refers to space that is perceived through human experience within the relation of one's body with the homogenous space of infinite extension that surrounds. In this respect, space syntax is used to meet the need for an analytical method. The limitations of the technique aim to be addressed

initially by reducing the missing information and taking into account the nature of activities performed in each unit of space through the material representations of those activities. To associate space with a particular activity(ies), artifact distribution is investigated. As an essential indicator of the social system, the population of the village is also calculated.

Societies also conceived and ordered space in a similar way to how they perceived the sky (Lopéz, 2015, pp.341-352). The built environment was employed also as media for power, belief systems, ceremonial rituals, daily activities and symbolic expressions related to celestial objects (Iwaniszewski, 2005, pp.11-16; 2011, pp.30-37; Krupp, 2015, pp.67-91; McCluskey, 2008, p.264). The analysis questions any interest in celestial bodies and aims to understand ancient people's perception of the sky, the conceptualization of celestial knowledge and its material manifestation (Ruggles, 2005, p.19; 2011, p.1). The interest in celestial phenomena could be reflected through portable objects (e.g. Jegues-Wolkiewiez, 2012, pp.1-3,8-9), symbolic expressions (e.g. Jegues-Wolkiewiez, 2005, pp.43-62) as well as the architectural design of construction (e.g. Nadali and Polcaro, 2016, pp. 103-108), planning the city layout (e.g. Müller-Karpe, 2015, pp.83-92) or in some cases encompassing the natural features of the region such as trees, posts (e.g. Ridderstad 2009), rock alignment (e.g. Bhatnagar and Livingston, 2005, p.17), caves (e.g.Roslund, Lindström and Andersson, 1999, pp.105-115) or mountain picks (e.g. Belmonte, 2015, pp.483-492). Analysis results offer a different perspective to understand the relationship between humans and their built environment. In the scope of this study, archaeoastronomical analysis is performed as a complementary segment of the built environment investigation to understand the function of buildings from a different perspective.

4 ANALYSIS AND RESULTS

4.1 Data Preparation

In the light of the published data including maps, the settlement layout is digitalized in which some buildings, wall constructions and architectural elements, which were not dated to the EBA II phase, are removed. The unexcavated area in the site is then reconstructed based on the excavation reports by replicating the existing ones to create a relatively contemporaneous complete building layout that follows traditional architectural plans of the EBA II village of Bademağacı Höyük.

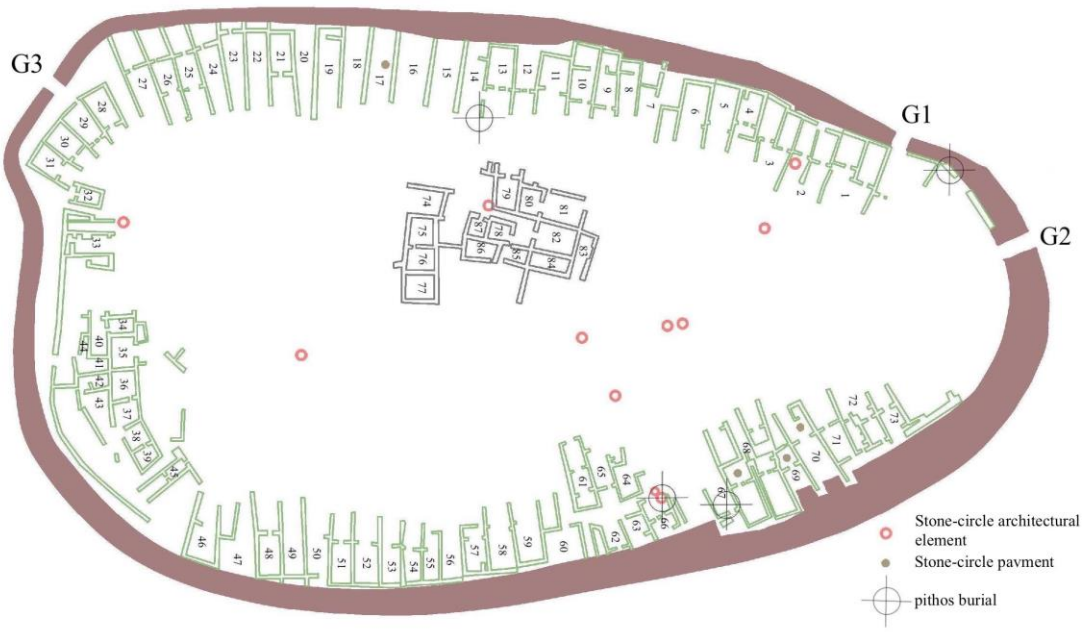

Figure 2: Bademağacı EBA II digitalized settlement plan

4.2 Artifact Distribution

To determine the functions of buildings, small finds, plant and animal remains, and ceramic assemblages are closely examined, as well as artifacts. Due to the poorly published data, artifacts and burials distributions over the site are only partially represented on the map (Figure 3). Nevertheless, some buildings and rooms are labelled as storage facilities even though the architectural traditions of the village give no clue to identify different building types with respect to their function. However, it is not possible to suggest a pattern for artifact assemblages or the locations of pithoi burials. The investigation of artifact distribution reveals that figurines, loom weights, seals and metal objects had been uncovered from all over the settlement. On the other hand, two animal figurines were found in the dwellings in the northern area.

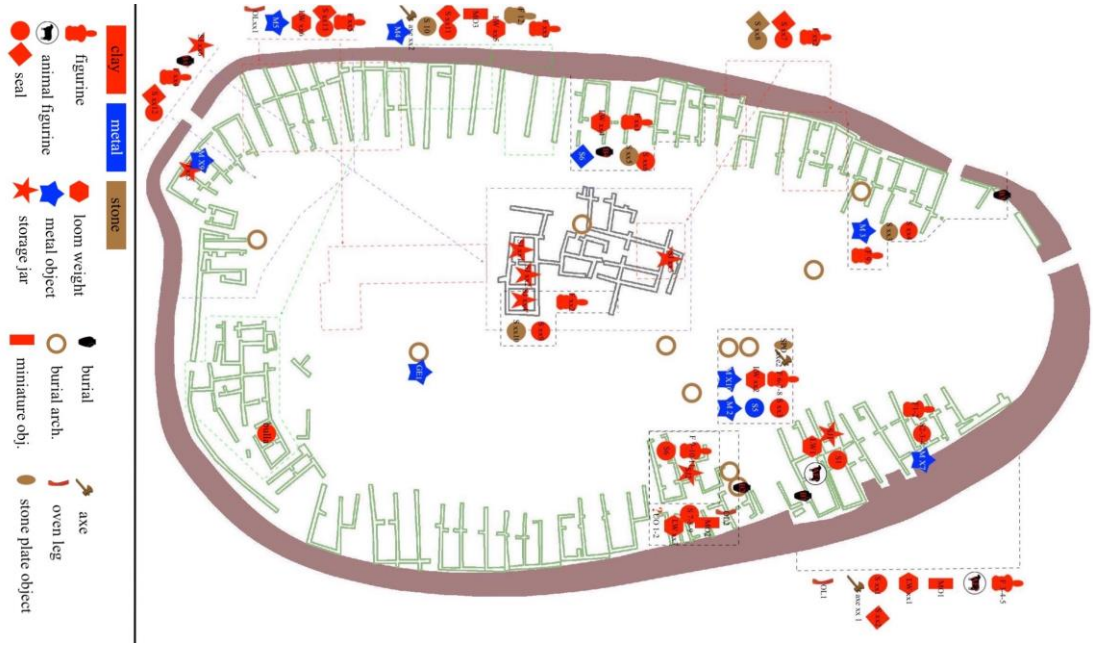

Figure 3: The map showing distributions of artifacts and burials over the site.

4.3 Architecture

Understanding social systems, especially identifying social stratifications and high-ranked families, is not always straightforward from architectural remains since status indicators could be intangible as well as tangible (Wason, 1994; Helms, 1992, pp.160-163; Steadman, 2000, pp. 164-199; 2010, pp. 27-46; 2011, pp.1-24). Nevertheless, leaders and elites could seek or need legitimation of their status among the community by engaging in power/authority-related actions that lead to archaeologically visible distinct material remains (Bird and Smith 2005; Boone 2000; Gardner 2008; Robb 1999; Steadman 2011). This distinct material remains displays such characteristic patterns of visible distributed traces in terms of materials or spatial positioning. The markers of high-ranked households include the presence of a higher percentage of local fine wares, greater access to exotic materials, management of surpluses, the distinct construction techniques either in terms of greater size or effort given for inner elaboration of buildings, and preferred spatial locations and maintenance of boundaries (Costin, 1991, pp.1-56; Helms, 1992, pp.160-163; Steadman, 2010; 2011; Wason, 1994, pp.139-143).

