RESSOURCENKULTUREN 15

HUMAN-MADE ENVIRONMENTS

THE DEVELOPMENT OF LANDSCAPES AS RESOURCEASSEMBLAGES

Editors
Martin Bartelheim,
Leonardo García Sanjuán &
Roland Hardenberg

TÜBINGEN
UNIVERSITY
PRESS

RESSOURCENKULTUREN

TÜBINGEN
UNIVERSITY
PRESS

RessourcenKulturen
Band 15

Series Editors:
Martin Bartelheim and Thomas Scholten

Martin Bartelheim,
Leonardo García Sanjuán &
Roland Hardenberg (Eds.)

HUMAN-MADE ENVIRONMENTS

The Development of Landscapes as ResourceAssemblages

TÜBINGEN
UNIVERSITY
PRESS

Bibliografische Information der Deutschen Nationalbibliothek
Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie, detaillierte bibliografische Daten sind im Internet über http://dnb.d-nb.de abrufbar.

Herausgeber der Reihe: Martin Bartelheim und Thomas Scholten

Die Online-Version dieser Publikation ist auf den Verlagswebseiten von Tübingen University Press frei verfügbar (open access).
http://hdl.handle.net/10900/119103
http://nbn-resolving.de/urn:nbn:de:bsz:21-dspace-1191034
http://dx.doi.org/10.15496/publikation-60477

1. Auflage 2021 Tübingen University Press
Universitätsbibliothek Tübingen
Wilhelmstr. 32
72074 Tübingen
tup@ub.uni-tuebingen.de
www.tuebingen-university-press.de

ISBN (Hardcover): 978-3-947251-45-2
ISBN (PDF): 978-3-947251-46-9

Redaktion: Marion Etzel, Hannah Bohnenberger, Uwe Müller, Henrike Srzednicki, Monice Timm
Umschlaggestaltung: Henrike Srzednicki
Coverfoto: Agro-pastoril genutzte Dehesa-Landschaft bei Munigua, Prov. Sevilla (Spanien)
(Aufnahme: Martin Bartelheim)
Layout: Büro für Design, Martin Emrich, Lemgo
Satz und Bildnachbearbeitung: Marion Etzel; Henrike Srzednicki
Druck und Bindung: medialis Offsetdruck GmbH Unternehmensbereich Pro Business
Printed in Germany

Contents

Martin Bartelheim, Leonardo García Sanjuán, and Roland Hardenberg

Human-Made Environments

The Development of Landscapes as ResourceAssemblages: An Introduction

1. Resources and Landscapes: Problematising an Old Concept

Landscapes bear traces of the use of resources over long periods. This reflects the history of human handling of environments in order to shape them in accordance with their ways of life. Resources can be material as well as immaterial and constitute the basis for the development and decline of societies. They are usually not exploited in isolation, but as parts of complexes whose specific constellations in time and space can be best described as assemblages.

This topic was the subject of the session 'Human-Made Environments: The Development of Landscapes as ResourceAssemblages' held at the 24th Annual Meeting of the European Association of Archaeologists (Barcelona, September 5th–8th 2018) and forms the basis of this volume. The aim was to debate new concepts concerning the interrelation of social dynamics and resource use and their suitability for a better understanding of European Prehistory as well as present day societies studied by anthropologists. The session resulted from the collaboration of the University of Tübingen (Germany) with other institutions, such as the University of Sevilla (Spain), the CNRS (France) and the Frobenius Institute, Frankfurt (Germany) in connection with the study of resource landscapes through archaeology and anthropology. Both theoretical questions and case studies were the substance of discussion about how landscapes were shaped to facilitate the utilisation of resources. Their characterisation implies not only material, but also spiritual aspects linked to the use of resources. Since ResourceAssemblages are products of historical transformations and mutual relations, the mechanisms of these processes are of great importance.

A look through research literature reveals that approaches to the topic of resources vary significantly and provide the basis for intense debates such as those that characterised the abovementioned EAA session. A recurrent approach to resources focuses on the demands and basic needs of people as individuals and emphasises the role that resources play for the creation, reproduction and transformation of societies. A material approach to the notion of resources would focus on the satisfaction of biological demands to make human life sustainable, including oxygen, water and food. As a species that has travelled far and away across the planet, *Homo sapiens* has developed substantial needs to adapt to a wide range of climatic conditions; dwellings, clothing and technology demand a broad range of resources to make stable human life possible.

Expanding on this approach, the collaborative research centre ResourceCultures (SFB 1070) at the University of Tübingen works on a definition of resources that places the emphasis on the role of resources in the development of societies (Bartelheim et. al. 2015; Hardenberg 2017; Hardenberg et al. 2017). According to this 'resource-as-culture perspective', resources are the result of cultural constructions. As such, they form the foundations

of societies, and these foundations do not simply exist 'naturally' and their use is not just a response to universal needs. Humans not only use the naturally pre-existing elements that ensure their biological continuity, but they also do create or construct resources and ensure their preservation, availability and use. At the same time, people are constantly changing their social relationships in the process of valorising these resources. This, in turn, has an impact on the resources, that are also transformed in the process of social reproduction. Thus, resources operate at multiple levels: they sustain human life, making it reproductible, they are socially created as a result of community action, and they can become critical for the renewal of social constructs. The way in which they are handled triggers complex socio-cultural dynamics, especially with regard to social developments, mobility and valuations (Scholz et al. 2017). According to this view, the concept of resources must be expanded to encompass the value they receive through cultural attribution and which makes them of great importance for the corresponding societies.

