Universitätsforschungen zur prähistorischen Archäologie

Band 207

Aus der Graduiertenschule
"Human Development in Landscapes"
der Universität Kiel

2012

Verlag Dr. Rudolf Habelt GmbH, Bonn

Tells:
Social and Environmental Space

Proceedings of the International Workshop
"Socio-Environmental Dynamics over the Last 12,000 Years:
The Creation of Landscapes II (14th–18th March 2011)" in Kiel

Volume 3

edited by

Robert Hofmann, Fevzi-Kemal Moetz and Johannes Müller

human development in landscapes
GRADUATE SCHOOL AT THE UNIVERSITY OF KIEL

2012

Verlag Dr. Rudolf Habelt GmbH, Bonn

Contents

9 Preface

10 The Kiel Graduate School "Human Development in Landscapes"

13 Foreword

15 Robert Hofmann
Tells: Reflections of Social and Environmental Spaces - an Introduction

19 Mehmet Özdoğan
Reading the Mounds: Problems, Alternative Trajectories and Biases

33 Eva Rosenstock
Environmental Factors in Tell Formation: An Archaeometric Attempt

47 Johannes Müller
Tells, Fire, and Copper as Social Technologies

53 Peter F. Biehl, Ingmar Franz, Sonia Ostaptchouk, David Orton, Jana Rogasch, Eva Rosenstock
One Community and Two Tells: The Phenomenon of Relocating Tell Settlements at the Turn of the 7th and 6th Millennia in Central Anatolia

67 Barbara Helwing, Tevekkül Aliyev, Andrea Ricci
Mounds and Settlements in the Lower Qarabakh - Mil Plain, Azerbaijan

79 Simone Mühl
Human Landscape - Site (Trans-) Formation in the Transtigris Area

93 Silvia Balatti, Maria Elena Balza
Kınık-Höyük and Southern Cappadocia (Turkey): Geo-Archaeological Activities, Landscapes and Social Spaces

105 William A. Parkinson, Attila Gyucha
Tells in Perspective: Long-Term Patterns of Settlement Nucleation and Dispersal in Central and Southeast Europe

117 Barbara Dammers
The Middle and Late Neolithic Tell of Uivar seen from a Ceramic Perspective

127 Svend Hansen, Meda Toderaş
The Copper Age Settlement Pietrele on the Lower Danube River (Romania)

139 AGATHE REINGRUBER
Copper-Age House Inventories from Pietrele: Preliminary Results from Pottery Analysis

153 CARSTEN MISCHKA
Late Neolithic Multiphased Settlements in Central and Southern Transilvania: Geophysical Survey and Test Excavation

167 INGA MERKYTE, SØREN ALBEK
Boundaries and Space in Copper Age Bulgaria: Lessons from Africa

181 ROBERT HOFMANN
Style and Function of Pottery in Relation to the Development of Late Neolithic Settlement Patterns in Central Bosnia

203 MARTIN FURHOLT
Kundruci: Development of Social Space in a Late Neolithic Tell-Settlement in Central Bosnia

221 ULRICH BULTMANN
Putting Sites in their Catchment Areas

231 ***Annex***
Workshop Programme, March 14th – 18th 2011

Human Landscape - Site (Trans-) Formation in the Transtigris Area

Simone Mühl

Abstract

The formation of Early Bronze Age centres in Upper Mesopotamia is the result of long term processes which can be explained by environmental, economical and social developments. Their physical appearance is not only a testimony of centralization, but also of the social evolution reflected in its impact on landscapes. Large tell sites, surrounded by a web of roads for inter-regional and inter-site communication, traceable through aerial and satellite photography, offer a testing ground for new methods. While the plains of northern Syria have little variation in terrain, the central Trans-Tigris area shows a highly differentiated terrain affected by the ridges of the Zagros Piedmont zone. The variation in climate and soil conditions leads to changes of strategies in economy and settling. For the Middle and Late Bronze Age changes in settlement and irrigation systems can be traced, reflecting the human impact on landscape. The paper aims at an inspection of the settlement variation and changes in two case study areas: the neighbouring sites of Ashur north and south of the Lesser Zab and sites along the Tanjero River Valley with the Shahrizor Plain in Iraqi Kurdistan with new material from recent excavations and site surveys combined with results from remote sensing.

General Settings

This study focuses on tell sites in the eastern part of the Fertile Crescent in modern day northeastern Iraq. The region east of Ashur comprises the Makhmur Plain north of the Lesser Zab and the al-Ta'mim Plain south of the Tigris tributary (Fig. 1). To the east lie the ridges and valleys of the Zagros Piedmont stretching northwest to southeast. This region, also known as the central Transtigris region, is an area of transition in many ways: the eastern parts are climatically bound to the steppe with a precipitation of less than 200 mm per annum, whereas further east the climate is more humid due to the raising terrain and the mountainous climate. The limits for agriculture in this area are set by the stability of average isohyets per year as well as the quality of the soil (Fig. 2). Zones of fertile brown soils are bordered by 'infertile land' such as lithosolic and gypsiferous soils, conglomerates, gullied and mountainous land (cf. Ali 1955; Buringh 1960). Therefore, the landscape east of the central Tigris can be categorized according to conditions suitable for agriculture into two fertile zones: the areas with good soils, but lacking necessary rain, found especially in the Makhmur Plain and the western Ta'mim Plain, and the eastern brown soil areas with sufficient rain in the vast area of Erbil, Kirkuk, the Rania Plain, and the Tanjero River valley with the Shahrizor Plain in the area of Sulaimaniya (Fig. 3). Nowadays, the latter region has a precipitation of 450 – 600 mm/annum. The alluvial and colluvial soils advance the growth of grasses, specifically crops. Therefore, the Shahrizor Plain is known as the breadbasket of Kurdistan, but it is also famous for its livestock: nearly 50 % of the land is allocated to pastures and about 30 % to agriculture.

It is obvious that the highly diverse nature of the transtigridian landscape provided room for various lifestyles and niches of subsistence, on occasion resulting in conflicts between settled farmers, nomadic, and semi-nomadic groups. The climate of the Zagros with cold and snowy winters do not provide suitable conditions for animal husbandry in wintertime. Therefore, herders moved down to the plains leading their livestock to winter pastureland (Streck 1998-2001, 594 f. §3; Greco 2003); for modern day references see (Coon 1951, 216; Braidwood / Howe 1960, 17), and for a system called 'enclosed vertical transhumance' (cf. Rowton 1973; Rowton 1974). The relationship between low- and highland is more ambivalent than what is described in programmatic historical texts, for example royal inscriptions. Access to raw materials such as minerals and metals, livestock and other resources, but also the intermit-

In: R. Hofmann / F.-K. Moetz / J. Müller (eds.), Tells: Social and Environmental Space [Proceedings of the International Workshop "Socio-Environmental Dynamics over the Last 12,000 Years: The Creation of Landscapes II (14st-18th March 2011)" in Kiel] (Bonn 2012) 79-92.