Based on their plan, their size and artifacts found within them, buildings are categorized into four groups: the Multi-Room Building 1 (MRB1), storage facilities (including MRB2), dwellings type 1 (DT1) and dwellings type 2 (DT2). The complex architectural plan of MRB1, its centralized location, the presence of several medium and large size pots and jars in one and 25 vessels in another room, and two clay tablets, thought to display numerical marks on their surfaces, found nearby (a third one was uncovered in the Deep Trench located near Building no.68) imply the existence of a high-ranked household. Excavators identified MRB1 as the residence of the high-ranked household with the administrative-associated statute (Duru and Umurtak, 2008b, pp.17-19;

2011, p.11; Umurtak, 2009, pp.1-10). The existence of a stele (the exact location is not mentioned) in this complex indicates some degree of religious activity took place in it (Umurtak, 2021, p.39). MRB2 differs from MRB1 in terms of its overall plan and size. That implies that they might be used for different purposes. MRB1 appears to have consisted of megaton-like buildings and storage facility-like rooms. While MRB2 consisted of a single-type building constructed side by side in a row (Building no.34-39) and additional spaces (Building no. 40-44) found further south surrounded by walls.

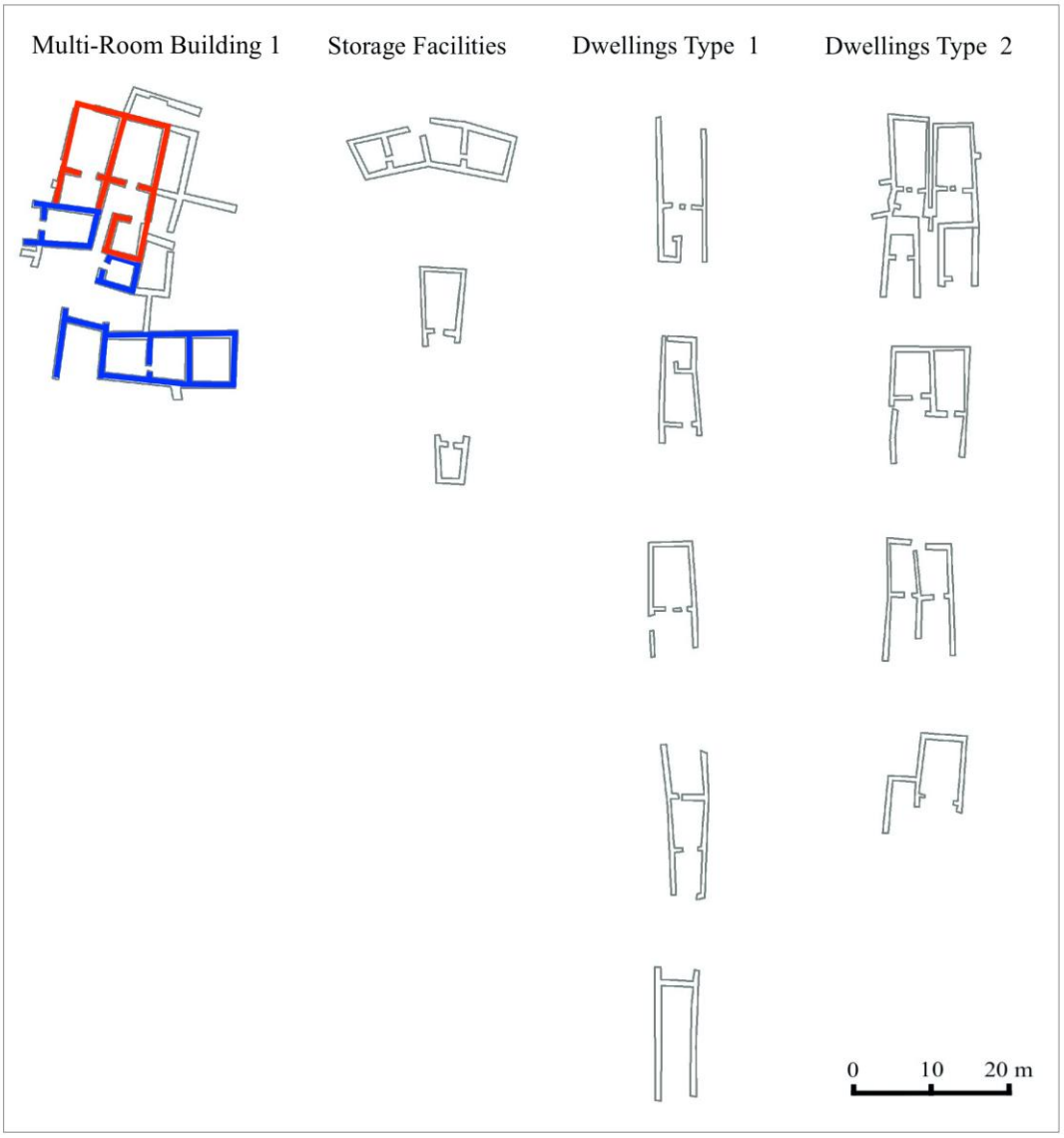

Figure 4: The building types categorized based on their plan and the artifact assemblages found within them

A significant number of large vessels and metal objects, which were found in two of them, were uncovered in Buildings no.29 and 30 (Duru and Umurtak, 2010b, pp.21, 24-25). A bulla, often used for sealing the doors to lock or the goods to transport safely, was found in Building no.38. In MRB2, a considerable number of vessels and metal objects as well as stamp seals were uncovered, but their exact location is not clear (Umurtak, 2009, pp.1-10; 2010, pp.19-27). Based on their

relatively smaller sizes and the artifacts found in them, Buildings no.28-45 are labelled as storage facilities. DT1 refers to buildings with rooms lined up in a row. Some buildings, however, seem to be built as two cellae sharing a common open space within two ante walls, and they are labelled as DT2. One of the animal figurines was found in Building 68, which is also labelled as DT2.

Excavators suggested that the space in the northern section served to keep the animals since no architectural remains or small finds were uncovered. Animal and plant remains indicate that there were animal husbandry and harvesting. Thus, hunting plays a minor role in the subsistence economy of the village (De Cupere et al., 2008). According to the Ministry of Agriculture and Forestry of Turkey, the annual amount of fodder required for a bovine animal is calculated as 4.5 tons. 4.5 tons of fodder corresponds to approximately 7 tons of corn silage and 1.5 tons of hay. Therefore, one needs additional space to keep this fodder dried, at least for the amount needed during the winter. The temperature also affects the animals by causing heat stress. The lowest temperature of the Burdur region is - 1,7 degrees, the highest is 29,4 degrees, and the average temperature is around 22,4 degrees. This temperature range is within limits not to be affected by heat stress. Nevertheless, during the winter the animals may have needed to be kept in closed places. The dwellings, labelled as DT2, are located in the northern section, where livestock are thought to be kept and may have belonged to households responsible for cultivating animals and needed additional space.

Despite the great number of large jars and vessels and a significant number of metal objects, there was no recognizable place for pottery production or trace of metalworking at the site. Lack of hearths in the dwellings, lack of ovens, and lack of any evidence of metalworking suggest that some activities, such as pottery-making and metalworking, were possibly carried out beyond the site boundary. While others, particularly cereal production, animal cultivation and textile, were carried out in the village. The presence of some activities and the absence of others may also suggest that the site was occupied seasonally and other activities took place elsewhere.

The agglutinated dwellings with an entrance facing the centre of the mound create cohesiveness which causes group members to remain in the group based on the combined commitment of each household to the group. Cohesiveness, on the other hand, refers to both positive and negative effects on individuals in a group in which people interact sometimes cooperatively but sometimes competitively. A variety of factors affect whether people interact cooperatively or competitively. Reward structure shaped by the nature of the social interdependence among group members either leads to competitive or cooperative interdependence (Taylor et al., 2006, pp.297-312, 320-326). Agglutinated buildings restrict the amount of space available while demanding a reciprocal concession and strong collaboration with neighboring dwellings that increase cooperation. These strengthen the bonds among village inhabitants and create a general sense of community.

Relatively wide entrances instead of thresholds that create a boundary between inside and outside increase interaction, thereby communications. Cooperation is greater when communication is required (Taylor et al., 2006, p.324). Except for DT2, sharing a similar size of a living room makes the concession easier, thereby reinforcing the cooperation and resulting in greater concession and quicker agreement (Taylor et al., 2006, p.323-325).

The inner division of the dwellings into two rooms is more likely to have a functional meaning. The arrangement of the rooms creates a different degree of privacy. The lack of remains indicating internal partitioning inside the living room might imply no need for private or fixed space for the various domestic activities within the dwelling. Excavation results suggest that the back rooms were for storage. The presence of an individual storage room indicates the concept of ownership and personal values. Personal value is also another major factor influencing the behavior of individuals orienting towards either cooperation or competition (Taylor et al., 2006, p.324-325). In this case, a similar size of dwellings also strengthens cooperative interaction. Unfortunately, there is no information enlightening how the inner arrangements of the buildings were.

Estimation of population size and space syntax analysis (mentioned below) indicate that the population density is lower compared to Demircihöyük and Seyitömer.[1] Therefore, it is aimed to visually display the ratio of built area and open space, and dwelling area and storage facilities. To create graphics, the size of each building as the building itself, its living space (cella), and its storage space are measured.

Graphics elucidate similar ratios for the total dwelling area to commonly used storage facilities (discussed below) and MRB1 area to its storage facilities (Figure 5). This similarity indicates a fair share of subsistence between the inhabitants and the people who lived in MRB1. Furthermore, the average size of living rooms (Building no.74,79,81,82 and 84) within the complex is 28,88 m2 which is relatively similar to the average size of DT1, 24,82 m2. This indicates that there is no privilege given to MRB1 in terms of room size and architectural planning.