The attributions of value that turn something into a resource change over time and space. There is a widespread understanding that environmental and biological constraints are essential in identifying what a resource is. For example, hunters and gatherers living in the tropical forests of the Amazonia are not in desperate need of furs, but indigenous groups in the polar regions are. According to this view, human societies have evolved into a bewildering variety of cultures across space and over time and as many of them grew bigger (especially over the last ten thousand years), an increasing amount and variety of resources became socially demanded. In Europe, Neolithic societies had no demand for certain resources such as petroleum, which is an exceedingly critical resource in the life of most humans at the beginning of the 21st cent. AD. But they had a demand for green stones, particularly jadeite or variscite, which were widely sought after, transformed and used as body ornaments and charms, or jade and jadeite, which were transformed into beautifully polished axes (Pétrequin et al. 2017). All those objects became increasingly important for status display and as resources for increasingly sophisticated forms of political economy. While jade and jadeite were in large demand and use as early complex societies and pristine states developed in regions as distant as Mesoamerica, Europe or China (Rodríguez-Rellán et al. 2019), which would suggest either an in-built desire for that particular type of stone, a remarkable convergence or, more likely, a much earlier common origin to such interest, going back to Palaeolithic societies, the exploitation and use of variscite remained more specific to western European prehistoric societies.

From a 'resource-as-culture perspective', almost anything can be regarded as a resource in human life. Conspicuous or beautiful natural formations lay at the core of most worldviews (Salisbury 2015): mountains, forests, rivers and lakes are considered to be resources not only because they provide material means to sustain human life, or socially-demanded raw materials, but also because they inspired, quite early on, ways in which human beings could interpret their position in the universe and organise themselves socially.

The analysis of prehistoric landscapes shows how 'special' natural places frequently became the focus of social action quite early on (Bradley 2000) and how they became important social and ideological resources susceptible of manipulation, competition or struggle. The same applies to human creations; material culture, such as portable artefacts or buildings, can become resources of remarkable social and political significance. When in the 8th cent. AD wannabe-king of Asturias Don Pelayo and his son were buried next to two Neolithic megalithic monuments, they were drawing on the prestige and significance of constructions that were already about 5000 years old (De Blas Cortina 2015). Those very old megaliths were regarded as resources to support the establishment of a new ruling house that would endure – Spanish Bourbons still acknowledge their symbolical ancestry to Pelayo by using the title of Prince or Princess of Asturias for the heirs to the crown. Even the materiality of the human body can become a powerful resource, both economic and ideological. In the Middle Ages, monastic institutions competed for the possession of the relics of holy men and women including, especially, fragments of their

bones (Walker Bynum/Gerson 1997). Those relics, inevitably fake in many cases, became extraordinary resources of political, economic and ideological power, not to say of religious fervour, as they acted as attractors for the pious (pilgrimages, gatherings, etc.) as well as magnets for donations from the wealthier members of feudal society.

In cultural anthropology and archaeology, the concept of resources is now a broad one and, therefore, narrow 'economicist' definitions that refer primarily to raw materials that are used to produce material goods are increasingly seen as not very useful. Resources cannot be reduced to 'all raw material deposits physically present on earth' (Wacker/Blank 1999, 4) for which there is a social interest (Niemann 2006, 11). New approaches define resources beyond their economic use. For example, Müller-Christ (2011, 167–170) distinguishes between resource definitions within the framework of production theory (input-transformation-output theory), competition theory (resource-based view) and systems theory (means-end continuum). In the first case, resources are primarily production factors, in the second case they are organisational prerequisites for economic success, and in the third case they are manifold means of maintaining systems. Giddens (1984, 258), on the other hand, differentiates between authoritative and allocative resources: while the former designate means and abilities that serve the exercise of power, the latter guarantee access to the material foundations of life. For Bourdieu (Bourdieu/Waquant 1992, 119), as is well known, resources are the basis of the various types of capital (economic, social, cultural, symbolic), which can be converted into one another and which depend quite decisively on social networks. Lowenthal (1985) has incorporated the concept of resources into so-called 'Heritage Studies', in which different cultural studies participate in order to investigate how societies use cultural resources to represent their history (or histories) and to evaluate or make current processes understandable (Hemme et al. 2007; Sørensen/Carman 2009). In the historical sciences, Ash has detached the concept of resources from its purely economic meaning in order to describe the mutual relations between science and politics. For him, resources can also be 'cognitive, apparatus, personnel, institutional and rhetorical' (Ash 2002, 32).

In all these broader approaches, the specific value of resources is often expressed in recurring, usually organised collective actions or through investments in extensive collective labour which is then materialised as objects, monuments or knowledge coded in texts or memories. These actions are directed at various resources, for the extraction and use of which people invest extensive collective labour and thus set socio-cultural processes in motion. Whether these foundations of social life are material or immaterial resources is secondary; what is decisive is that resources are linked to a social and cultural value for the forms of living together. Through actions, the values of resources are made visible and integrated into larger social contexts.

Problematising the concept of resources is also helpful in order to identify and challenge Eurocentric assumptions. It is tempting to see the 'economicist' approach, according to which resources are located in nature and seen primarily as a means of capitalist production (Hausmann/Perreaux 2018, 188–190), as resulting from the process of economic and social mercantilisation and industrialisation that Europe has experienced in the past five centuries. Today, this concept of resources is almost inseparable from prevailing capitalist and consumerist notions of nature resulting from neoliberal market economies and the main traits that characterise our lifestyles: compulsive shopping, extreme commodification and high energy consumption. From this understanding, in which the accumulation of resources as capital plays a central role (Hausmann/Perreaux 2018, 190), similar resources and their capitalist forms of use can now be identified and compared almost worldwide. However, leaving aside the issue of the origins of capitalism as an economic form, the fact remains that much of modern thinking about resources has been developed in Europe under social conditions that gave primacy to ideologies of mercantilisation and industrialisation. Thus, in order to grasp what material and immaterial resources other societies have used in the past to maintain and develop their ways of life, we need a more open understanding of the concept, an

understanding that is also applicable to a wider range of human activity.