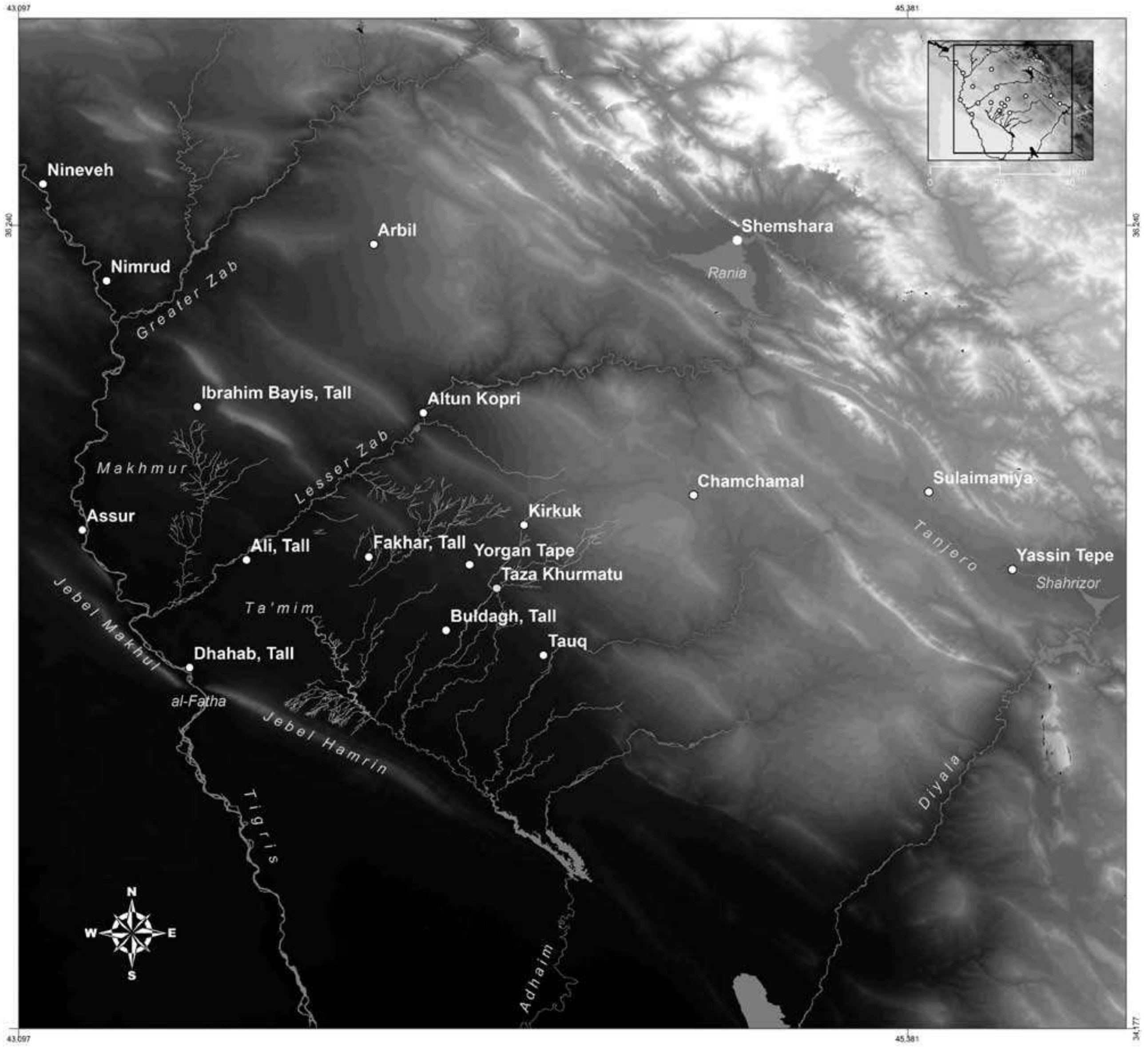

Fig. 1. General map of the central eastern Tigris region.

tent position between the Mesopotamian Lowland and the Iranian Highland, giving access to important trade routes, show the Zagros Piedmont and the western inter-mountainous plains as a permeable region. This zone of interaction is highly geography dependent and dictated by the mountain ridges running in northwest-southeast direction. Its course played a major role in various trading systems of prehistoric and historical periods (e.g. obsidian trade or the eastern routes of the Old Assyrian karum commerce; cf. Cauvin et al. 1998; Oguchi 1999; Marro 2004). A horizontal communication for the link and access to this route from the Mesopotamian lowland is only possible through the anticline formations of the bedded ridges in the foothill and high folded zone (cf. Jassim / Goff 2006, 74, Fig. 6.3), which offer accessibility by various greater passes and chains of smaller cols.

The significance of the geographical setting for spatial communication can be visualized by tracing ancient roads, visible as hollow ways on aerial photographs and satellite images such as CORONA and ASTER (Fig. 5; cf. Wilkinson 1993; Wilkinson / Tucker 1995, 24 – 28; Ur 2003; Altaweel 2003; Altaweel 2005). The mapped features give a multiperiod picture of the region's general infrastructure where passes and river crossings bundle traffic and determine the arrangement of routes in relationship to sites and their environment. The roads can be categorized in radial features intersecting at sites, and linear swales that can be traced over long distances (Wilkinson 1993, 551 ff.). It can be argued that the shorter radial hollows are connectors of a local settle-

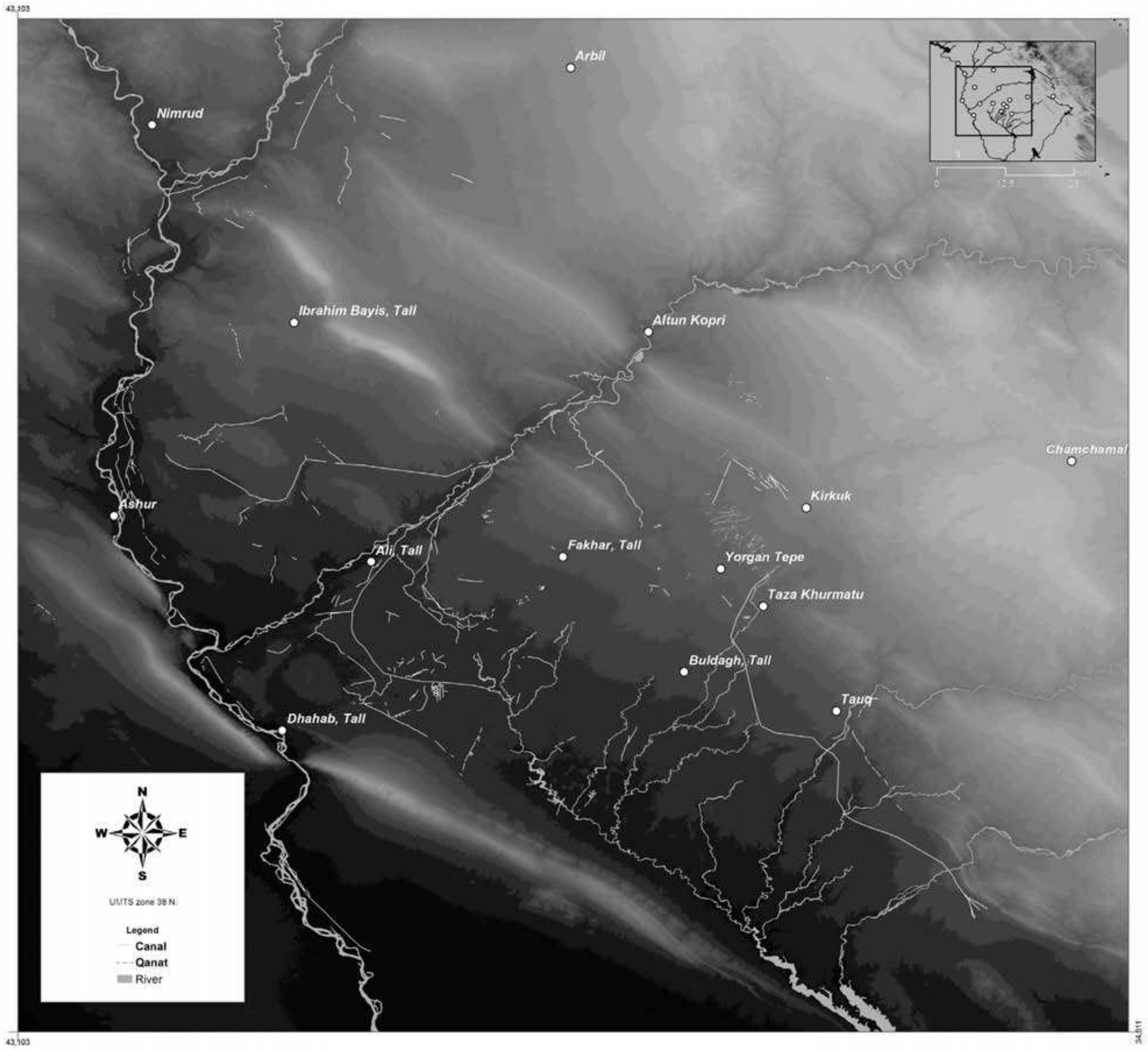

Fig. 2. Map of ancient canal and Qanat systems in the regions adjacent to the Lesser Zab as mapped on CORONA imagery, lain over a digital elevation model (SRTM90).

ment network. Furthermore, they give access to agricultural fields and pastures adjacent to their connected settlements (Fig. 8; cf. Fig. 10; cf. Wilkinson 1993, 560 f. Fig. 9; Wilkinson 2003, Fig. 6.17). The long distance hollows are connectors between regional and inter-regional centres (cf. Altaweel 2003; Altaweel / Hauser 2005). Roads connected to a site are not necessarily all used at the same time. Their use can shift and be transferred to other routes, depending on changing settlement patterns on a lower or higher scale. Therefore, the dating of single route features remains uncertain. One can argue that they correlate to the spans of inhabitation of the sites (Fig. 11). But in general, investigated sites have a multi-period occupation and exist in a highly dynamic relationship to neighbouring sites as well as to sites at greater distances throughout centuries of political and economical changes. This makes interpretation of the route system difficult. Nevertheless, more general assumptions can be made on the long term use of routes, especially those determined by natural features and linked to regional centres which show a higher rate of settlement continuity[1].

Within the study area the connection between

1 Most of the regional centres in the Transtigris area have not been studied archaeologically because their citadels, the ancient tells, have been populated until most recent years.