Although the location of MRB1 indicates strategic importance, possibly in terms of higher status among the other buildings, by taking into consideration of the architectural plan of the rooms in MRB1, the similar ratio of the building area and storage facilities and the existence of stele, it is suggested that the higher status previously suggested for the households lived in MRB1 is a social leadership like authority who focuses on the emotional and interpersonal aspects of social interaction, rather than task leadership like an authority who controls, direct and organize the society in carrying out a specific task, such as controlling surplus. In another word, the households that lived in MRB1 were ritual or moral leaders rather than a wealth-based elite.

[1] The size of the site Demircihöyük is 0,35 ha and the estimated population 130 (Korfmann, 2011, p.214). The size of the site Seyitömer is 0,6 ha. The population is, roughly, estimated to be 180 people, based on a total of approximately 30 dwellings with a household of 5-7 individuals for an average capacity of houses.

DT2, having two cellae, is almost twice the size of DT1. Except for the size and the two animal figurines found within them, there are no traces of the presence of a higher percentage of local fine wares, greater access to exotic materials, and the distinct construction techniques or any indication of management of surpluses or existence of boundary that could imply a high-ranked household. In this respect, if we agree that the households that lived in DT2 were livestock raising people, then this difference was possibly due to the functional need to obtain additional space for the animals, rather than symbolic to represent higher status.

Table 1: The size of the building area, roofed area and the main room of the buildings in Bademağacı.

Bld. no.	Bld. area	Roofed area	Living/Main room a.	Bld. no.	Bld. area	Roofed area	Living/Main room a.	Bld. no.	Bld. area	Roofed area	Living/Main room a.
1	117,50	66,00	52,69	35	24,31	24,31	24,31	68	206,26	176,78	75,86
2	106,35	41,26	39,51	36	22,98	22,98	22,98	69	59,25	42,10	15,54
3	85,49	50,48	50,48	37	19,21	19,21	19,21	70	83,71	50,93	50,93
4	51,82	31,47	21,50	38	16,30	16,30	16,30	71	75,84	37,50	26,47
5	55,49	35,13	35,13	39	11,56	11,56	11,56	72	66,42	37,22	26,96
6	77,92	53,33	33,67	40	18,84	18,84	18,84	73	36,80	20,08	14,11
7	47,41	28,30	17,43	41	15,56	15,56	15,56	74	31,00	31,00	31,00
8	35,61	35,61	26,15	42	13,89	13,89	13,89	75	22,76	22,76	22,76
9	44,31	36,16	22,87	43	28,56	28,56	28,56	76	20,83	20,83	20,83
10	57,60	43,48	26,08	44	4,27	4,25	4,27	77	24,70	24,70	24,70
11	56,48	32,30	32,30	45	20,70	20,70	20,70	78	11,86	30,41	#
12	50,80	31,85	31,85	46	75,68	50,00	#	79	28,69	21,02	21,02
13	61,00	34,19	34,19	46	75,13	46,10	30,48	80	17,29	17,29	17,29
14	58,73	58,73	43,95	47	62,42	39,49	39,49	81	36,93	36,93	36,93
15	66,77	#	#	48	59,85	29,72	29,72	82	59,98	37,07	37,07
16	81,03	#	#	49	62,51	36,78	27,89	83	18,68	18,68	18,68
17	61,24	#	#	50	62,74	35,07	26,84	84	18,36	18,36	18,36
18	63,24	63,24	63,24	51	47,90	28,07	28,07	85	11,67	11,67	11,67
19	66,12	57,71	57,71	52	58,58	32,80	32,80	86	16,61	16,61	16,61
20	53,36	#	#	53	43,56	23,87	23,87	87	9,83	9,83	9,83
21	60,15	27,30	27,30	54	36,75	18,39	18,39				
22	62,93	38,06	29,71	55	28,18	16,36	16,36				
23	57,43	42,78	30,51	56	34,90	26,57	26,57				
24	66,81	48,66	24,37	57	33,77	33,77	21,66				
25	71,59	48,53	24,65	58	54,50	35,44	35,50				
26	71,03	50,25	22,54	59	77,45	51,25	34,51				
27	75,57	59,51	27,93	60	44,41	44,41	44,41				
28	38,53	28,28	28,28	61	44,26	24,81	13,62				
29	42,44	31,32	31,32	62	21,19	16,94	16,94				
30	36,78	25,97	25,97	63	24,69	24,69	15,35				
31	34,27	21,55	21,55	64	19,90	19,90	19,90				
32	13,70	9,90	9,90	65	41,68	34,61	24,11				
33	32,27	26,60	26,60	66	32,04	32,04	15,38				
34	12,50	12,50	12,50	67	23,43	23,43	23,43				

DT1 — Communal storage facilities
DT2 — artificial buildings
MRB1

DT1 av. building size	= 54,78	m²
DT2 av. building size	= 116,40	m²
DT1 av. living room size	= 24,82	m²
DT2 av. living room size	= 49,10	m²
C. storage facility av. building size	= 22,59	m²
MRB1 av. storage room size	= 17,14	m²
MRB1av. living room size	= 28,88	m²

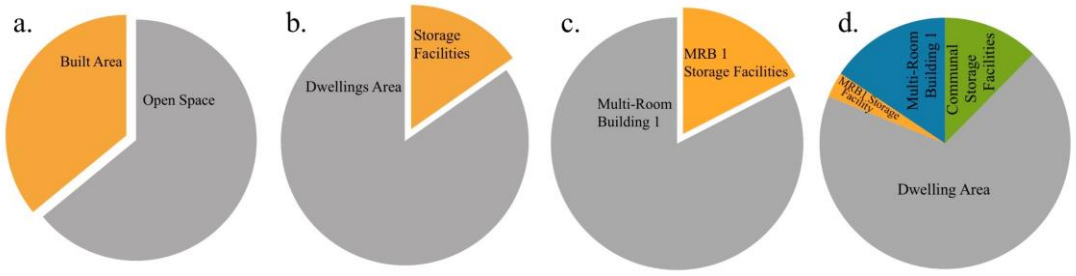

Figure 5: : a. the ratio of built area to open space within the glacier in Bademağacı, b. the ratio of total dwelling area to the total area of communal storage facilities, c. the ratio of the Multi-Room Building 1 built area to the total area of its storage facility, d. the ratio of the Building complex, its storage facility, the total dwelling area and the communal storage facilities

4.4 Space Syntax Analysis

Unlike the villages developed organically, both the settlement layout with some degree of standardized architectural tradition and the excavation results suggest that the EBA II village of Bademağacı was established based on a plan in which decisions and actions were taken

strategically in advance to achieve specific goals to meet the needs of society. This strategy requires putting things into proper order or a relationship based on the social norms and physical needs of that time. Therefore, although the settlement layout and the plans of the buildings are relatively simple compared to the previous studies applying space syntax to the complex building plans or urban layouts, the techniques are applied blindly in hopes of finding order in the configuration of space that might give insight into the social system of the village. Unfortunately, neither architectural remains nor excavation reports provide sufficient information for any modification in the analysis. Yet, the analyses not only facilitated the interpretation of the data by enlightening the crossroads at the key points, but they also revealed unpredictable outcomes.

Figure 6: The justified graphs created for different building types: from the village center for the dwellings and storage facilities, from the cardinal directions for the Multi-Room Building 1

Justified graphs are drawn for different building types. For the dwellings and storage facilities, the graphs are scored from the entrance as approached from the village centre. However, for the

MRB1, the graph is drawn for each cardinal direction since the building complex had multiple entrances and not all rooms are connected.

Space Syntax acknowledges two types of relationships: those between the inhabitants and those between inhabitants and foreigners. The glacier pierced by three passageways and the building's blind back walls appear to create a pervasive boundary providing limited interaction between the inhabitants and foreigners. According to excavators, this boundary served for protection from outside danger. However, the glacier has a gentle slope rather than a steep slope, and there was no trace of additional architectural features for a closure of the gates at the entrances. Moreover, with the shallow wall construction, the northern section of the site is vulnerable in terms of controlling the site's access. According to the connectivity graph, inside the settlement, on the contrary, the connectivity is high. The settlement plan is pedestrian-friendly, whether inhabitants or foreigners, and it provides easy access to the desired location. That contradicts the idea of limiting access for foreigners. Therefore, this boundary is more likely to serve as a barrier for spate while creating a sense of community.

The visibility graph analysis also reveals that G2 has a greater degree of connectivity followed by G1 and G3, respectively. That means that G2 has a higher strategic value compared to the others. By taking into account the isovist graphs, connectivity graphs and step depth graphs altogether, it seems more likely that G2 was the main gate into the village rather than G3, as excavators suggested.

According to the visibility graph, the connectivity is highest, as colored red, in the southwestern area of the village centre, which corresponds right in front of MRB2. This building complex, however, does not display a profile that matches with a standard village dwelling, instead, consists of two rows of rooms in small size placed back to back displaying a complex architectural plan where the most southern side was closed with a long wall. The bulla was found in one of the rooms, Building 38. Even though this building complex was placed in a location where its visibility is highest in the village, the convex graph analysis results clearly show that it has also the highest deepness. In other words, pedestrians whether inhabitants or foreigners, could see the building complex right away but they could not reach it easily. Therefore, it won't be a coincidence to find the bulla in a location where its deepness is highest. According to the mean depth graph, Building 42 has the highest score for mean depth.