Applying a New Approach

In this volume, the potential of this approach is explored in order to encourage a 'resource turn' (Hardenberg et al. 2017). A first central consideration here is that the distinction between natural and cultural resources is not always helpful, as this dichotomy very often would hide the cultural embedding of all resources, regardless of their origin or characteristics. Socially, something becomes a resource when people ascribe a culturally shaped interest to it, that is give it value, construct it materially and symbolically and use it within the framework of socially and culturally shaped practice. To some, the only possible exceptions to this are the fundamentals of the individual human life mentioned above; not all human societies consume variscite, but all consume water. But even among the 'building blocks' essential for life, substantial cultural differences may arise: water and food are valued in widely differing ways by different societies depending on climatic conditions, ecological availability and cultural sanctions.

This leads to a second consideration: if resources are defined by shared ideas (or interests) and integrated into cultural practice, then they have an impact on the social relationships that people enter into in order to use these resources. This means that resources not only have an impact in terms of meeting individual needs and demands, but are also highly relevant to their respective societies. They form the culturally defined foundations of a society, and are thus closely linked to the way of life and the values that hold a community together. To this extent, the use of resources always has social effects, for example by creating, preserving or changing groups and their identities. It could also be said that resources have a social agency, which becomes particularly evident when resources become scarce or crises make access to resources more difficult.

A third central consideration is that resources can best be understood as being processes themselves. This means that resources are constantly changing in the course of their social use. Thus, by becoming resources, raw materials are processed, changing their appearance, form, value, significance, consistency and others. As human knowledge changes, new characteristics and forms of use of these resources may be recognised, and different social dynamics may result in new evaluations and symbolisations of the resource. In this respect, resources are always in a process of becoming.

Fourthly, an attempt is made to open up the concept of resources to different societies and their economic 'base' (see Gudeman 2001; 2012). This is achieved by making resources an object of study, which means it is always necessary to first explore what were or are the resources that form the central base for the ways of life in different societies at different times. According to this approach, there are no things that are to be understood as resources *per se*, but rather the most diverse material and immaterial aspects of life can be transformed into resources and often form a particular ResourceComplex (see below). However, the aim of scientific research is not only to identify something as a resource for a society, but to use this resource as a category for analysis, which means as a starting point for investigating various questions, such as: What social developments result from the use of particular resources? What forms of spatial mobility characterise the use of certain resources? How are the resources symbolically represented and used?

Finally, it is important to note that social formations attach 'strategic' or 'key' value to certain resources. Such resources vary widely through time and space, depending on their cultural connotation: the bodily parts of purportedly holy men and women that were so important economically, socially and ideologically in Medieval Europe do not seem to play a major role in today's capitalist markets. By 'key' resources, we understand the resources that are crucial for sustaining an established social order and/or have the potential to trigger societal change. The domestication of animals, and particularly cattle and pigs because of their high return, endowed these animals with 'strategic' or 'key' economic and social significance at the onset of the Neolithic way of life. However, the spread of the domesticated riding horse throughout Eurasia in the 3rd mill. had profound

economic, social and ideological consequences (Anthony 1986; Anthony/Brown 2000) and horses became a new 'key' resource, triggering societal change and giving support to new ways of life.

Landscapes as Resources

Understanding landscapes as resources, as proposed in this volume, expresses these perspectives well. The concept of landscape has been one of the most successful ones in both cultural anthropology and archaeology over the last four decades. A look at the development of the concept in both disciplines shows that it is not problem-free and there has been a significant transformation in its usage. Like with the notion of resources, an earlier understanding of landscape was shaped by the dichotomy between nature and culture. As Knapp and Ashmore pointed out, the American geographer Carl Sauer already understood cultural landscapes as something 'fashioned' from nature in an essay entitled 'The morphology of landscapes' in 1925 (Knapp/Ashmore 1999). Even later theoreticians did not overcome this dualism. Daniels and Cosgrove, for example, saw landscapes as a 'cultural image, a pictorial way of representing or symbolising surroundings' (1988, 1, cit. in Ingold 1993, 154) and contrasted it with nature, that is the 'surroundings' that are the object of these symbolic constructions. Tim Ingold was one of the first theorists to develop a more dynamic view of the concept when he defined a 'dwelling perspective' by which people are part of lived relationships, landscapes being a kind of archive of the life and work of past generations: '[T]he landscape tells – or rather is – a story' (Ingold 1993, 152). This perspective characterises Ingold's understanding of environment and landscape. He distinguishes both concepts by introducing the distinction between function and form. An environment offers 'affordances' to the beings that dwell in it, and therefore, according to his argument, the environment has concrete functions for human life. Landscapes, according to Ingold, are, by comparison, like the form of the body, they arise and change in the process of interaction. Ingold uses the term 'embodiment' in this context, making it clear that bodies like landscapes become a visible expression of the relationships and actions that have shaped them (Ingold 1993, 156). Thus, this concept of 'landscape' complements the one widespread in ecology, which appears closer to 'environment' (e.g. Wu 2013), with a cultural or perceptional dimension.

A complementary concept to that of landscape that needs to be taken into account is that of territory. The notion of territory is strongly marked by its usage in ecology and biology, as part of the study of species showing highly patterned spatial behaviour (many types of insects, most mammals, etc.). Perhaps for that reason, its incorporation into the conceptual toolkit of human geography places a great deal of emphasis on the control of resources, including raw materials, objects or people, partly in line with the 'economicist' approach to the concept of resources mentioned above. From this perspective, territoriality can be defined as 'the attempt to affect, influence, or control actions, interactions, or access by asserting and attempting to enforce control over a specific geographic area' (Sacks 1983, 56). However, the development of theoretical approaches in human geography (see Cloke et al. 1991 for a discussion) has led to an expansion of its specificities in terms of human behaviour. A good example of a definition of territory from an approach which deals with cultural strategies is provided by Michael J. Casimir: 'Human territorial behaviour is a cognitive and behaviourally flexible system which aims at optimizing the individual and hence often a group access to temporarily or permanently localised resources, which satisfy either basic or universal or culture-specific needs and wants, or both, while simultaneously minimising the probability of conflicts over them' (Casimir 1992, 20).