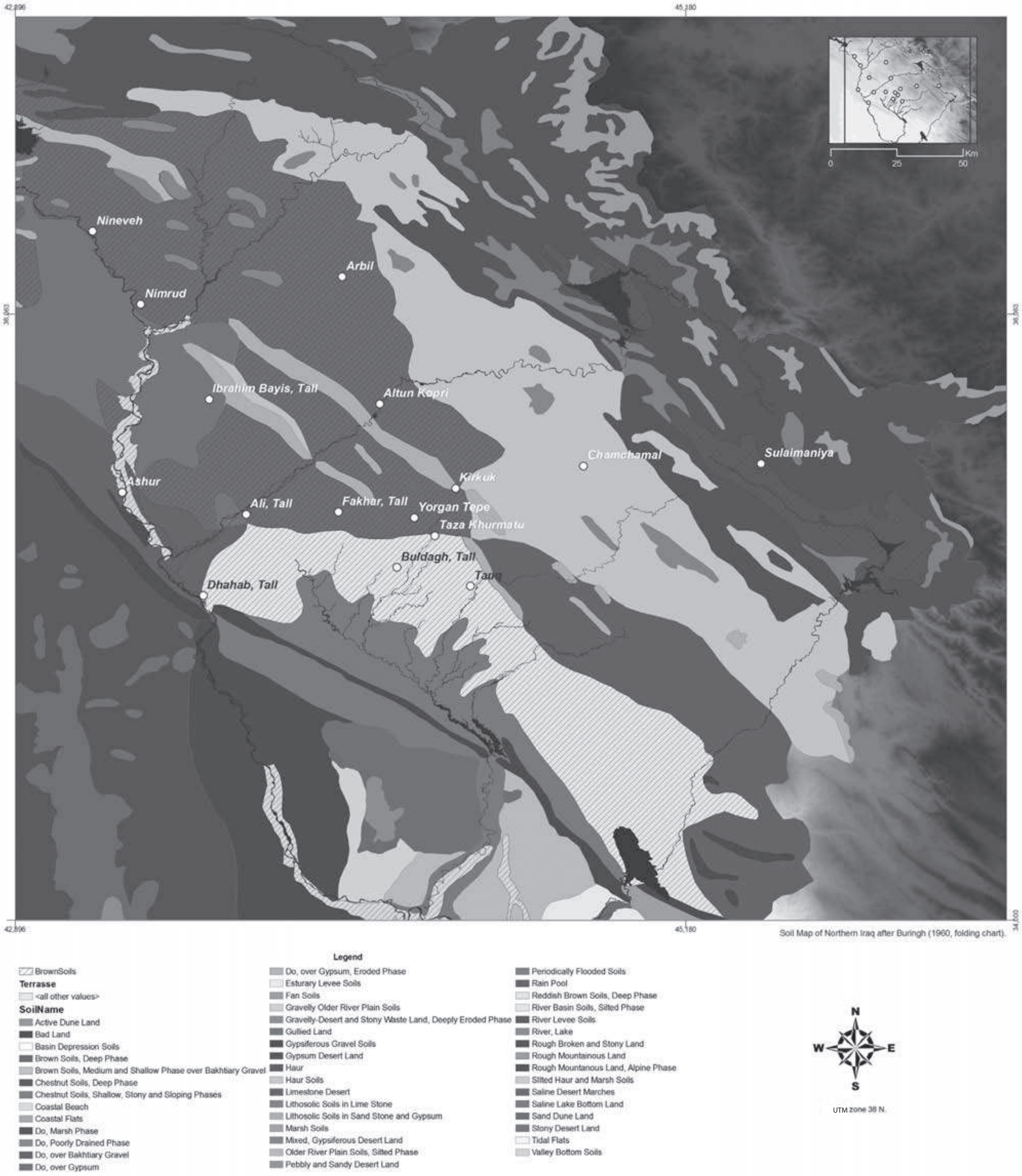

Fig. 3. Soil map of the eastern Central Tigris Region with fertile soils highlighted (after Buringh 1960, folding chart).

traffic, its routes and the natural environment is strongly related to 'pass situations' such as fords over rivers and streams, mountain passes and their seasonal usability as well as variability. As visible on maps based on digital elevation models (data of the Shuttle Radar Topography Mission [SRTM90] was used in this study) and satellite imagery (CORONA) routes bundle at specific points, such as river crossings and passes (Fig. 5). Such positions are also linked to the formation of sites. One can observe that transtigridian regional centers are often located right next to natural features that bundle traffic. Those ancient settlements, amongst them larger ones like Erbil, Kirkuk and Chamchamal, are by comparison with Tell Brak, Tell Leilan and other centres in upper Mesopotamia - supposed to have had their greatest expansion during the later Early Bronze Age (cf. WEISS 1986)[2].

The link between sites and trade routes in the area east of the Tigris is visible in the general settlement pattern in the 3rd millennium as visualized in an "Eastern Tigris at night" simulation (Fig. 4). From 886 dated sites in the regions north and south of the Lower Zab 132 can be attributed to the Early Bronze Age[3]. The inhabited sites show up as conurbation areas of white spots, which appear on the image as virtually illuminated clusters of settlements. Besides the dense occupation along the Zagros belt, a line of sites is visible between al-Fatha with Tell al-Dhahab

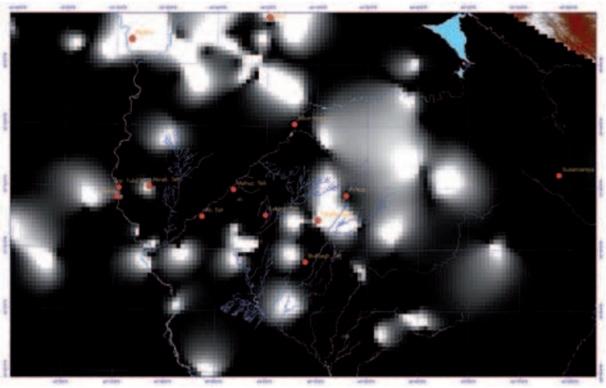

Fig. 4. The „Eastern Tigris at Night" simulation (Inverse Distance Weighting [IDW] method).

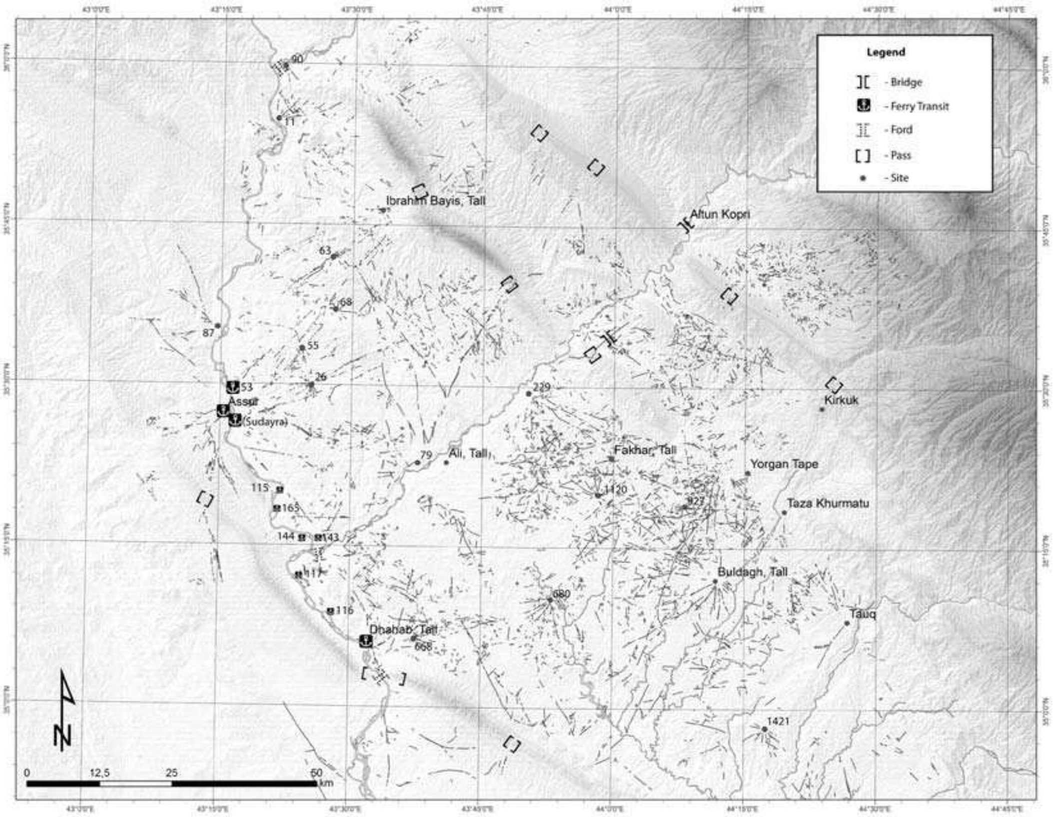

Fig. 5. Ancient road system (grey lines) as mapped on CORONA (1968) and ASTER imagery (2001-2). Site key: 11. Tell al-Sha'ir, 26. Tell Akrah, 53. Tulul al-'Aqr (Kar-Tukulti-Ninurta), 55. OTG019, 63. OTG021, 68. Zarnaj Kabir, 79. Sharah, 87. Tell Huweysh, 90. Tell Kushaf, 115. Tell en-Neml, 116. Tell Marmus, 117. Tell al-Faras, 143. Tell az-Zab, 144. Tell az-Zuwiyah, 165. Qaqiyah North, 229. Tell Mahuz, 668. Kan'az, 680. Kiriya an-Nakar, 927. OTG255, 1120. Haql Duwajaz, 1421. Tell Rubeida (after MÜHL 2011).