Spatial step depth from each gate is created to observe whether the situation differs based on which gate was chosen to enter the village (Figure 7c,d,e). However, regardless of which gate was used to enter the village, this MRB2 has the highest deepness even more than MRB1, where authority lived according to excavators. Analysis results and artifacts found within this region emphasize the strategic importance of this building complex. The graphic also indicates that almost all buildings, except MRB2, are relatively equally distant from the main room in MRB1.

On the other hand, MRB2 have a lower spatial connection with the buildings in the northeast and northwest sides as well as with MRB1 (Figure 8).

Even though the architectural plan of MRB1 differs from that of MRB2, it is worth comparing their structural connectivity. Therefore, a j-graph is created for MRB2 as it was for MRB1. The graphs elucidate no similarity between the buildings complexes but point out possible main entrance directions. Based on the structural routes of the rooms and the architectural plan that has been uncovered, the main entrance for MRB1 is possibly from the west direction while the main entrance of MRB2 is from the east.

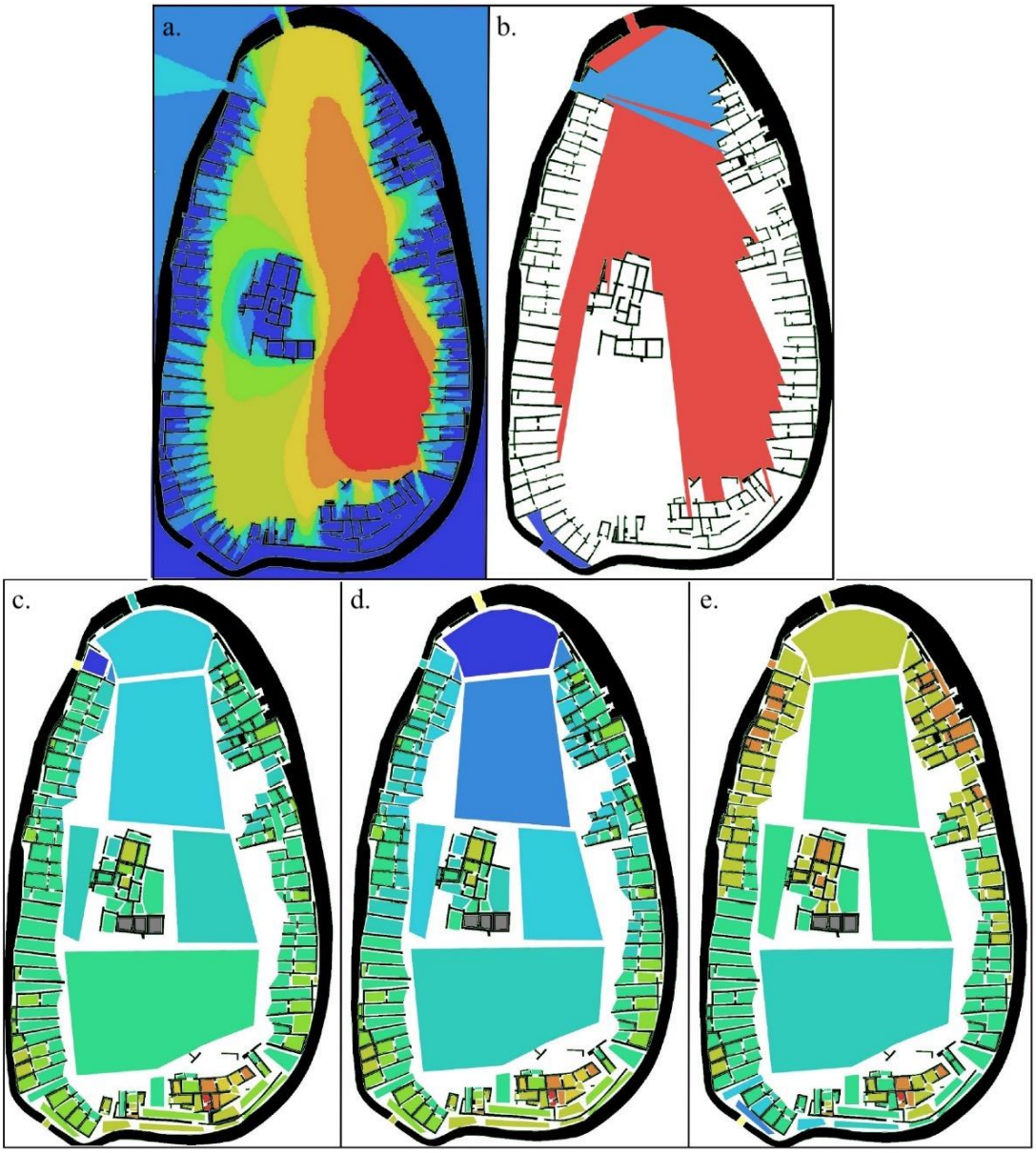

Figure 7: : a. the inner-visibility graph, b. the soviet graph displaying a set of all points visible from gates. The spatial step depth graphs of G1 (c.), G2 (d.), and G3 (e.).

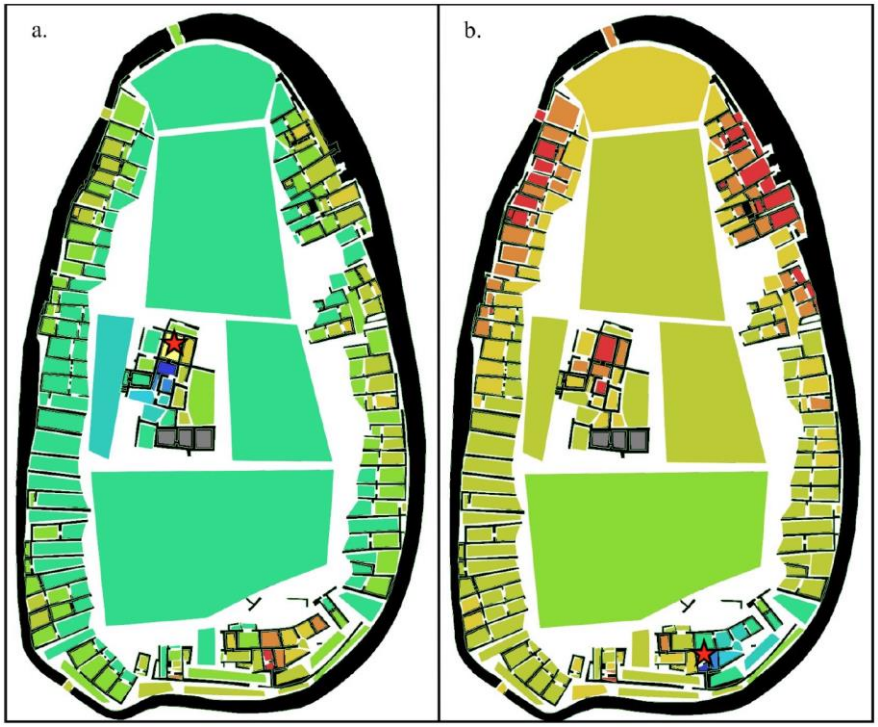

Figure 8: a. the spatial stept depth graph from the Building no.82 in MRB1 b. the spatial stept depth graph from the Building no.42 in MRB2.

Table 2: Table showing numeric values of the Space Syntax analysis results. VC: visual connectivity, I: integration, RA: relative asymmetry, RRA: real relative asymmetry, MD: mean depth, C: control. Different rooms of a building are labelled as a, b, and str (storage room).