In archaeology, concepts of territoriality expanded significantly in the 1960s and 1970s with the rise of the so-called spatial archaeology, heavily inspired by locational and human geography, and later, from the 1990s on, through the incorporation of GIS-based approaches to spatial behaviour. Such approaches were criticised during the 1980s and 1990s from advocates of post-processual archaeology who relied heavily on a phenomenological point of view according to which the notion of landscape was better suited for the study of the subjective perceptions (individual or collective), which were seen as the main

aim of archaeology (Tilley 1994, 12). While such 'radical' relativist propositions have been widely criticised, the concept of landscape has made a powerful impact in the discipline.

There are numerous definitions of landscape. In Anthropology, Filippucci, for example, defines a landscape 'as something constructed by humans in the course of their daily lives and interactions, both physically and also symbolically, by being invested with meaning, memory, and value. But moreover, anthropologists argue that the two – investing with meaning and shaping physically – go hand in hand and cannot really be separated' (Filippucci 2016). Knapp and Ashmore (1999) distinguish between constructed landscapes, conceptualised landscapes and ideational landscapes. For them, the former describes the fact that 'sedentary groups [...] structure their landscapes [...] obtrusively, physically constructing gardens, houses and villages on the land, often in the near vicinity of natural landmarks' (Knapp/Ashmore 1999, 10). They contrast this with the conceptualised landscapes, which 'are characterized by powerful religious, artistic or other cultural meanings invested in natural features' (Knapp/Ashmore 1999, 11), a process that is more typical for mobile groups. The latter type, the ideational landscapes, is more mental and emotional and is formed by moral messages, mythic stories or genealogies (Knapp/Ashmore 1999, 12). These characterisations are ultimately still based on the opposition between natural/physical and cultural/spiritual, thus perpetuating dichotomies that, as we mentioned above, are not very helpful when dealing with social realities.

The success of the concept of 'landscape' in archaeology, human geography and cultural anthropology has led to its incorporation into legal texts that seek to protect places and spaces of especial cultural significance. For example, the UNESCO has developed its own definition of 'cultural landscapes' by distinguishing 'clearly defined landscapes' (e.g. gardens, parklands), 'organically evolved landscapes' (e.g. disrupted fossil landscape or continuing landscapes with material evidence of long-term evolution) and 'associative landscape' (e.g. landscapes which carry significant religious, artistic and other cultural meanings for the people) (Fowler 2003, 19). Another legal definition of landscape is available in the European Landscape Convention promoted by the European Council in a meeting held in Florence (Italy) in November 2000: 'Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.' Legally, the concept of 'landscape' has significantly expanded previously held notions of 'site' that could not encapsulate all the complex relationships people maintain with their environments. Scientifically, the concept of 'landscape' has greatly expanded our understanding of past and present societies, helping archaeologists to break away from limiting notions of 'site' and contributing to a more contextual approach to the understanding of action.

The two disciplines, archaeology and cultural anthropology, have diverging potential to deal with two main elements integrated within the concept of landscape: 'time' and 'meaning', which blend into 'memory'. Cultural anthropology, using basically qualitative methods from the social sciences for studying living societies, does usually not focus on the temporal dimension of landscapes. Archaeology, on the other hand, has different tools to establish the evolving nature of human relationship with the changing environments, from the deep past of the genus *Homo*, three million years ago, to the most recent historical periods. In turn, whereas cultural anthropologist, interacting either directly with living informants or studying written documents of the past, can gain insights to systems of symbolic communication based on 'meaning' and 'value', archaeologist have less access to such aspects. Cultural anthropologists, however, are aware that these meanings are not clear, undisputed data. On the contrary, meanings are notoriously elusive, as they operate at many different levels (individual vs. collective) and change constantly over time, depending partly on the context, but also on the intent (meanings can be hidden, manipulated, falsified, misinterpreted). Therefore, while in both cultural anthropology and in archaeology meanings are often seen as important, their study does not offer simple solutions and sometimes raises more questions than answers. Without living informants, archaeology can aim at establishing 'shared-meanings' at a general level, at most, but individual meanings are largely lost.

Here, we want to avoid the 'economicist' approach to territoriality as much as the 'subjectivist' approach to landscapes. In our view, both cultural anthropology and archaeology can collaborate towards a scientific approach to how human societies have interacted with their environments and how they have used a wide-ranging suit of resources of both material and immaterial character, over millennia, creating, in the process, what we have termed 'resource landscapes'. Inspired by definitions of territory and landscape as those provided by Casimir or Ingold respectively, this concept of 'resource landscape' bridges multiple approaches to human spatial interaction while at the same time connects with the aforementioned approach to resources.

Landscapes of resources are understood as an expression of collective work as well as places of remembrance and as a means of creating social relationships. Like resources that acquire their own effectiveness through their 'affordances' (Gibson 1977) and embedding in social contexts, landscapes are also found to have agency, for example when they are the sites for constructing identities or expressing political claims. In other words, 'landscapes are a focus, and indeed a means, of political contestation and of the formation of different and competing identities' (Filippucci 2016, 2). For both, archaeologists as well as anthropologists, the common themes when dealing with landscapes are memory, identity, social order and transformation (Knapp/Ashmore 1999, 13). To understand the network character of resource landscapes, the notion of ResourceComplexes as proposed by the SFB 1070 (Teuber/Schweizer 2020) is considered next.