2 Nevertheless, most recent investigations in Erbil on the slope of the citadel only show few traces of 3rd and early 2nd millennium BC occupation (NOVÁČEK 2008, 276).

3 The data for these datings is provided by an analysis and integration of entries in the Journal of "Archaeological Sites in Iraq" which was correlated with the "Atlas of Archaeological sites in Iraq" together with reports from archaeological projects in the region (Directorate General of Antiquities Baghdad 1970; Directorate General of Antiquities Baghdad 1976; MÜHL 2011).

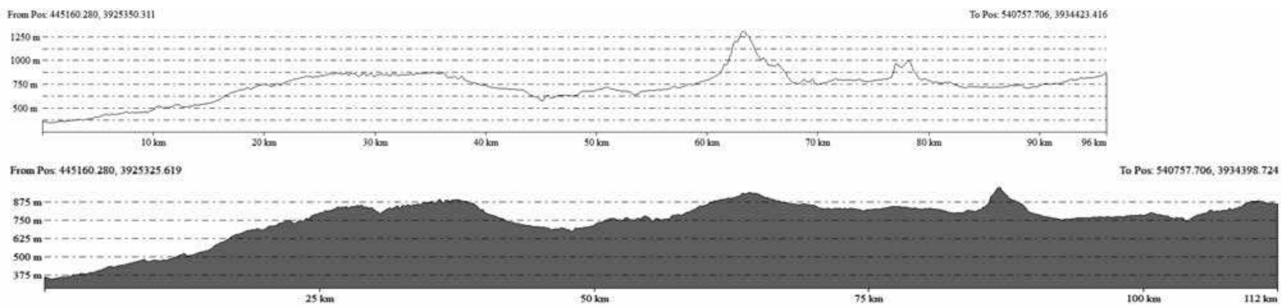

Fig. 6. Comparison between a height profile from a route as the crow flies from Kirkuk to Sulaimaniya to a profile taken from the historical route as mapped on topographic charts from 1941 (Wehrmacht 1941).

in the west and Kirkuk in the east. Tell al-Dhahab is a huge fortified settlement with attested occupation during the Late Chalcolithic, Late Early Dynastic and Akkadian periods as well as during the Late Bronze Age (Herzfeld 1907, 93 – 96; Sulaiman 2010, 131 – 138; Mühl 2011, 240 – 244, Pl. 101 – 103). In Kirkuk only accidental finds like a face mask vessel dating to the Akkadian Period found during construction work on the mound give us a glimpse of its Early Bronze Age occupation, for this site has never been studied systematically (Mühl / Sulaiman 2011, 378; Raheem / Abdullah 2011). While Dhahab controls traffic along the Tigris as well as the route to the Ta'mim region in the east, which is connected with Kirkuk through a col in the Hamrin, Kirkuk is situated at the northwest-southeast connection along the Zagros flanks. Furthermore, it lies along the route to several passes that lead to the western Zagros valleys with the fertile Shahrizor Plain and its access to the Iranian plateau behind it. In this region the modern city Sulaimaniya stretches along the western side of the Piramagroon Mountain. The city is not believed to have been an important centre in antiquity, though the capital of māt Zamua, which had been the target of several campaigns of Neo-Assyrian kings, is assumed to be in its vicinity. Nevertheless, the city lies at a good strategic position for obtaining control over the Tanjero River valley which is part of the Shahrizor Plain, known for its fertility in antiquity as well (Levine 1974, 10). Several tell sites line up like pearls along the Tanjero River on its way southeast before it unites with other streams to become the Diyala River. Amongst them is Yasin Tepe, 29 km south east of Sulaimaniya, which certainly was a regional centre in antiquity. The tell has a size of 30 ha and a height of 17 m above plain level. It is surrounded by a polygonal city wall, comparable to the defensive structure of Tell al-Rimah (Mühl 2010, 50, Fig. 2). A short site survey conducted in 2009 produced artifacts that can be assigned to periods ranging from the Late Chalcolithic to Ottoman times, the latter having been explored by an Iraqi excavation on top of the mound in 1973 (cf. Hijara 1976).

Although the route between the Ta'mim and the Shahrizor Plain consists of several mountain passes and river crossings, it shall be considered as a pass, respectively corridor situation, in this paper. It channels transport due to the limited number of available tracks. The route to the northern Shahrizor has a length of approximately 100 km, overcoming a total height difference of 1500 m. The comparison of the profiles as the crow flies and of the historical track as transferred from a German military map of 1941 based on maps of the Royal British Army (Wehrmacht 1941) shows that the course of the path was determined by the need to temper the slope of the route. The northwest to southeast running ridges of the Zagros generally prevent an easy west to east passage. One has to take advantage of the passes and valleys, as well as the availability of slopes. This sometimes results in detours in northern or southern directions.

The relation between the topographical conditions in the piedmontal zones and the emergence of the centers mentioned above can be explained with various models:

Questions about the formation and hierarchization of such sites or centres and their networks emerged in the beginning of the 20th century with the so-called 'central place' as well as the 'rank size' theories, both linking organized settlement systems with economy, respectively markets (Christaller 1933; Lösch 1944, 86 ff.; Jefferson 1939; Zipf 1949). Since then network theory has become a subject of its own ('network science') and is applied to studies in various fields, e.g. computer science, telecommunication, biology or anthropology. In archaeology both fields become important when it comes to the discourse on the evolution of sedentariness where we are soon confronted with problems of causality concerning the question of what comes first – trade network/route or settlement (cf. Flannery 1976, 283 – 286).

A different model that found its way from social sciences to particle physics, traffic management and back to social sciences through pattern recognition and modelling shall be proposed as an explanation

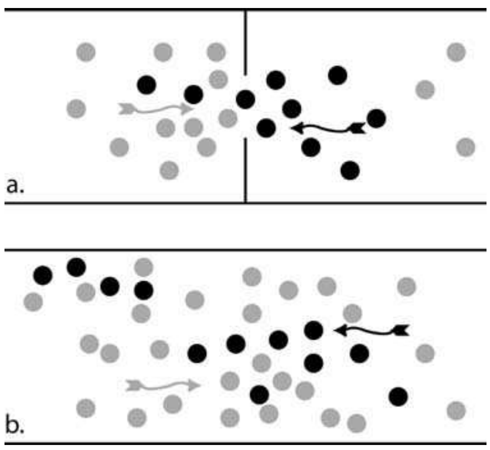

Fig. 7. Flow dynamics in two-dimensional space (e.g. human movement). a. oszillation, b. formation of tracks (after Helbing / Molnár 1998).

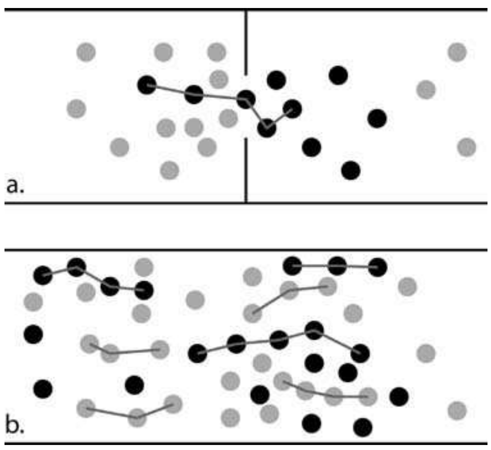

Fig. 8. Flow dynamics from Fig. 7 scenarios with vectorized movement visualization (after Helbing / Molnár 1998).

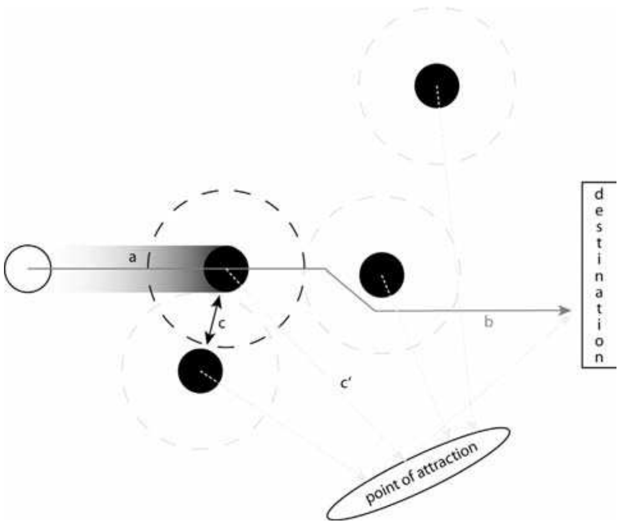

Fig. 9. Scheme of the social forece model for pedestrian dynamics (a. acceleration, b. shortest route, c. minimum distance from/to other particles, c'. force of attraction).