Locations	VC	i (p-value)	RA	RRA	MD	C	Locations	VC	i (p-value)	RA	RRA	MD	C	Locations	VC	i (p-value)	RA	RRA	MD	C
G1	6229	1,06	#	#	5,94	#	bld. no.25	5159	1,34	#	#	4,89	0,5	bld. no.59 str	7821	1,79	1	3	0,93	1
G2	17946	1,33	#	#	4,96	#	bld. no.25 str	1205	1,07	1	4,74	5,88	1	bld. no.60	478	1,83	#	#	3,88	1
G3	833	1,08	#	#	5,79	#	bld. no.26	3261	1,34	#	#	4,89	0,5	bld. no.61	605	1,34	#	#	4,89	0,5
bld. no.1_a	1604	1,32	1	3	4,95	1	bld. no.26 str	337	1,07	1	4,74	5,88	1	bld. no.61 str	461	1,07	1	4,74	5,89	1
bld. no.1_b	1209	1,06	1	3	5,93	1	bld. no.27	9253	1,79	#	#	3,91	0,5	bld. no.62	417	1,21	#	#	5,33	0,2
bld. no.2_a	1564	1,06	1	2,84	5,93	1	bld. no.27 str	1375	1,34	#	#	4,91	1	bld. no.62 str	166	0,98	#	#	6,33	1
bld. no.2_b	1323	1,06	1	2,84	5,93	1	bld. no.28	3652	1,34	#	#	4,91	1	bld. no.63	254	1,21	#	#	5,33	0,5
bld. no.3_a	1684	1,32	1	3	4,95	1	bld. no.29	3619	1,36	#	#	4,84	1	bld. no.63 str	244	0,98	#	#	6,33	1
bld. no.3_b	1973	1,06	1	3	5,93	1	bld. no.30	2548	1,36	#	#	4,91	1	bld. no.64	5941	1,75	#	#	3,99	1
bld. no.4	660	1,06	1	4,74	5,92	1	bld. no.31	2428	1,35	#	#	4,88	1	bld. no.65	6593	2,14	#	#	3,45	0,5
bld. no.5	5275	1,32	#	#	4,97	1	bld. no.32	90	1,09	#	#	5,79	1	bld. no.65 str	671	1,55	#	#	4,38	0,5
bld. no.6	6564	1,32	1	3	4,97	1	bld. no.33	8800	av. 1,03	#	#	av. 6,33	1	bld. no.66	7663	1,34	#	#	4,9	0,5
bld. no.6 str	8587	1,75	1	3	3,98	1	bld. no.34	63	0,9	1	4,74	6,8	1	bld. no.66 str	943	1,07	#	#	5,9	1
bld. no.7	7446	1,76	#	#	3,96	0,5	bld. no.35	3514	1,34	#	#	4,91	1	bld. no.67	6982	1,76	#	#	3,98	0,5
bld. no.7 str.	302	1,32	#	#	4,96	1	bld. no.36	101	0,79	0,7	2,25	7,59	1	bld. no.68_a	356	0,88	0,7	2	6,9	1
bld. no.8	6151	1,76	#	#	3,97	0,5	bld. no.37	190	0,93	0,5	1,46	6,59	0,5	bld. no.68_b	154	1,06	0,9	2,58	5,93	1
bld. no.8 str	847	1,32	#	#	4,97	1	bld. no.38	120	0,93	0,5	1,46	6,59	0,5	bld. no.68 str_a	av. 7340	av. 1,54	#	#	av. 4,48	0,75
bld. no.9	2051	1,52	0,3	1	4,44	0,5	bld. no.39	55	0,79	0,7	2,25	7,59	1	bld. no.68 str_b	5331	1,54	#	#	4,48	0,75
bld. no.9 str	457	av.1,07	av. 0,6	av. 2	av. 5,92	0,75	bld. no.40	514	1,09	#	#	5,8	0,5	bld. no.69	92	1,06	1	4,74	5,95	1
bld. no.10	803	1,33	#	#	4,94	0,5	bld. no.41	96	1,1	#	#	5,75	0,5	bld. no.70	1674	1,06	0,6	2	5,94	1
bld. no.10 str	129	1,06	1	4,74	5,94	1	bld. no.42	42	0,61	0,8	2,7	9,53	1	bld. no.71	1717	1,34	#	#	4,91	0,5
bld. no.11	1183	1,32	#	#	4,96	1	bld. no.43	273	av. 0,88	av. 0,4	1,18	av. 7,06	0,5	bld. no.71 str	526	1,08	1	4,74	5,86	1
bld. no.12	295	1,32	#	#	4,96	1	bld. no.44	37	1,1	#	#	5,75	1	bld. no.72_a	1807	0,9	0,4	1,18	6,83	0,5
bld. no.13	479	1,32	#	#	4,96	1	bld. no.45	2228	1,83	#	#	3,86	0,5	bld. no.72_b	799	1,08	0,4	1,18	5,88	0,5
bld. no.14	2941	1,76	#	#	3,97	0,5	bld. no.46	4229	1,34	1	1,18	4,91	1	bld. no.72 str	404	1,08	0,4	1,18	5,86	0,5
bld. no.14 str	492	1,32	#	#	4,96	1	bld. no.46 str	10726	1,79	1	1,18	3,92	1	bld. no.73	1917	1,32	#	#	4,96	0,5
bld. no.15	4424	1,76	#	#	3,98	1	bld. no.47	2277	1,34	#	#	4,91	1	bld. no.74	8554	1,79	#	#	3,92	1
bld. no.16	8064	2,12	#	#	3,47	1	bld. no.48	2479	1,34	#	#	4,91	1	bld. no.75	100	NA	#	#	1	1
bld. no.17	8968	1,79	#	#	3,92	1	bld. no.49	9307	1,79	#	#	3,92	1	bld. no.76	94	NA	#	#	1	1
bld. no.18	8098	1,79	#	#	3,92	1	bld. no.50	7231	1,34	#	#	4,89	0,5	bld. no.77	98	NA	#	#	NA	#
bld. no.19	8663	1,79	#	#	3,91	0,5	bld. no.50 str	2554	1,07	#	#	5,88	1	bld. no.78	83	0,89	0,6	1,78	6,87	1
bld. no.19 str	1799	1,34	#	#	4,92	1	bld. no.51	2738	1,34	#	#	4,91	1	bld. no.79	342	1,32	#	#	4,97	1
bld. no.20	4616	1,79	#	#	3,92	1	bld. no.52	4882	1,53	#	#	4,42	1	bld. no.80	843	1,32	#	#	4,98	1
bld. no.21	2356	1,34	#	#	4,91	1	bld. no.53	2720	1,34	#	#	4,91	1	bld. no.81	3114	1,76	#	#	3,98	0,5
bld. no.22	9027	1,79	#	#	3,91	0,5	bld. no.54	1778	1,34	#	#	4,91	1	bld. no.82	186	0,89	0,6	1,77	6,87	1
bld. no.22 str	23	1,34	#	#	4,91	1	bld. no.55	1551	1,34	1	4,74	4,91	1	bld. no.83	2847	1,79	#	#	3,93	1
bld. no.23	6130	1,79	#	#	3,91	0,5	bld. no.56	8720	1,77	#	#	3,94	1	bld. no.84	75	1,07	0,8	2,37	5,88	1
bld. no.23 str	543	1,34	#	#	4,91	1	bld. no.57	469	1,07	1	4,74	5,89	1	bld. no.85	914	1,35	0,3	0,95	4,88	0,5
bld. no.24	7680	1,79	#	#	3,91	0,5	bld. no.58	3538	1,34	#	#	4,91	1	bld. no.86	238	1,35	0,7	1,89	4,89	1
bld. no.24 str	859	1,34	#	#	4,91	1	bld. no.59	4516	1,34	1	3	4,91	1	bld. no.87	100	1,33	0,5	1,57	4,92	1

DT1 DT2 MRB1 Communal storage facilities artificial buildings

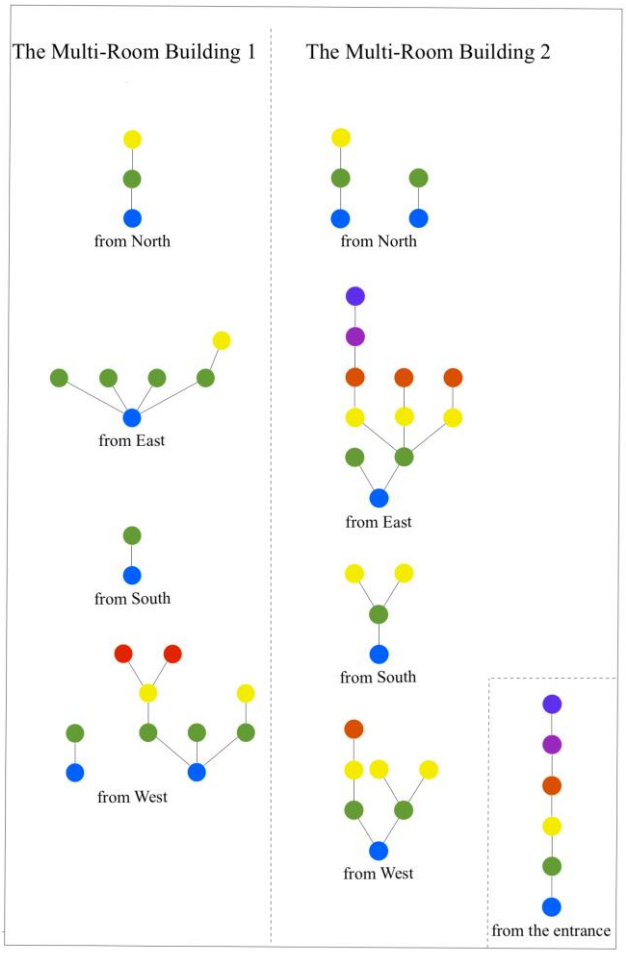

Figure 9: The justified graphs for the Multi-Room Building 1 and the Multi-Room Building 2 from the main cardinal directions

Based on the space syntax analysis and archaeological remains, MRB2 is likely to have served as storage facilities. These facilities, however, had no connection with MRB1 or the buildings found on the northern side of the village. Its position with the highest connectivity in the village implies that it was employed for communal storage facilities.

MRB1, as mentioned above, consists of megaron-like buildings and storage facility-like rooms. There are at least two, but possibly three megaron-like buildings found. The entrance of the storage rooms is either from the outside or the inside. In the light of these observations, I suggest multiple households, possibly relatives, lived in this building complex. The location of the building gave importance related to the status of its household. Based on the assumption that G2 was the main entrance into the village and the main entrance of MRB1 was from the west, one can conclude that the position of the building and architectural plan aimed not to have control over the village entrance but seek some degree of privacy. Additionally, the entrances of some storage rooms are from outside, and it suggests that this needed privacy may not be for the inhabitants but for the foreigners who could not reach easily to the main entrance when they enter the village from any gate.

4.5 Estimating Population

Even though it is desirable to apply different methods using different archaeological data, which can be compared with historical and ethnographical data to calculate the carrying capacity based on the ecological and cultural conditions of the village, only the architectural features provide a suitable proxy to estimate the population size. In this respect, the average living room size is calculated based on excavated buildings identified as dwellings. The average living room size is 27,97 m2, and it provides suitable space for 5-7 people to live.