Complexes, Assemblages, and Landscapes

When looking at the wider socio-cultural dynamics, it may be useful to understand resources not in isolation, but as part of ResourceComplexes. These are, according to the definition of the collaborative research centre ResourceCultures (SFB 1070), networks of materials and environments, actors, objects or media, monuments and landscapes, knowledge, techniques, infrastructures, practices and systems, in which individual elements can interact in a certain way through the interplay of intention and materiality in order for resources to be used by a community. Therefore, ResourceComplexes serve in specific spaces and at particular times to develop, extract and use socially relevant resources and are intentionally and functionally linked to each other. They are also an expression of human planning, the effort to create stable orders and to have long-term access to resources. In such a ResourceComplex, a wide variety of material and immaterial things work together, implying different people, things, forms of knowledge and contents. The concept of the ResourceComplex is to be understood primarily as an analytical tool to grasp these components that come together when resources are used (Teuber/Schweizer 2020).

Thus, ResourceComplexes involve also the co-occurrence of certain elements considered as resources in particular regions by certain people. This is in many cases influenced by their geological, climatic and ecological availability, while those elements not available in the territory of a given community will have a constrained access, dependent on exchange. One school of thought in archaeology therefore argues that communities inhabiting environments with a wide range of affordances had a head-start in the development of well-functioning ResourceComplexes. From this perspective, all major societal transformations occurred in regions endowed with a wealth and variety of affordances – including communication and networking – such as ecotones. Ecotonal regions are defined as areas where two or more environments meet and overlap, thus generating a richer environment whose characteristics are a mixture of the ones in contact (Gosz 1993). According to this approach, demographic growth, economic intensification and increased social complexity are more likely to happen in ecotonal regions combining marine resources, arable land and access to abiotic resources (rocks suitable for tool-making, salt, metals, etc.).

For reconstructing past ResourceComplexes, the understanding of the corresponding environments is therefore an important task. Archaeology has devoted a great deal of effort to develop the necessary tools, both theoretical and technical, to understand how the physical environment has

changed over time, especially during the Holocene, when the intensification of human action has caused growing anthropogenic footprints (Davidson/Shackley 1976; Butzer 1982).

However, networks like ResourceComplexes are only partially planned by humans and under human control. What is regarded and used as resources is subject to constant change, new human and material contextualisations and attributions of value and significance, which are characterised by contingency. The term ResourceAssemblage is intended to analytically grasp the unpredictable or unstable.

In archaeology an assemblage usually refers to a collection of material remains (faunal remains, lithic tools, pottery fragments) coming from an identified context. In this sense, an assemblage is therefore a series of objects that are likely to convey some kind of significance in their composition and associations, in terms of human behaviour. In cultural anthropology, the concept of assemblage has a more theoretical connotation. Originally coined by Deleuze and Guattari (Deleuze/Guattari 1992 [1980]), an assemblage is an arrangement which provides coherence and consistency to heterogeneous elements (Deleuze 2007, 179). 'In assemblages', Deleuze argues, 'you find states of things, bodies, various combinations of bodies, hodgepodges; but you also find utterances, modes of expression, and whole regimes of signs' (Deleuze 2007, 177). The further development of the assemblage concept in anthropology and archaeology is the result of a number of different intellectual inspirations which entered the debates through the Material Turn (Miller 2005), New Materialism (Coole/Frost 2010), the influence of Bruno Latour's Actor Network Theory (Latour 1996; 2005), the renewed interest in animism and ontologies (Descola 2011) and the study of different perceptions of environment as mentioned above (Ingold 2000).

Assemblage theory combines many of these new ideas as it stresses the links and interactions between heterogeneous elements of different materiality and temporality which can become part of larger compositions. In cultural anthropology, it provides a way to understand how people and things are part of wider institutions, are embedded in systems of meaning and form contingent and often relatively unstable constellations. Assemblage theory further recognises that each of these arrangements has different degrees of territorialisation, homogeneity and coding (DeLanda 2016, 22).

Cultural anthropologists and archaeologists have employed the concept of an assemblage in various ways. Ursula Rao, for example, has employed the concept of a 'biometric assemblage' in her study of the relations between bodies, machines, regimes of knowledge and power in the context of using fingerprint technologies in India (Rao 2018). Stephan Kloos in his research on herbal medicine in Asia uses the idea of a 'pharmaceutical assemblage' to trace the connections between drugs, human health, subjectivity, contemporary forms of science, governance and markets (Kloos 2017). The concept of 'sensorial assemblage' has been used by the archaeologist Yannis Hamilakis to describe the participatory relationship between humans and food substances within the context of feasting in Bronze Age Crete (Hamilakis 2017).

Landscapes as well can be understood as assemblages, because they consist of very heterogeneous elements (earth, rocks, rivers, climate, animals, plants, people, buildings, fences and walls, paths and streets, etc.), which have a certain spatial extension, show different degrees of heterogeneity and homogeneity and are part of sociocultural processes. The peculiarities of landscapes are an expression of the interaction of the individual components that have entered this structure at different times and have shaped it or still shape it. The concept of the assemblage helps on the one hand to understand how a landscape was created, but also what dynamics characterise it, since the latter partly derive from the relationships between the elements. An approach like this surpasses the formerly common contrast between natural and cultural landscapes and goes beyond the simplistic idea that humans construct their landscapes. In a landscape assemblage, humans are only one component in a much larger network. For archaeologists, this approach is helpful because, due to the continuous interaction between humans and their physical environment, all things always contain 'traces' of human past actions and are therefore 'assemblages of humans and non-humans' (Joyce 2015).

2. Characterisation of Resource Landscapes in the Papers

The papers assembled in this volume help to explore this wide theoretical frame and offer some concrete examples of how resource landscapes could be analysed. Here, the focus is on the identification of what has been considered a key resource by the respective societies as well as the exploration of the means and mechanisms through which the corresponding landscapes were transformed. These refer not only to ways of using, shaping, organising, controlling and exchanging resources, but also knowledge, perceptions, motivations for actions and related social dynamics. The central questions defined for the EAA session were:

- Is it possible to detect a conscious human attempt in the shaping of landscapes in order to suit the use of resources?
- How are landscapes created to serve the requirements of resource use? What are the social practices connected to this?
- Is there specific evidence for a personal or group identification with resources or resource use and if so, which social practices, ideas and values are linked with these identities?
- Which perceptions of resources and landscapes as well as motivations for action can be traced?
- How are socio-cultural dynamics linked to the use of resources?