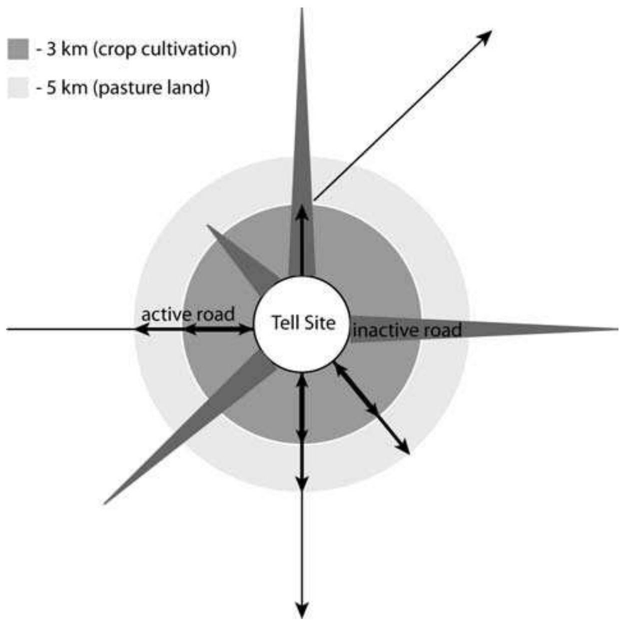

Fig. 10. Model of land use surrounding tell sites in connection to use intensity and preservation of hollow ways (after Wilkinson 2003).

for the self-organization of urban settlement systems respectively the formation of Early Bronze Age centres in northern Mesopotamia.

Social Force Model

The self-organization of movement and clustering, both part of system theory, are key concepts within the analysis of particle flows of fluids and gases in three-dimensional space. Phenomena like oscillation or osmosis show modalities that can be applied to two-dimensional space. Human movement is two-dimensional from its very nature and, when compared with particles, predictable. This comes into concern for crisis management such as mass panics, their prevention and control or spatial economic factor calculation through the integration of movement models to architectural planning and market strategies like product placement in shopping malls. Scenarios of daily situations show some examples of self-organizing principles within pedestrian dynamics (cf. Helbing / Molnár, 1995):

Figure 7a shows only one door of a frequented building open. People coming from opposite directions need to arrange passage. Without the need of discussing an order of who comes first, the situation gets resolved by self organization through oscillation: One person uses a gap or weak part to get through the mass of people with the intention to go to the opposite direction, and others follow. So they oscillate to the other side of the door until the others find a gap to do the same.

Fig. 7b represents the scenario of a crowded street where the movement of people in opposing directions results in the formation of tracks. This happens automatically and guarantees the best organization for fluid traffic without the need for regulations.

The movement of particles is mathematically characterized as follows (cf. Fig. 9): its acceleration until reached speed, its distance from other particles and forces of attraction, which depend on its charge. For pedestrians this means that people usually choose the shortest way to their destination. Their movement, either of individuals or rows of people, can be described as a polygon for pursoses of visualization and spatial description (Fig. 8). Privacy, as a cultural and/or social factor of distance can be described as a repulsive territorial effect (c), which leads pedestrians to keep a certain distance from other people. Effects of attraction are quite similar to the repulsive effects, although it is its opposite (c'). We go where we meet friends, see nice things in shop windows or listen to street musicians. As one can observe, interesting things are always surrounded by crowds of pedestrians – such attraction effects result in clustering.

Just as pedestrian dynamics are akin to particle dynamics I would propose that the same can be argued for settlement dynamics. The difference resides in the resolution of movement in time and space, so I attempt to adopt these theories to landscape archaeology (Tab. 1):

Tab. 1. Social Force Model for pedestrian dynamics applied on the north Mesopotamian tell landscape.

Description:	
1. Acceleration until reached speed	Course of routes, settlement connectors
2. Evaluation of distance to keep	Evaluation of distance to keep
3. Attraction effects	Attraction effects
→ Description of self-organization of collective effects	→ Description of self-organization of dynamics in settling
Examples:	
1. Shortest route to destination (polygonal description)	Analysis of hollow ways (polygonal)
2. Privacy → territorial effect (repulsive) .	Nucleus of settlements → Areas for crop cultivation and pasture land
3. People (e.g. friends, street performers) or objects (e.g. shop windows) → similar to repulsive effects → responsible for the formation of groups of pedestrians	Raw materials, topographical favourable factors → densification of settlement → Genesis of the formation of Early Bronze Age centres .

The Early Bronze Age in the Central Transtigris Region

At the beginning of the 3rd millennium BC, we can reconstruct a network of sites with Ninevite 5 and Scarlet Ware material at regular distances of 3 to 7 km along the Tigris. Two of these sites have been excavated, others have been surveyed: Round buildings dated to the beginning of the 3rd millennium BC have been uncovered in Tall al-Namil and Tall al-Faras. Finds provide links between the sites north and south of the Lesser Zab. These sites lie directly on the Tigris and may have been connected by boat traffic as indicated by the regular distance to other Early Bronze Age sites on the river (Fig. 5). As mentioned before, Tall al-Dhahab and Kirkuk are part of another chain of sites connecting the Mesopotamian lowland with the Zagros piedmont zone in a corridor-like pattern. This is visible in the distribution of sites along this route, their connecting roads as mapped from CORONA imagery and the archaeological material found at these sites (cf. Mühl 2011, 197 – 273). Other major centers along this chain are Chamchamal and bigger sites in the Shahrizor Plain southwest of Sulaimaniya such as Yasin Tepe.

Kirkuk offers a good opportunity for a case study on the system of self organizing settlement patterns in the Early Bronze Age. The site is situated on a gorge in the Kani Domlan mountain range, where the river Qadha Chai flows out of the mountainous terrain and accumulates sediment deposits to a fan that spreads into the eastern Ta'mim region. The fan soil is fertile and the drainage system offers higher

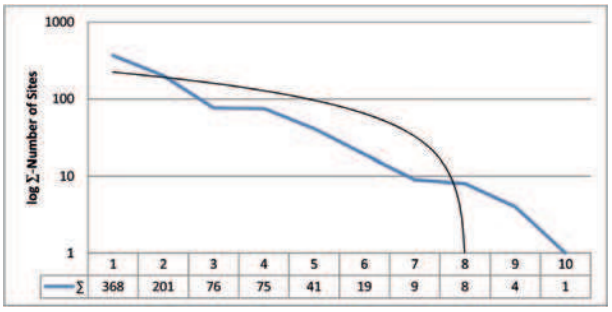

Fig. 11. Number of occupation periods represented on sites in the eastern Central Tigris Region (after Mühl 2011).

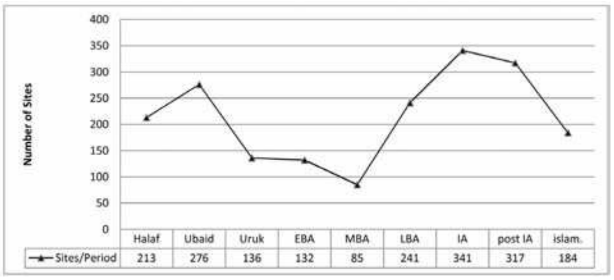

Fig. 12. Number of sites per period in the eastern Central Tigris Region (after Mühl 2011, 62, Fig. 18).

humidity in the ground and a higher groundwater table. Qanat systems are attested in the Neo-Assyrian and Islamic Periods in the wider area, but water run-off farming is also possible. Kirkuk is situated on the periphery of the fan, a position that avoids floods by the meandering streams. Smaller settlements on this fan seem to show a chronological distribution related to the usage of different irrigation techniques. Prehistoric sites can be found in the upper zones while sites dating to the Iron Age and early Islamic periods can be found in the irrigated zone beneath a belt of qanat systems.

The environmental conditions in the Kirkuk area form only one aspect of the various circumstances that lead to advantageous settlement conditions. The special location of this site is also enhanced by the geographically dictated bundling of traffic in its vicinity. The route connecting it with the highlands is dictated by the slope of the terrain as well as weather conditions. Different paths are used in the wintertime when some passes are blocked by snow, in spring when the wadis are filled with melt water, and in summertime. This situation can be compared to artificial points of bundled traffic such as counters in a supermarket for example.

The counter can be seen as an artificial pass, created to control traffic and receive payment. It is a point which everyone has to pass in order to leave. This is calculated by market strategists who position small luring products like sweets, respectively alcohol or cigarettes in some countries, next to the conveyor belt. This results in the ambivalent nature of a point of attraction additionally combined with a point of control in this artificial pass.