Although Umurtak asserted another 30 buildings in the unexcavated area, only 15 buildings can fit in it. They also assumed that all buildings were houses. Assuming 6-7 people living in each, excavators estimated a total number of 120 houses produced at least 700 people (Duru and Umurtak, 2015, pp.77-78; Umurtak and Çongur, 2021, pp.4-6). However, the investigation of artifact distribution reveals that some buildings were used as storage facilities. Moreover, the number of buildings that fit in the unexcavated area is less than the number suggested by excavators. Excluding the storage facilities, a total of approximately 55 dwellings produces a population of 350 people based on a household of 5-7 individuals as an estimation using the average capacity of houses.

4.6 Archaeoastronomical Analysis

Archaeoastronomical analysis is performed to understand whether celestial objects influenced the configuration of space during the EBAII of Bademağacı. Architectural remains of the site were the foundation of the buildings that were hardly more than 30-40 cm tall. This condition is merely suitable for horizontal orientation analysis. In this respect, the architectural plan of MRB1 gave no clear idea about the whole building plan as well as the main entrance into the building. Furthermore, the settlement design clearly shows buildings were not oriented to a certain direction, but rather to the village centre according to their positions within the settlement layout. Therefore, the analysis is applied only to the three village gates.

The azimuth is measured for each village gate based on their axis of passageways. Then, horizon profiles for each gate are generated by using a website (http://www.heywhatsthat.com/) where the horizon height is measured to calculate the declination degree of each gate. The declination values are calculated based on the related horizon height and latitude. Declination values are essential when comparing results with other sites. The same declination values mean that buildings are oriented toward the same point in the sky regardless of their locations. It will be a key criterion for analyzing the patterns of orientations in settlements belonging to the same culture but located in different regions. Stellarium, which displays a realistic sky view based on the specific location, is used to determine whether the declinations of the gates match with a potential celestial object. However, analyses produce no meaningful results.

5 DISCUSSION

The application of techniques requires clear starting and finishing configurational features. The nature of archaeological data, on the other hand, is fragmented and results in theoretical, methodological and epistemological limitations. Although space syntax is flexible and open to modification, archaeological remains found in Bademağacı Höyük preclude any alteration. In this study, the limitations aim to be addressed initially by reducing the missing information and taking into account the nature of activities performed in each unit of space through the material representations of those activities. The plans and positions of the uncovered buildings are employed to replicate buildings in the unexcavated area on the digitalized map. By doing it, the architectural traditions of the village during the EBA II is maintained, and a relatively reliable settlement layout, which reflects the spatial distribution of the buildings once in time, is generated. Artifact distributions are investigated to associate space with a particular activity. Unfortunately, publications do not provide all the information required to comprehend building sequences or locate findings and samples in their context. For the necessary information, the head of the excavation was contacted, but no result was obtained. Therefore, the accuracy of digitalized settlement layout and artifact distribution map should be treated with caution.

The artifact distribution map does not display exact locations of all artifacts but it does point out the boundaries within which they were uncovered and gives at least a general idea whenever a place and its location are investigated. The map elucidates that figurines, loom weights, seals and metal objects were uncovered from all over the settlement and suggests household-level production and consumption. Furthermore, when evaluated together with ceramic groups it gives no indications for identifying any buildings as privileged residences (Figure 3).

In the scope of space syntax analysis, axial line analyses, convex isovist analysis and convex spatial analyses are applied, justified graphs are constructed, and the numeric value table is created (Figure 6,7,8, and 9). The use of graphics to visualize calculations demonstrates that they are efficient for analyzing large amounts of data and straightforward displaying the ordered relationships between spaces. The numeric values of related analysis, on the other hand, are difficult to fathom at first glance (Table 2). The simplicity of the settlement layout and the similarity of the building plans produce numerical data very close to each other. Thereby, inferring the numerical values becomes challenging. The result of the space syntax analyses reveals that some identifications and definitions made by excavators need to be re-evaluated. It also enables interpretation of the finds from a holistic approach. Consequently, a more coherent narrative about the EBA II settlement of Bademağacı became possible.

More than 120 seals were uncovered in the EBA II settlement of Bademağacı. These seals have round, square, triangular or oval foot-shaped stamp surfaces with a conical handle that is pierced for passing a string through it (Duru and Umurtak, 2007; 2008b, p.19; 2009, p.20; 2010, p.24; 2011b, p.14; Umurtak, 2009, p.3). Except for one bronze and one lead stamp seal, they were made

either from stone or clay (Duru and Umurtak, 2008c, p.209; Umurtak, 2002). Except for two samples, the surface of the stamps was often divided into four sections by two crossed lines and filled with geometric motifs or line like decorations.

According to Akkermans and Duistermaat (1996), in a society (writers referred to the Late Neolithic society of Tell Sabi Abyad, in Syria) with a mixed economy, where agriculture and animal husbandry were practiced, some members of the society would have to temporarily leave the village due to the transhumance pastoralism. Thereby, they needed others, the store-keepers, to hold the fort on their property to ensure its safety, as well as places, the storehouses, for the communal level of storage. Seals, in this context, were possibly used to represent independent socio-economic units, and the overall resemblance in their design implied that the seal holders were most likely extended families or groups with specific symbolic representations enhancing group coherence (Akkermans and Duistermaat, 1996, p.29).

Following Akkermans and Duistermaat's argument (1996), Frangipane (2000, pp.222-226) asserted that in such a social organization with a mixed economy, the function of the administration was most likely to manage equality and equity of the goods by enhancing cooperation and collectivization within the group. She argued that if the economy of society was a family-based production, and the goods were stored in the houses, then there would be no need for sealing the containers.

Considering the early use of sealing, here it is suggested that these stamps were used by household units who had to temporarily leave the village. Moreover, lack of hearths in the dwellings, lack of ovens, and lack of any evidence of metalworking suggest that some activities, such as pottery-making and metalworking, were possibly carried out beyond the site boundary. While others, particularly cereal production, animal husbandry and textile, were carried out in the village. Thereby, it was most likely that some households leaved the site seasonally or periodically to perform certain activities, possibly including the transhumance pastoralism. This, inherently, required a place for secure their properties, the storehouses for the communal level of storage, and the store-keepers, as well as some degree of an administration. Here, however, not the design of the stamp surface, but its shape might be representing independent socio-economic units.

In this narrative that reconstructs the situation in the village of Bademağacı Höyük, it was more likely that the reason for the greater deepness of the communal storage facilities (including MRB2) was that the concern of security of this collective surplus. The presence of a bulla used for sealing, is also evidence for ensuring the safety of products. While three clay tablets that were thought to display numerical marks on their surfaces imply some degree of management. Although excavators identified MRB1 as the residence of the high-ranked household with the administrative-associated statute, Figure 8 shows that MRB2 has a lower spatial connection with

MRB1, implying that the households of MRB1 were not the store-keepers or wealth-based elites. Rather, they were ritual or moral leaders.

In this context, except for MRB1, buildings were employed to establish relatively spatial equality and equitability for the households in terms of location and size, while demanding cohesiveness and promoting cooperative interdependence to establish and maintain a general sense of community.

6 CONCLUSION

In conclusion, the embodiment of symbolic expressions changed its form from the buildings to portable objects and consequently it altered the human-built environment relationship during the Early Bronze Age. Based on the archaeological remains, the results of analyses lead to the conclusion that buildings were employed as a medium to establish relatively spatial equality and equitability for the households, while also serving a functional role in establishing and maintaining a general sense of community and social norms by demanding cohesiveness and promoting cooperative interdependence.

In the site of Bademağacı, buildings are categorized into four groups based on their plan and the artifact assemblages found within them: the Multi-Room Building (1); communal storage facilities; dwelling type 1; and dwelling type 2. Results suggest the presence of a social leadership like authority, in other words, ritual or moral leaders who focus on the emotional and interpersonal aspects of social interaction. The lack of hearths, ovens and any evidence of metalworking suggest that some activities, such as pottery-making and metalworking, were possibly carried out beyond the site boundary. While others, particularly cereal production, animal management and textile, were carried out in the village. The presence of some activities and the absence of others may also suggest that some socio-economic units leaved the site seasonally or periodically to perform certain activities. However, to support or refute the argument, further research is needed. If this was the case, calculating population, identifying the demography and determining the structure of the social system become even more complicated.

Acknowledgement

This study is a part of the doctoral thesis submitted to the Middle East Technical University. I offer my deepest gratitude to my supervisor Assoc. Prof. Dr. Evangelia Pişkin for her guidance and support. Without her encouragement and effort, the thesis would not have been completed. I also would like to express my very profound gratitude to my parents and my brother for their love and support.

REFERENCES

Akkermans, P. M. M. G., & Duistermaat, K. (1996) 'Of Storage and Nomads the Sealings from Late Neolithic Sabi Abyad, Syria', *Paléorient*, 22(2), pp.17-44.

Angel, J. L. (1976) 'Excavations in the Elmalı Area, Lycia, 1975. Appendix: Early Bronze Karataş people and their cemeteries', *American Journal of Archaeology*, pp.385-391.

Bafna, S. (2003) 'Space syntax: A brief introduction to its logic and analytical techniques', *Environment and Behavior*, 35(1), pp.17-29.