The broad implications and complexity of these issues made it necessary to incorporate approaches and empirical experiences from a wide interdisciplinary field that encompasses many disciplines from the Social Sciences and Humanities.

Because of its research-related close contact with the actors and their respective understanding of landscapes and resources, cultural anthropology provides relevant insights into local perceptions of landscapes and the character of ResourceComplexes and ResourceAssemblages. This widens the horizon by providing examples of perspectives alternative to those of our contemporary Western perception and thus represents a valuable extension of the explicatory scope in the interpretation of findings, primarily from the more distant past, for which current Western ways of thinking may not necessarily be assumed.

Archaeological approaches, on the other hand, reveal the complex depth of human interaction with resources, the wide-ranging and ever-changing nature of the resources at play, while at the same time displaying the evidence of the persistence and endurance of certain resources and social practices, technologies and cultures surrounding them.

Cultural anthropology as well as archaeology deal with a vast range of social systems, from hunter-gatherers to recent colonial empires and can therefore offer a huge amount of empirical evidence to understand the wealth and variety of human interaction with resources.

The study presented by Roland Hardenberg demonstrates vividly that people like the Dongria Kond, who practise swidden agriculture, growing mainly various types of grain, pulses, tubers and fruits in the Niamgiri mountains of Odisha in present-day eastern India, do not see the environment as something independent and separate, but as part of their social (and cultural) world. Humans are not above or beyond nature, they are part of the environment. Thus, the surrounding landscape is considered as a world populated by various animated beings with whom they establish and maintain social relationships. In his interpretation of Dongria Kond socio-cosmic views, dwelling in the environment is shaped by relationships based on exchange, rearing, hunting, sharing and marrying, that is by activities that also structure the relations between humans. In the same way these modes of attachment form the relationship between the Dongria Kond and their animated environment. Their engagement with the environment is meant to create ‘we-ness’ instead of maintaining an ‘otherness’ of a nature that has to be controlled and exploited by human culture. Gods, environment and people are connected and their relations formed by giving and taking. As in an assemblage, this is not a fixed arrangement but in the constant process of becoming: relationships get disturbed and have to be restored, new relationships have to be created or expanded. For all agents the whole landscape is a continuously changing assemblage of resources with humans being only one part of it.

This case study suggests that non-modern people subjectify (or personify) rather than objectify their environment, which is of great potential interest when studying the interaction of prehistoric societies with their environments. It should therefore be considered that similar to the Dongria Kond environments and specific landscapes were not seen as 'the other' but as part of one's society. Correspondingly it seems reasonable to assume that the landscapes of the past were assemblages created by social, not simply economic activities. Following this perspective, humans of prehistory may be expected not to 'use' and 'exploit' their environment driven by economic constraints ('scarcity') and maximising calculations ('profits'). It seems much more likely that they dwelled in it by respecting mutual concerns as well as behaving socially and on the basis of their socio-cosmic concepts shaped landscapes of meanings that constituted resources in a multiple sense.

A rather different approach towards landscape and resource use – although also regarded as a complex interaction of natural and human elements – is presented in the study by Maike Melles, which deals with how the Spanish *dehesa* economy is portrayed in 'official' exhibitions. The *dehesa* is a multifunctional agro-sylvo-pastoral system and cultural landscape found in central and south-western Iberia, based on human-managed natural forests of oaks, usually holm oak (*Quercus ilex*) and cork oak (*Quercus suber*) which, besides the forestry exploitation, is used primarily for grazing of animals, very especially Iberian pigs, which are allowed to roam freely, feeding on acorn. The *dehesa* economy has a long history probably dating back to the 4th mill. BC (García Sanjuán 2017, 241). The two exhibitions analysed by Melles are primarily designed to promote a positive image of the present-day handling of the *dehesa*. The author highlights the dichotomy between nature and culture underlying the view of the landscape, with a strong emphasis on resource exploitation by humans. Key element of both exhibitions is the production of the typical Iberian ham, around which a ResourceComplex consisting mainly of a special breed of pigs, climate, oaks, acorns, workforce and artisanal knowledge has formed. Both exhibitions, which are called 'museums' but in fact are more like marketing centres for ham, highlight the natural background of the production of ham: movement of animals in open nature, feeding acorns from the surrounding trees, production of ham according to traditional principles. The associated characterisation of *dehesa* as a 'natural' landscape, which produces this natural product ham, is countered by a long-lasting massive anthropogenic influence, which makes what is presented in these exhibitions as a 'natural' landscape a profoundly culturally-shaped one. Various historical events, social and cultural developments, as well as varying forms of use, have had an impact on the landscape and have left their mark on it. Thus, with the contingent character of the events, they make the *dehesa* appear as a ResourceAssemblage and a primarily cultural and social phenomenon. Behind the practices that have shaped the *dehesa* are also the corresponding values and beliefs as well as social relations. Therefore, the *dehesa* cannot be seen in a typical nature-culture distinction; it is not exclusive, but rather a reflection and mediator of what we call nature, cultural and social life. Reducing landscape to any of these components would deny the complexity of relationships inherent to it.

Ethnographic examples such as these demonstrate the multitude of socio-cultural aspects that imply the use of ResourceComplexes or ResourceAssemblages in landscapes. Furthermore, they also provide an insight into the (intellectual) complexity of the relationship between humans and nature, which is part of the complex histories of landscape use and can only be tentatively explored in archaeological studies through the combination of environmental data, contextual associations and artistic creations. In cases in which historical documents can add at least some information about the political background of events in landscapes and about the motives of actors – ideally complemented by own testimonies – the archaeological record on the development of landscapes, resource use and the associated socio-cultural dynamics can be interpreted more specifically.