Belonging to the package of going through a natural pass within an anthropogenic landscape are goods, human resources, as well as various kinds of information. Control over the passage and the redistribution of the incoming package can serve as a basis for the power of an elite. Furthermore, control over the pass and everything coming to and from it by an administrative component also helps in controlling the settlement's hinterland. In comparison

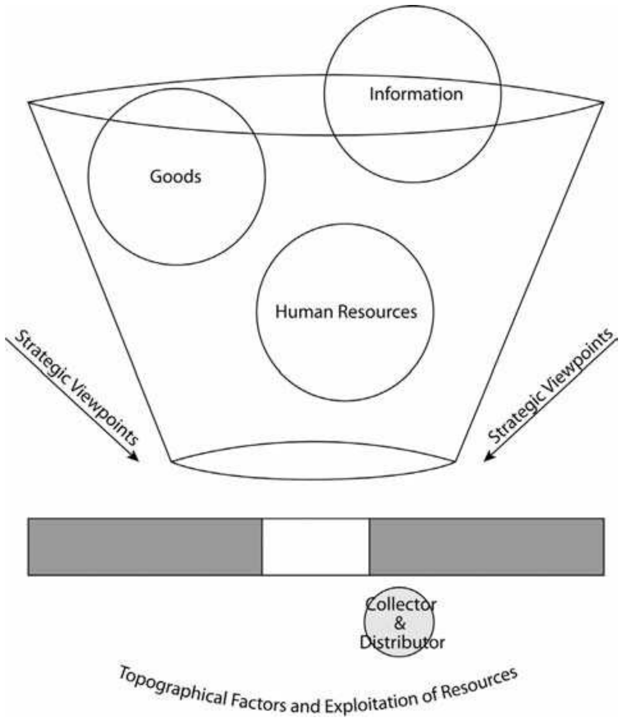

Fig. 13. Scheme of economic and topographical factors coming into account for the evolution of an Early Bronze Age centre situated next to a pass.

with the supermarket example where the counter is situated directly in the artificial pass, there are two reasons why the settlement will not be located in the pass itself, but at a slight distance from it (Fig. 13). First, settlements within the pass could have easily been overrun by people and hostile forces that were attracted by the markets, accumulated wealth, and the fertility of the hinterland; secondly, the nearby fan offers far better agricultural opportunities than the pass itself. For these reasons a settlement would emerge near, but not in the pass. It could control the flow through it, while benefiting from its distance from it. Therefore, one can argue that settlements at passes play the role of both cashier and consumer, a position whose ambivalence promotes the economic

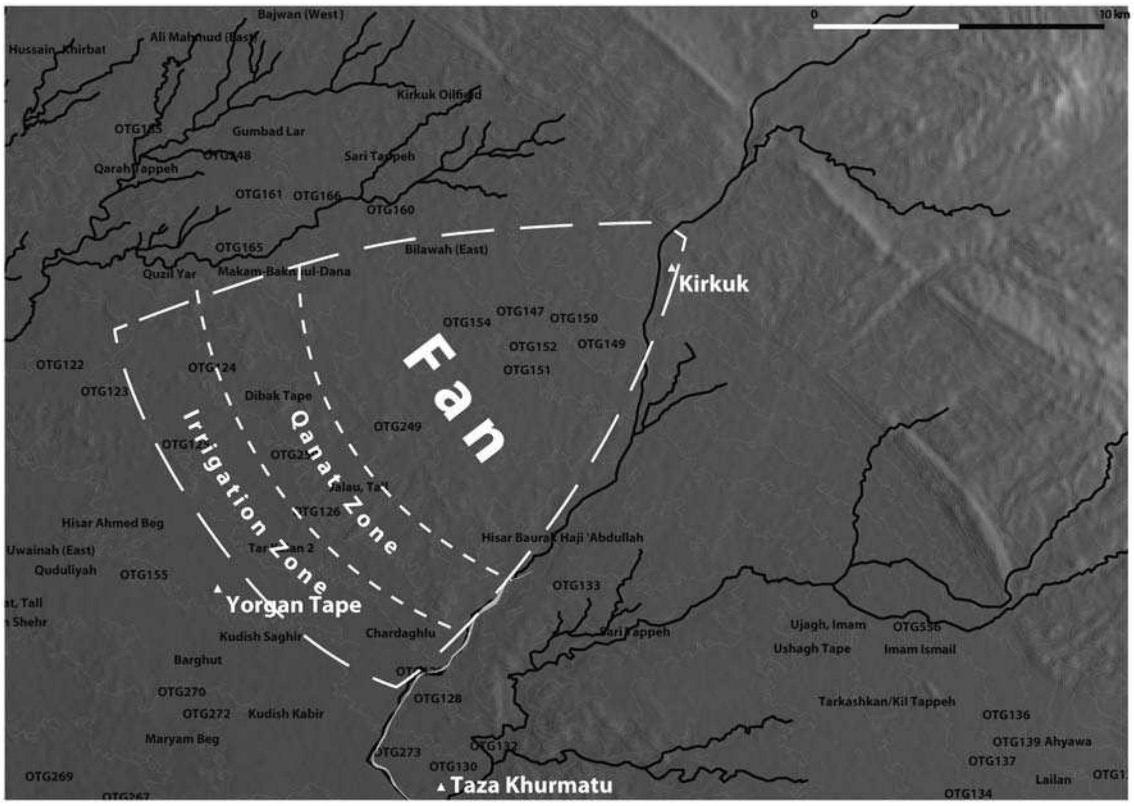

Fig. 14. The Qadha Chai fan with suggested zones of land-use according to Qanat systems mapped on CORONA images.

attraction of these places. Its long-term frequentation results in clustering due to the repulsive as well as to attractive territorial effects. These show distinct similarities to the natural self-organizing principles explained above. But this picture seems to change during the periods succeeding the later Early Bronze Age.

Transformation of the Human Landscape

During the Middle Bronze Age significant changes in the regional settlement patterns are traceable. We can note a decline of nearly 40 % of the settlements (Fig. 12)[4]. While some centers such as Ashur, Tall Akrah – an important site in the Makhmur Plain (Mallowan / El-Amin 1950, 60 – 62; Dittmann 1995, 95) – and Kirkuk, ancient Arrapha, are still inhabited, other settlements such as Tall al-Dhahab, Tall al-Faras, Marmus (for reports about these sites in the Makhul Dam area see Sulaiman 2010; Mühl / Sulaiman 2011) and smaller sites are abandoned. This correlates to climatic stress due to an aridification as detected for the Middle Bronze Age in Upper Mesopotamia (cf. Riel et al. 2008, 1019, Fig. 6). From the archaeological material only little is known for the period following the time of the flourishing old Assyrian trade in which many sites within the region took part or profited, as their archaeological material and some texts suggest (cf. Mühl 2011). During the last years of the reign of Shamshi Adad I (1808 – 1776 BC) significant political changes took place in the Transtigris area. This is indicated in texts from Mari, Eshnunna and Shemshara. After wars against the city state of Qabra, a non-located site supposedly lying 15 – 20 km northwest of Altun Kopri on the way to Erbil (Deller 1990), won by the coalition between Shamshi Adad and Dadusha, king of Eshnunna, the areas east of Ashur became incorporated into the kingdom of Shamshi-Adad (Ziegler 2011). At the same time the Zagros Piedmont areas had to deal with refugees from the war in the west, but also from people fleeing from neighbouring regions caused by military actions by people called "Guti" (Eidem 1985, 95). With the destruction of the palace in Shusharra his-

4 Settlement sizes cannot be taken into account in the study area because no data is provided by systematic archaeological surveys.

torical records become scarce. The transition to Late Bronze Age material culture is underrepresented in the archaeological evidence. While the pottery sequence of the first half of the 2nd millennium is characterized by painted, painted-incised and unpainted Khabur Ware types north of the Lesser Zab, south of the river unpainted goblets, incised grey ware and appliqué vessels are common. The only complete sequence is provided by excavations in the temple area of Yorgan Tepe (Starr 1937/39), where changes can be traced in the cultic topography of the city. During the transition to the early 2nd millennium a single shrine sanctuary (Temple G), comparable to similar buildings dating to the Early Bronze Age in northern Mesopotamia, evolves into a complex comprising two cellae (Temple F), probably for two deities, most probably for Ishtar/Inanna and the weather god, as attested in later sources (cf. Wilhelm 1998 – 2001).

In the western Zagros presumably at the same time as reports about political unrest increase and the palace of Shusharra is destroyed, another site in the Shahrizor Plain, named Tell Shamlu, shows significant changes in its pottery sequence. The mound was excavated due to the construction of the Darband-i Khan Dam in 1959/60 (Janabi 1961). Ten layers were differentiated, of which Layers V – X can be dated to the Middle Bronze Age. According to the excavator, Khalid al-Janabi, the site was uninhabited for a short time during the old Babylonian period. The layers following this gap in occupation (VI, VII) are marked by a new group of pottery, very different from the wheel turned and plain old Babylonian types of level VIII. They are replaced by very distinctive, handmade vessels, the so-called Shamlu Ware (Fig. 15). This pottery is red burned with a polished red surface, though some dark grey examples also occur. Decorated specimens are incised with standing bands of several curved lines, each one incised individually rather than by a comb. The spaces in between can be filled with schematic floral and faunal motives. An analysis of the different styles of decoration in the stratigraphic context of this pottery allows us to make a distinction between older and younger Shamlu Ware (Mühl 2011, 296 – 300), though exact dates for their respective duration are still missing due to lacking references from other excavations in the wider area of the Shahrizor Plain. After a short period, the repertoire of handmade vessels finally becomes replaced by common old Babylonian pottery types (level V). Up to now Shamlu Ware has been attested in 15 other sites of the Shahrizor Plain and in the Tanjero River valley, examined during the Darband-i Khan Dam salvage campaigns (Janabi 1961, map 1) and surveyed by the author in 2009/11. Single pieces from excavated sites are reported from Yorgan Tepe (Starr 1937/39, Pl. 62 l.), Tell Shemshara (Hamlin 1971, 103, 119), and Dinkha Tepe in the Urmia region[5].