Baird, D., Fairbairn, A., & Martin, L. (2017) 'The animate house, the institutionalization of the household in Neolithic Central Anatolia', *World Archaeology*, 49(5), pp.753-776.

Belmonte, J. A. (2015) 'Solar Alignments-Identified and Analysis' in Ruggle, C. L. N. (Ed.) *Handbook of Archaeoastronomy and Ethnoastronomy*. New York: Springer, pp.438-492.

Benech, C. (2007) 'New approach to the study of city planning and domestic dwellings in the ancient Near East', *Archaeological Prospection*, 14(2), pp.87-103.

Bhatnagar, A., & Livingston, W. C. (2005) *Fundamentals of solar astronomy* (Vol. 6). World Scientific.

Bird, R. B, & Smith, E. A. (2005) 'Signaling Theory, Strategic Interactions, and Symbolic Capital', *Current Anthropology*, 46, pp.221-248.

Blanton, R. E. (1994) *Houses and Households-A Comparative Study*. New York: Plenum Publishing Corporation.

Boone, J. L. (2000) 'Status Signaling, Social Power, and Lineage Survival.' in Diehl, M. W. (Ed.) *Hierarchies in Action. Cui Bono?* (Vol. 27). Carbondale: Southern Illinois University Press, pp.84-110.

Brück, J., & Goodman, M. (Eds.) (1999) 'Introduction: themes for a critical archaeology of prehistoric settlement', *Making places in prehistoric world: themes in settlement archaeology*. London: UCL Press, pp.1-19.

Clarke, D. L. (Eds.) (1977) 'Spatial information in archaeology', *Spatial Archaeology*. New York: Academic Press Inc, pp.1-32.

Costin, C. L. (1991) 'Craft Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production' in Schiffer, M. B. (Ed.) *Archaeological Method and Theory* (Vol. 3). Tucson: University of Arizona Press, pp.1-56.

Cutting, M. (2003) 'The use of spatial analysis to study prehistoric settlement architecture', *Oxford Journal of Archaeology*, 22(1), pp.1-21.

De Cupere, B., Duru, R, & Umurtak, G. (2008) 'Animal husbandry at the Early Neolithic to Early Bronze Age site of Bademağacı (Antalya province, SW Turkey): evidence from the faunal remains. *MOM Editions*, 49 (1), pp.367-405.

Dobres, M. A. & Robb, J. (Eds.) (2000) 'Agency in archaeology: paradigm or platitude?', *Agency in Archaeology*. London: Routledge, pp.3-17.

Durgun, P. (2012) *Social Organization in the Early Bronze Age Demircihöyük: A Re-evaluation*. Master Thesis. Koç University. İstanbul. Available at: https://acikbilim.yok.gov.tr/handle/20.500.12812/169311 (Accessed: September 2018)

Duru, R. (1997, April) 'Bademağacı Kazılar 1994 Yılı Çalışma Raporu', *BELLETEN*, LXI, 230, pp.149-181.

Duru, R. (2000, April) 'Bademağacı Kazıları 1997 ve 1998 Yılları Çalışma Raporu', *BELLETEN*, LXIV, 239, pp.187-255.

Duru, R., & Umurtak, G. (2002) 'Bademağacı 2000-2001 Çalışma Raporu', *BELLETEN*, LXVI, pp.561-562.

Duru, R., & Umurtak, G. (2005) 'Bademağacı Kazıları 2004', *27. Kazı Sonuçları Toplantısı*, Cilt II, pp.437-444.

Duru, R., & Umurtak, G. (2006) 'Bademağacı Kazıları 2005', *28. Kazı Sonuçları Toplantısı*, Cilt I, pp.639-646.

Duru, R., & Umurtak, G. (2007) 'Bademağacı Kazıları 2006 Yılı Çalışmaları', *29. Kazı Sonuçları Toplantısı*, Cilt II, pp.187-196.

Duru, R., & Umurtak, G. (2008a) 'Bademağacı Kazıları 2007 Yılı Çalışmaları', 30. *Kazı Sonuçları Toplantısı*, Cilt I, pp.255-268.

Duru, R., & Umurtak, G. (2008b) 'Bademağacı Kazıları 2007 Yılı Çalışmaları', *ANMED*, pp.14-19.

Duru, R.,& Umurtak, G. (2008c, April). 'Bademağacı Kazıları 2004, 2005 ve 2006 Yılları Çalışma Raporu', *BELLETEN*, LXXII, 263, pp.193- 311.

Duru, R., & Umurtak, G. (2009) 'Bademağacı Kazıları 2008', *31. Kazı Sonuçları Toplantısı*, Cilt III, pp.261-268.

Duru, R., & Umurtak, G. (2010a) 'Bademağacı Kazıları 2009 Yılı Çalışmaları', *32. Kazı Sonuçları Toplantısı*, Cilt I, pp.438-445.

Duru, R., & Umurtak, G. (2010b) 'Bademağacı Kazıları 2009 Yılı Çalışmaları', *ANMED*, pp.19-25.

Duru, R., & Umurtak, G. (2011) 'Bademağacı Kazıları 2010 Yılı Kazıları', *ANMED*, pp.7-15.

Duru, R., & Umurtak, G. (2015) 'Torosların kuzey eteklerinde en erken yerleşik yaşamın izinde Bademağacı Höyüğü', *Antalya*, 27, pp.70-80.

Duru, R., & Umurtak, G. (Eds.) (2019) *Bademağacı Höyüğü Kazıları I Neolithic ve Erken Kalkolitik Çağ Yerleşmeri*. İstanbul: Ege Yayınları.

Erdoğu, B. (2009) 'Ritual symbolism in the early Chalcolithic Period of Central Anatolia', *Journal for Interdisciplinary Research on Religion and Science*, 5, pp.129-151.

Fisher, K. D. (2009) 'Placing social interaction: An integrative approach to analyzing past built environments', *Journal of Anthropological Archaeology*, 28(4), pp.439-457.

Fladd, S. G. (2017) 'Social syntax: An approach to spatial modification through the reworking of space syntax for archaeological applications', *Journal of Anthropological Archaeology*, 47, pp.127-138.

Frangipane, M. (2000) 'The Development of Administration from Collective to Centralized Economies in the Mesopotamian World' in Feinman, G. M., & Manzanilla, L. (Eds.) *Cultural Evolution*. New York: Springer Science+Business Media, LLC, pp.215-234.

Foster, S. M. (1989) 'Analysis of spatial patterns in buildings (access analysis) as an insight into social structure: examples from the Scottish Atlantic Iron Age', *Antiquity*, 63(238), pp.40-50.

Gardner, A. (2008) 'Acency' in Bentley, R. A., Maschner, H. D., & Chippindale, C. (Eds.) *Handbook of archaeological theories*. Plymouth: Rowman & Littlefield, pp. 95-108.

Harrison, L. K. (2016) *Living spaces: Urbanism as a social process at Seyitömer Höyük in Early Bronze Age Western Anatolia*. Doctoral dissertation. State University of New York at Buffalo. New York. Available at: https://www.proquest.com/openview/c149b10b0fa050c28f1775e81c71fa7d/1?pq-origsite=gscholar&cbl=18750 (Accessed: September 2018)

Helms, M. W (1992) 'Long-Distance Contacts, Elite Aspirations, and the Age of Discovery in Cosmological Context' in Schortman, E. M., & Urban, P. A. (Eds.) *Resources, Power, and Interregional Interaction*. New York: Springer Science+Business Media, pp.157-174.

Hillier, B. (2007) *Space is the machine: a configuration theory of architecture. Space Syntax.* London: UCL.

Hillier, B. & Hanson, J. (1984) *The Social Logic of Space*. Cambridge: Cambridge university Press.

Hillier, B., Hanson, J. & Peponis, J. (1987) 'Syntactic analysis of settlements', *Environment and Planning B: Planning and design*, 3(2), pp.147-185.

Hodder, I., & Cessford, C. (2004) 'Daily practice and social memory at Çatalhöyük', *American antiquity*, pp.17-40.

Hodder, I., & Hutson, S. (2003) *Reading the past: current approaches to interpretation in archaeology*. 3rd edn. Cambridge: Cambridge University Press.

Hodder, I., & Pels, P. (2010) 'History houses: a new interpretation of architectural elaboration at Çatalhöyük' in Hodder, I. (Ed.) *Religion in the emergence of civilization: Çatalhöyük as a case study.* Cambridge: Cambridge University Press, pp.163-186.

Iwaniszewski, S. (2005) 'Astronomy in cultural landscape: new challenges for World heritage issue', *Cultural Landscapes in the 21st Century Forum UNESCO: University and Heritage 10th International seminar and Inter-Congress of the World Archaeological Congress.* April. pp.11-16.

Iwaniszewski, S. (2011) 'The sky as a social field', *Proceedings of the International Astronomical Union*, 7(S278), pp.30-37. Available at: https://www.cambridge.org/core/services/aop-cambridge-core/content/view/B9B1D25A545AD17BB5BB519EF0E0ADF3/S1743921311012440a.pdf/the-sky-as-a-social-field.pdf (Accessed: November 2015)

Jégues-Wolkiewiez, C. (2005) 'Aux racines de l'astronomie, ou l'ordre caché d'une oeuvre paléolithique', Antiquités nationales, (37), pp.43-62.