In fact, three of the contributions to this volume combine evidence from the archaeological record with historical documents and personal accounts in order to explore the evolution of landscapes in Mediterranean Europe. The first of

them by Heleni Simoni et al. compares patterns of landscape in two elevated plains in Greece, one in Epirus in the north and one on the Peloponnese in the south, to investigate resource use over a period of about 600 years. Within the predominantly agropastoral use of the landscapes it is possible to identify a specific ResourceComplex in both areas that consists of the consciously established link between animal husbandry and the preservation of sacred forests. Later developments allow also the analysis of the landscapes in question as ResourceAssemblages to describe the culturally driven formation of the landscape. One of these historical events would be the poverty driven migrations during the 19th and 20th cent. leading to considerable depopulation. This made them attractive for lifestyle migrants, for example educated people from big cities of Europe or Greece, who were searching for a 'rural idyll' in an attractive landscape. These developments were caused by external factors not at all linked to the two elevated plains in Greece, like on the one hand the industrialisation in other parts of the world, mostly northern Europe, and the allurement of the earning potential there. On the other hand, a change of life style in urban zones due to a widened horizon of the inhabitants and development of living conditions brought people to move to the abandoned mountain plains in search of resources, which are not connected to subsistence and survival, but to aesthetics and pleasure provided by the interaction of nature and culture. The consequences were substantial changes in the use of the landscape in the two elevated plains and in what is regarded to be a resource.

The chapter by Oscar Jané Checa et al. has a similar aim, as it looks into the transformation of rural landscapes in the eastern Pyrenees of Spain. Traces of earlier use are recognisable in abandoned villages and their economic areas which were shaped mostly by agriculture and animal husbandry. Historical events, such as the Spanish Civil War and the enduring hardships of Franco's dictatorship, including repression and poverty, especially during the post-war period, led to major economic disruption as well as massive emigration to the more prosperous industrial countries of Northern Europe during the 1950s and 1960s. This reflects the effects of economics, politics, social behaviours and ideologies during the 20th cent., which led to abandonment, and illustrates the functioning of the corresponding social and political networks in the Pyrenees.

Leonardo García Sanjuán et al. deal with the pervasive presence of aquatic resources in the Antequera region, in southern Spain. The point of departure of their analysis is a water well found in 2005 inside Menga, the largest dolmen in the Iberian Peninsula and one of the most special megalithic monuments world-wide. This water well, a remarkable hydraulic feature itself, is discussed with the support of geographic, archaeological and historical evidence in order to understand the multiple, complex and subtle roles played by water in the region over the last 6000 years. Important elements of this contribution are, therefore, its deep temporal focus, and the multi-disciplinary character of the evidence. Antequera is marked by the geologically-determined brackish character of most of its surface water. Yet, at the same time, it boasts a formidable resource of fresh-water: the aquifer underlying the El Torcal karstic formation, which provides a large amount of fresh water all year around. This is a water resource of critical importance in a Mediterranean region subject to intra and inter-annual water shortages. At the same time, Antequera is situated in an ecotonal region, right between the Baetic mountains, full of abiotic resources, and the Antequera plain, with high-quality agricultural land, which, in turn, is where major communication routes of southern Spain meet. All these elements combined form an exceptional landscape of resources, in which waterscapes have played a major role through time. Salt exploitation, aquatic sanctuaries, healing waters, irrigation agriculture and enduring prehistoric monuments feature highly in a contribution that explores the pervasiveness of some ResourceComplexes.

Various other contributions to this volume rely more exclusively on the archaeological record. Depending on the evidence and the state of knowledge, these case studies discuss different aspects of the handling of landscapes and the use of resources therein. Whereas symbolical aspects stand in the forefront in some of the contributions, socio-economic questions are highlighted in others. In accordance with the spectrum of the available

information, which differs from those of the other examples, the focus of the archaeological investigations is primarily on observations of long-term developments in landscapes.

In a study on settlement systems in Neolithic southern Italy, Roberto Filloramo et al. investigate the use of landscape as a resource by analysing the visibility areas of settlements. The landscape is viewed as a repository for resources in the sense of natural goods, and its analysis is tied to questions regarding the exchange of culturally connoted resources like ideas, practices and techniques. The visibility areas of settlements are considered to have been closely linked to zones of control over the landscape and thus areas of resource use. In this way, the control over land and a close link to communication routes for the exchange of goods, information and innovations are viewed together with knowledge, practices and methods as an important ResourceComplex. It changes over time as it is revealed mainly by the shifting of the location of the sites and the variations in the viewsheds.

The landscape of the southern Spanish Guadalquivir valley offered a number of possibilities for resource use during the Bronze Age as it is discussed by Martin Bartelheim et al. Apart from the use of minerals, the use of transit areas or places with transcendental meanings, refers mainly to agriculture and husbandry. The use of the fertile lowland soils has been demonstrated sufficiently for the preceding Chalcolithic by settlers living close-by. For the Bronze Age a similar resource use can be assumed, but a shift of settlements to elevated positions at the transition from the 3rd to the 2nd mill. BC points towards a reorganisation and a shaping of the landscape with a visual control from those defensive sites to meet modified social interests. The transformation was probably an answer to socio-economic consequences of climatic changes, whose accidental character allows to describe the ResourceComplex around subsistence production, social networks and landscape use also in a long-term perspective as a ResourceAssemblage.

For Iron Age Denmark Astrid Skou Hansen postulates a conscious and planned human shaping of a landscape according to archaeological features from north-western Jutland. This is thought to have served the interests of a ResourceComplex around arable land as well as trade and communication. A series of pit field alignments are interpreted as a means to direct movement to certain roads that gained importance at a time when the landscape was redefined and the settlement structure became more centralised, moving from single farmsteads into larger, more coherent settlements. Together with the new agricultural production system of the Celtic Fields, a more efficient system of land use was established that together with the reformed system of transportation led to a stronger social coherence and new ways of getting access to resources and external communication. The transit routes became part of a ResourceComplex related to infrastructure, comprising exchange of goods, maintenance of political ties or herding of livestock, and an overall understanding of the organisation of space as well as a ‘correct’ way to move in the landscape.