During the second half of the 2nd millennium the region slowly recovers. With the decline of the Mittani rule, the kings of Ashur started a building program of new founded residences and cities as physical landmarks along the Tigris and in territories further east (Jakob 2011; Miglus 2011; Mühl / Sulaiman 2011). But they also started incorporating new tenure land with technological improvements in irrigation techniques. In the Middle Assyrian residential and cultic city of Kar-Tukulti-Ninurta, modern Tulul al-Aqr, remnants of an ancient canal, which is also attested in written sources as *pattu mešari* - "canal of justice" (Bagg 2000, 37), were traced by Walter Andrae and Walter Bachmann (Andrae 1977, 175; Dittmann 1995, 89, Fig. 2). They can be connected to a wider network of irrigation features, partly datable to this period (Al-Taweel 2004, 68). The new possibility to irrigate the upper terraces of the Tigris River are reflected in the Late Bronze Age settlement patterns of this region, which clearly show a spread of sites in those areas that had not been settled extensively before (Mühl 2011, 69, Plate 27, 1). These developments are based on the technological improvements of large scale irrigation as well as the socio-political changes that made the evolution of the Assyrian state during the Late Bronze Age possible (cf. Jakob 2003, 24f.). During the Neo-Assyrian period one can observe a territorial expansion far beyond the upper terraces of the Tigris in places not suitable for rain fed agriculture. One can observe that the very nature of the settlement patterns changes in comparison to the Early and Middle Bronze Age. While earlier sites only succeeded under naturally favourable conditions, now settlements emerged under conditions improved by the anthropogenic changes to the landscape. Smaller rural sites spread in bigger distances from regional centres due to more independence from climate conditions as well as security guaranteed by state power (cf. Diakonoff 1969 (1949)).

These new possibilities for land-use can be regarded as a human transformation of natural conditions leading to an anthropogenic landscape which can be settled and exploited on the broadest possible scale. The self-conception of Neo-Assyrian kings as transformers of unfavourable natural conditions to culti-

5 (Hamlin 1971, Pl. 6 no. 1; Hamlin 1974, 138, Fig. 6). Though there are different statements about the quantity of Shamlu ware at Dinkha Tepe: „An incised pot, (…), is of considerable interest because it is unique (in decoration) at Dinkha (…)" (Hamlin 1971, 103). A second remark states: „This small pot is found in great quantity at Dinkha, in Phases C and D" (Hamlin 1974, 151 note to Fig. 6.1).

Fig. 15. Sherds of Shamlu ware from sites surveyed in the Shahrizor Plain. All pieces are handmade. 24-214/10: Shakar Tepe, polished slip, mineral temper (1:1) -

vated land is shown in royal inscriptions where it appears in the dichotomy between chaos and order (cf. Bagg 2000, 348 – 352 Bavian 6-8).

Despite the improvements, this system is very susceptible to political instability. Several salt concentrations adjacent to critical points in large canal works could be detected on multi-spectral ASTER images covering the region south of the Lesser Zab. While a running and maintained artificial irrigation system washes salt out of upper soils, salinity increases by osmosis when the constant wash stops. This can be the result of lacking canal maintenance due to declining administrative control over this system and the people linked with it. The eastern Central Tigris Region faced several episodes of declining state power. The latest large scale irrigation features south of the Lesser Zab can be dated to the Abbasside period. The canals can be remotely connected to Samarra further downstream along the Tigris. With the decline of the dynasty's rule and the Mongolian conquest that depopulated vast areas in the wider region, the mark is set for a long period of small scale rural land-use by small farming communities and pastoral groups at the same time. First starting in the 1950s through more intensified land-use, initiated and supported by the Government in Iraq, farmers were settled systematically in the region. A new irrigation system for the agricultural exploitation of the plains, partly took over the courses of ancient canal beds (cf. Ali 1955). Nowadays this process is still evolving and slowly erasing the palimpsests of ancient human landscape.

ganization that are observed, described and modelled for example in particle physics, but also human spatial behaviour. After significant changes took place during the Middle Bronze Age we can trace the human adaption and "mechanization" of natural attraction effects (artificial reduction of repulsive effects) during the Late Bronze Age. This period marks the beginning of a process leading to a disperse network of sites due to a transfer to newly irrigated areas and the beginning of a decentralization of control. These processes reach their climax in the Neo-Assyrian period. At that time the provincial system of state control offered the possibility to sustain large scale irrigation and agricultural activity. At the same time the fragility of this system lies in its very nature. Absent control leads to its collapse.

Nevertheless, the environmental conditions should not be seen as firm deterministic factors responsible for ancient and existing settlement systems. They operate along ethnical, social and political factors.

REFERENCES

Ali 1955: H.M. Ali, Land Reclamation and Settlement in Iraq (Baghdad 1955).

Altaweel 2003: M.R. Altaweel, The Roads of Ashur and Niniveh. Akkadica 124, 2003, 221 – 228.

Altaweel 2004: M.R. Altaweel, Land of Ashur. A Study of Landscape and Settlement in the Assyrian Heartland. PhD, University of Chicago, 2004.

Altaweel 2005: M.R. Altaweel, The Use of ASTER Satellite Imagery in Archaeological Contexts. Archaeological Prospection 12, 2005, 151 – 166.

Altaweel / Hauser 2005: M.R. Altaweel / S.R. Hauser, Trade Routes to Hatra According to Evidence from Ancient Sources and Modern Satellite Imagery. Baghdader Mitteilungen 35, 2005, 59 – 86.

Andrae 1977: W. Andrae, Das wiedererstandene Assur. In: B. Hrouda (ed.), 2[nd] revised edition of the original edition from 1938.

Bagg 2000: A.M. Bagg, Assyrische Wasserbauten. Landwirtschaftliche Wasserbauten im Kernland Assyriens zwischen der 2. Hälfte des 2. und der ersten Hälfte des 1. Jahrtausends v. Chr. Baghdader Forschungen 24 (Mainz 2000).

Braidwood / Howe 1960: R.J. Braidwood / B. Howe, Prehistoric Investigations in Iraqi Kurdistan. Studies in Ancient Oriental Civilizations 31 (Chicago 1960).

Buringh 1960: P. Buringh, Soils and Soil Conditions in Iraq (Baghdad 1960).

Cauvin et al. 1998: M.-C. Cauvin / A. Gourgaud / B. Gratuze / N. Arnaud / G. Poupeau / J.-L. Poidevin / C. Chataigner, L'obsidienne au Proche et Moyen Orient. Du volcan à l'outil. BAR International Series 738, 1998.

Christaller 1933: W. Christaller, Die zentralen Orte in Süddeutschland. Eine ökonomisch-geographische Untersuchung über die Gesetzmäßigkeit der Verbreitung und Entwicklung der Siedlungen mit städtischen Funktionen (Darmstadt 1933).

Coon 1951: C.S. Coon, Caravan. The Story of the Middle East (New York 1951).

Deller 1990: K.H. Deller, Eine Erwägung zur Lokalisierung des aB ON Qabrā/Qabarā. Nouvelles assyriologiques brèves et utilitaires (N.A.B.U.) 84, 1990, 62 – 63.

Diakonoff 1969 (1949): I.M. Diakonoff, Agrarian Conditions in Middle Assyria. In: I.M. Diakonoff (ed.), Ancient Mesopotamia. Socio-economic History. A Collection of Studies by Soviet Scholars (Moskau 1969).

Directorate General of Antiquities Baghdad 1970: Directorate General of Antiquities Baghdad, Archaeological Sites in Iraq (Baghdad 1970).

Directorate General of Antiquities Baghdad 1976: Directorate General of Antiquities Baghdad, Atlas of Archaeological Sites in Iraq (Baghdad 1976).

Dittmann 1995: R. Dittmann, Ruinenbeschreibungen der Machmur-Ebene aus dem Nachlaß von Walter Bachmann. In: U. Finkbeiner / R. Dittmann / H. Hauptmann (eds.), Beiträge zur Kulturgeschichte Vorderasiens: Festschrift für Rainer Michael Boehmer (Mainz 1995) 87 – 102.

Eidem 1985: J. Eidem, News from the Eastern Front. The Evidence from Tell Shemshāra. Iraq 47, 1985, 83 – 107.