Jégues-Wolkiewiez, C. (2012) 'Paleolithic techniques and tools used to calculate space and time, Part3', Pleistocene Coalition News, 4(I).

Korfmann, M. (2011) 'Demircihöyük' in Kabul, N. (Ed.) *Tarih Öncesinden Demir Çağı'na Anadolu'nun Arkeoloji Atlası*. İstanbul: Doğan Burda Rizzoli Dergi Yayıncılık, pp.214-215.

Krupp, E. C. (2015) 'Astronomy and Power' in Ruggle, C. L. N. (Ed.) *Handbook of Archaeoastronomy and Ethnoastronomy*. New York: Springer, pp.67-91.

Kuijt, I. (2001) 'Place, death, and the transmission of social memory in early agricultural communities of the Near Eastern Pre-Pottery Neolithic', *Archaeological Papers of the American Anthropological Association*, 10(1), pp.80-90.

Leach, E. (1978) 'Does space syntax really constitute the social' in Green, D., Haselgrove, C., & Spriggs, M. (Eds.) *Social organization and settlement: Contributions from Anthropology, Archaeology and Geography*. Oxford: BAR International Series (Supplementary) 47(i). British Archaeological Reports, pp.385-401.

Lehner, J. W., & Yener, K. A. (2014) 'Organization and specialization of early mining and metal technologies in Anatolia' in Roberts, B. W., & Thornton, C. P. (Eds.) *Archaeometallurgy in Global Perspective*. New York: Springer, pp.529-557.

Lopéz, A. M. (2015) 'Cultural Interpretation of Ethnographic Evidence Relating to Astronomy' in Ruggle, C. L. N. (Ed.) *Handbook of Archaeoastronomy and Ethnoastronomy*. New York: Springer, pp.341-352.

Massa, M. (2014) 'Early Bronze Age burial customs on the central Anatolian plateau: a view from Demircihöyük-Sarıket', *Anatolian Studies*, 64, pp.73-93.

Mazurowski, R. F. , & Jamous, B. (2000) 'Tell Qaramel: excavations 2000', *Polish archaeology in the Mediterranean*, 12, pp.327-341.

McCluskey, S. C. (2008) 'Nationalism and politics in the recovery of past astronomies', *Archaeologia Baltica*, 10, pp.263-267.

Montello, D. R. (2007) ' The contribution of space syntax to a comprehensive theory of environmental psychology', Proceedings of the 6th International Space Syntax Symposium. İstanbul. Available at: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.509.3933&rep=rep1&type=pdf (Accessed: September 2019)

Müller-Karpe, A. (2015) 'Planning a sacred landscape. Examples from Sarissa and Hattusa' in D'Agostiona, A., Orsi, V., & Torri, G. (Eds.) *Sacred Landscapes of Hittites and Luwians: Proceedings of the International Conference in honor of Franca Pecchioli Daddi Florence*, Vol.9. Frienze: Firenze University Press, pp.82-93.

Nadali, D., & Polcaro, A. (2016) 'The sky from the High Terrace: Study on the Orientation of the Ziggurat in Ancient Mesopotamia', *Mediterranean Archaeology and Archaeometry*, 16(4), pp. 103-108.

Nortoff, J., Dietrich, O., & Schmidt, K. (2016) 'Gathering of the dead?The early Neolithic sanctuaries of Göbekli Type, southeastern Turkey', in Boyd, M. J., Morley, I., & Renfrew, C. (Eds.) *Death rituals, social order and the archaeology of immortality in the ancient world: Death shall have no dominion*. Cambridge: Cambridge University Press, pp.65-81.

Osborne, J. F. (2012) ' Communicating power in the Bīt-Ḫilāni palace', *Bulletin of the American Schools of Oriental Research*, 368(1), pp.29-66.

Osman, K. M., & Suliman, M. (1994) 'The space syntax methodology: fits and misfits', *Architecture and Behaviour*, 10(2), pp.189-204.

Özbaşaran, M. (2012) 'Aşıklı' in Başgelen, N., Özdoğan, M., & Kuniholm, P. (Eds.) *The Neolithic in turkey. New Excavations and New Research 3-Central Turkey*. İstanbul: Arkeoloji ve Sanat Yayınları.

Özkaya, V., & San, O. (2007) 'Körtik Tepe. Bulgular ışığında kültürel doku üzerine ilk gözlemler', *Türkiye'de neolitik dönem*, pp.21-36.

Parker Pearson, M., & Richards, C. (Eds.) (2005) Architecture and order: approaches to social space. Taylor & Francis e-Library.

Rapoport, A. (1990) *The meaning of the built environment: A nonverbal communication approach*. Tucson: The University of Arizona Press.

Ridderstad, M. (2009) 'Orientation of the northern gate of the Goseck Neolithic rondel'. Available at: https://arxiv.org/abs/0910.0560 (Accessed: November 2015)

Robb, J. E. (Ed.) (1999) 'Secret Agents: Culture, Economy, and Social Reproduction', *Material Symbols: Culture and Economy in Prehistory*. Carbondale: Southern Illinois University Press, pp. 3-15.

Rosenberg, M., & Redding, R. W. (2002) 'Hallan Çemi and early village organization in eastern Anatolia' in Kuijt, I. (Ed.) *Life in Neolithic farming communities*. Boston: Springer, pp.39-62.

Roslund, C., Lindström, J., & Andersson, P. (1999) 'Alignment in profusion and confusion' *Lund Archaeological Review*, 5, pp.105-115.

Ruggles, C. L. (2005) *Ancient astronomy: an encyclopedia of cosmologies and myth*. Oxford: Abc-Clio.

Seeher, J. (1992) 'Demircihöyük Nekropol Kazısı: 1991 Yılı Sonuöları', *24. Kazı Sonuçları Toplantısı*, Cilt I, pp.365-379.

Shapiro, J. (1997) 'Fingerprints in the landscape: Cultural evolution in the north Rio Grande', *Proceedings Volume II, Archaeology, Space Syntax First International Symposium*. London. 21. Available at: https://www.spacesyntax.net/symposia-archive/SSS1/SpSx%201st%20Symposium%2097%20-2003%20pdf/1st%20Symposium%20Vol%20II%20pdf/3%20-%20Archaeology/21%20Shapiro%20300.pdf (Accessed: October 2022)

Steadman, S. R. (2000) 'Spatial patterning and social complexity on prehistoric Anatolian tell sites: models for mound', *Journal of anthropological archaeology*, 19(2), pp.164-199.

Steadman, S. R. (2010) 'Agency, Architecture, and Archaeology' in Steadman, S. R., & Ross, J. C. (Eds.) Agency and Identity in the Ancient Near East: New Paths Forward. London: Equinox, pp.27-46.

Steadman, S. R. (2011) 'Take me to your leader: the power of place in prehistoric Anatolian settlements', *Bulletin of the American Schools of Oriental Research*, *363*(1), pp.1-24.

Stordeur, D., & Abbès, F. (2002) 'Du PPNA au PNB: mise en lumière d'une phase de transition à Jerf el Ahmar (Syrie)', *Bulletin de la Société préhistorique français*, pp.563-595.

Taylor, S. E., Peplau, L. A., & Sears, D. O. (Eds.) (2006) *Social Psychology*. New Jersey: Pearson Education, Inc.

Thomas, J. (1996) *Time, Culture and Identity: An Interpretative Archaeology*. London, New York: Routledge.

Tringham, R. (1994) 'Engendered places in prehistory', *Gender, Place and Culture: A Journal of Feminist Geography*, 1(2), pp.169-203.

Umurtak, G. (2009) 'A Study of three Numerical (!) Tablets and a Stamp Seal from the Early Bronze Age Settlement at Bademağacı Höyük', *ADALYA*, XII, pp.1-10.

Umurtak, G. (2010) 'Questions Arising from a Bulla Found in the EBA II Settlement at Bademağacı', *ADALYA*, XIII, pp.19-27.

Umurtak, G., & Çongur, F. (2021) 'The Early Bronze Age II Settlement at Bademağacı Höyük: An Evaluation of the Pottery and Beak Spouted Jugs', *Olba*, 29(XXIX), pp.1-24.

Vandam, R., Kaptijn, E., Poblome, J., & Waelkens, M. (2013) 'The Bronze Age Cemetery of Gavur Evi Tepesi, Southwestern Turkey', *Anatolica*, 39, pp.241-259.

Verhoeven, M. (1999) *An archaeological ethnography of a Neolithic community: space, place and social relations in the burnt village at Tell Sabi Abyad, Syria*. Nederland Historisch-Archaeologisch Instituut.

Wason, P. K. (1994) *The archaeology or rank.* Cambridge: Cambridge University Press.

Wheeler, T. S. (1973) *The Early Bronze Age Burial Customs of Karataş-Semayük*. Doctoral dissertation. Bryn Mawr College. Bryn Mawr. Available at: https://repository.brynmawr.edu/dissertations/182/ (Accessed: June 2021)

Yıldırım, B., & Steadman, S. R. (2021) 'Chalcolithic Religion and ritual on the Anatolian Plateau' in Steadman, S. R., & McMahon, G. (Eds.) *The Archaeology of Anatolia Volume IV: Recent Discoveries (2018-2020)*. Newcastle-upon-Tyne: Cambridge Scholars Press, pp.307-393.