Flannery 1976: K.V. Flannery, The Early Mesoamerican Village (New York 1976).

Greco 2003: A. Greco, Zagros Pastoralism and Assyrian Imperial Expansion. A Methodological Approach. In: G.B. Lanfranchi / M. Roaf / R. Rollinger (eds.), Continuity of Empire (?): Assyria, Media, Persia (Padua 2003) 65 – 78.

Hamlin 1971: C. Hamlin, The Habur Ware Ceramic Assemblage of Northern Mesopotamia. An Analysis of its Distribution. Diss. University of Pennsylvania 1971 (1976).

Hamlin 1974: C. Hamlin, The Early Second Millennium Ceramic Assemblage of Dinkha Tepe. Iran 12, 125 – 153.

Helbing / Molnár 1995: D. Helbing / P. Molnár, Social Force Model for Pedestrian Dynamics. Physical Review E 51, 1995,4282 – 4286.

Herzfeld 1970: E. Herzfeld, Untersuchungen über die historische Topographie der Landschaft am Tigris, kleinen Záb und Ğebel Hamrîn. Memnon 1, 1907, 89 – 143, 217 – 238.

Hijara 1976: I. Hijara, Exploration in Shahrizor. Yasin Tepe [the first campaign 1973]. Sumer 31, 1976, 275 – 282.

Hirth 1984: K.G. Hirth, Catchment Analysis and Formative Settlement in the Valley of Mexico. American Anthropologist 86, 1984, 136 – 143.

Jakob 2003: S. Jakob, Mittelassyrische Verwaltung und Sozialstruktur. Untersuchungen. Cuneiform Monographs 29 (Leiden / Boston 2003).

Jakob 2011: S. Jakob, Das Osttigrisgebiet im strategischen Konzept mittelassyrischer Könige. In: P.A. Miglus / S. Mühl (eds.), Between the Cultures. The Central Tigris Region from the 3[rd] to the 1[st] Millennium BC. Papers read at the Symposium at Heidelberg, Jan 22[nd] – 24[th] 2009. Heidelberger Studien zum Alten Orient 14 (Heidelberg 2011) 191 – 208.

Janabi 1961: K.A: Janabi, The Excavations at Tell Shamlu in Shahrizur (Arabic Report). Sumer 17, 174 – 193.
Jassim / Goff 2006: S. Jassim / J.C. Goff (eds.): Geology of Iraq (Prague / Brno 2006).
Jefferson 1939: M. Jefferson, The Law of the Primate City. Geographical Review 29, 1939, 226 – 232.
Levine 1974: L.D. Levine, Geographical Studies in the Neo-Assyrian Zagros. Journal of the British Institute of Persian Studies 12, 1974.
Lösch 1944: A. Lösch, Die räumliche Ordnung der Wirtschaft, (Jena 1944).
Mallowan / El-Amin 1950: M.E.L. Mallowan / M. El-Amin, Soundings in the Makhmur Plain 2. Sumer 6, 1950, 55 – 90.
Marro 2004: C. Marro, Upper Mesopotamia and the Caucasus. An Essay on the Evolution of Routes and Road Networks from the Old Assyrian Kingdom to the Ottoman Empire. In: A. Sagona (ed.), A View from the Highlands. Archaeological Studies in Honour of Charles Burney. Ancient Near Eastern Studies Supplement 12 (Leuven 2004) 91 – 120.
Miglus 2011; P.A. Miglus, Middle Assyrian Settlement in the South. In: P.A. Miglus / S. Mühl (eds.), Between the Cultures. The Central Tigris Region from the 3rd to the 1st Millennium BC. Papers read at the Symposium at Heidelberg, Jan. 22nd – 24th 2009. Heidelberger Studien zum Alten Orient 14 (Heidelberg 2011) 217 – 225.
Mühl 2010: S. Mühl, Durchs wilde Kurdistan. Neue Forschungen in der Provinz Sulaimaniya, Irak. Agora 1, 48 – 53.
Mühl 2011: S. Mühl, Siedlungsgeschichte im mittleren Osttigrisgebiet - Vom Neolithikum bis in die neuassyrische Zeit. PhD Dissertation, University of Heidelberg (2011).
Mühl / Sulaiman 2011; S. Mühl / B. Sulaiman, The Makhūl Dam Project. In: P.A. Miglus / S. Mühl (eds.), Between the Cultures. The Central Tigris Region from the 3rd to the 1st Millennium BC. Papers read at the Symposium at Heidelberg, Jan. 22nd – 24th 2009. Heidelberger Studien zum Alten Orient 14 (Heidelberg 2011) 371 – 384.
Nováček 2008: Research of the Arbil Citadel, Iraqi Kurdistan, First Season. Památky Archeologické 99, 2008, 259 – 302.
Oguchi 1999: H. Oguchi, Trade Routes in the Old Assyrian Period. Al-Rāfidān 20, 1999,85 – 106.
Raheem / Abdullah 2011: K.R. Raheem / H.H. Abdullah, A Vessel with Face Mask Appliqué from Kerkuk. In: P.A. Miglus / S. Mühl (eds.), Between the Cultures. The Central Tigris Region from the 3rd to the 1st Millennium BC. Papers read at the Symposium at Heidelberg, Jan. 22nd – 24th, 2009. Heidelberger Studien zum Alten Orient 14 (Heidelberg 2011) 417 – 418.
Riel et al 2008: S. Riel / R. Bryson / K. Pustovoytov, Changing Growing Conditions for Crops during the Near Eastern Bronze Age (3000–1200 BC). The Stable Carbon Isotope Evidence. Journal of Archaeological Science 35, 2008, 1011 – 1022.
Rowton 1974: M.B. Rowton, Enclosed Nomadism. Journal of the Economic and Social History of the Orient 17, 1974, 1 – 30.
Rowton 1973: M.B. Rowton, Urban Autonomy in a Nomadic Environment. Journal of Near Eastern Studies 32, 1973, 201 – 215.
Starr 1937/39: R.F.S. Starr, Nuzi. Report on the Excavations at Yorgan Tepa near Kirkuk, Iraq (Cambridge, Mass. 1937/39).
Streck 1998 – 2001: M.P. Streck, Nomaden. In: D.O. Edzard (ed.), Reallexikon der Assyriologie und Vorderasiatischen Archäologie (Berlin / New York 1998 – 2001).
Sulaiman 2010: B.S. Sulaiman, Irakische Ausgrabungen im Makhūl-Staudammgebiet. Heidelberger Studien zum Alten Orient 12 (Heidelberg 2010).
Ur 2003: J.A. Ur, CORONA Satellite Photography and Ancient Road Networks: A Northern Mesopotamian Case Study. Antiquity 77, 2003, 102 – 115.
Wehrmacht 1941. Vorläufige Sonderausgabe V. 1:200.000.
Weiss 1986: H. Weiss, The Origins of Cities in Dry-Farming Syria and Mesopotamia in the Third Millennium B.C. In: H. Weiss (ed.) The Origins of Cities in Dry-Farming Syria and Mesopotamia in the Third Millennium B.C. (Guilford, Conn. 1986) 1 – 6.
Wilhelm 1998-2001: G. Wilhelm, Nuzi. A. Philologisch. In: D.O. Edzard (ed.) Reallexikon der Assyriologie und der Vorderasiatischen Archäologie (Berlin / New York 1998 – 2001) 636 – 639.
Wilkinson 1982: T.J. Wilkinson, The Definition of Ancient Manured Zones by Means of Extensive Sherd-Sampling Techniques. Journal of Field Archaeology 9, 1982, 323 – 333.
Wilkinson 1989: T.J. Wilkinson, Extensive Sherd Scatters and Land-Use Intensity: Some Recent Results. Journal of Field Archaeology 16, 1989, 31 – 46.
Wilkinson 1993: T.J. Wilkinson, Linear Hollows in the Jazira, Upper Mesopotamia. Antiquity 67, 1993, 548 – 562.
Wilkinson 2003: T.J. Wilkinson, Archaeological Landscapes of the Near East (Tuscon 2003).
Wilkinson / Tucker 1995: T.J. Wilkinson / D.J. Tucker, Settlement Development in the North Jazira, Iraq. A Study of the Archaeological Landscape (Warminster 1995).
Ziegler 2011: M. Ziegler, Die Osttigrisregion im Spiegel der Archive aus Mari. In: P.A. Miglus / S. Mühl (eds.), Between the Cultures. The Central Tigris Region from the 3rd to the 1st Millennium BC. Papers read at the Symposium at Heidelberg, Jan. 22nd – 24th 2009. Heidelberger Studien zum Alten Orient 14 (Heidelberg 2011) 143 – 155.
Zipf 1949: G.K. Zipf, Human Behavior and the Principle of Least Effort. An Introduction to Human Ecology (Cambridge, Mass. 1949).

Simone Mühl
Institute for Pre- and Protohistory
and Near Eastern Archaeology
University of Heidelberg
Marstallhof 4
69117 Heidelberg
Germany