In his regional study on the Upper Rhine Valley in the area of today‘s Alsace (France) and Baden (Germany), Michael Kempf analyses parameters that influenced the use of soil as a resource within the ResourceComplex of agriculture during the early Middle Ages. Water supply plays a central role in the analysis, on the one hand with regard to the avoidance of flood zones, on the other hand because of the need for sufficient irrigation of agricultural land. A further factor is the soil properties and their suitability for agriculture and livestock breeding, which is why the abundant loess soil areas in the Upper Rhine Valley form preferred settlement and economic areas. It has been shown that knowledge of the most suitable sites and their use can be found as traces in the landscape and is handed down over long periods of time. It is conceivable that from about 700 AD onwards – as a result of the institutionalisation of the church as an important organisational factor – the establishment of fixed locations of village churches consolidated the locations of villages and thus created the landscape structures still visible today. Previously, settlement sites were moved more frequently within the area. With the influence of the church as an organising power, an independent external factor comes into play, which adds a further contingent component to the ResourceComplex of agriculture, landscape and knowledge and, applying

a longer chronological perspective, turns it into a ResourceAssemblage. This goes hand in hand with further continuously changing technological, cultural and social adaptation processes which, as a consequence of local as well as supra-regional developments, can be found in the archaeological and historical memory of a landscape and contribute significantly to its shaping.

Although the presented case studies constitute a heterogeneous collection of examples in terms of time and space, they demonstrate that analysing the use of landscapes and the specific resources therein can contribute to a better understanding of the dynamics within the corresponding societies. 'Landscapes' and humans mutually constitute each other. Landscapes thus contain traces of everyday life, interactions, social relations, identities as well as symbolic spheres of meaning within a certain space. The composition of landscapes can vary strongly showing different degrees of heterogeneity and homogeneity and is formed within cultural processes. The application of the concept of ResourceComplexes or alternatively ResourceAssemblages as heuristic devices help to illustrate the interplay of the relevant factors, since neither resources nor landscapes can be understood in isolation.

Martin Bartelheim
Eberhard-Karls Universität Tübingen
Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters
Schloss Hohentübingen
72070 Tübingen, Germany
martin.bartelheim@uni-tuebingen.de

Leonardo García Sanjuán
University of Sevilla
Department of Prehistory and Archaeology
María de Padilla s/n
41004, Sevilla, Spain
lgarcia@us.es

Roland Hardenberg
Goethe University Frankfurt
Institute of Social and Cultural Anthropology
Norbert-Wollheim-Platz 1
60323 Frankfurt am Main, Germany
hardenberg@em.uni-frankfurt.de

Bibliography

Anthony 1986: D. W. Anthony, The ‚Kurgan Culture', Indo-European Origins, and the Domestication of the Horse. A Reconsideration. Current Anthropology 27, 1986, 291–313.

Anthony/Brown 2000: D. W. Anthony/D. R. Brown, Eneolithic Horse Exploitation in the Eurasian Steppes. Diet, Ritual and Riding. Antiquity 74.283, 2000, 75–86.

Ash 2002: M. G. Ash, Wissenschaft und Politik als Ressourcen füreinander. In: R. vom Bruch/B. Kaderas (eds.), Wissenschaften und Wissenschaftspolitik. Bestandsaufnahmen zu Formationen, Brüchen und Kontinuitäten im Deutschland des 20. Jahrhunderts (Stuttgart 2002) 32–51.

Bartelheim et al. 2015: M. Bartelheim/R. Hardenberg/T. Knopf/A. Scholz/J. Staecker, ResourceCultures. A Concept for Investigating the Use of Resources in Different Societies. In: A. Danielisová/M. Fernández-Götz (eds.), Persistent Economic Ways of Living. Production, Distribution, and Consumption in Late Prehistory and Early History (Budapest 2015) 39–50.

Bradley 2000: R. Bradley, An Archaeology of Natural Places (London 2000).

Bourdieu/Waquant 1992: P. Bourdieu/L. J. D. Waquant, An Invitation to Reflexive Sociology (Chicago 1992).

Butzer 1982: K. Butzer, Archaeology as Human Ecology (Cambridge 1982).

Casimir 1992: M. J. Casimir, The Dimensions of Territoriality. An Introduction. In: M. J. Casimir/A. Rao (eds.), Mobility and Territoriality. Social and Spatial Boundaries Among Foragers, Fishers, Pastoralists, and Peripatetics (New York 1992) 1–26.

Cloke et al. 1991: P. Cloke/C. Philo/D. Sadler, Approaching Human Geography. An Introduction to Contemporary Theoretical Debates (London 1991).

Coole/Frost 2010: D. Coole/S. Frost, Introducing the New Materialisms. In: D. Coole/S. Frost (eds.), New Materialisms. Ontology, Agency, and Politics (Durham 2010) 1–43.

Davidson/Shackley 1976: D. A. Davidson/M. L. Shackley (eds.), Geoarchaeology. Earth Science and Past (London 1976).

DeLanda 2016: M. DeLanda, Assemblage Theory (Edinburgh 2016).

Deleuze/Guattari 1992 [1980]: G. Deleuze/F. Guattari, Tausend Plateaus. Kapitalismus und Schizophrenie II (Berlin 1992 [1980]).

Deleuze 2007: G. Deleuze, Two Regimes of Madness. Texts and Interviews 1975–1995 (Cambridge 2007).

Descola 2011: P. Descola, Jenseits von Natur und Kultur (Frankfurt am Main 2011).

De Blas Cortina 2015: M. A. De Blas Cortina. Megaliths and Holy Places in the Genesis of the Kingdom of Asturias (North of Spain, AD 718–910). In: M. Díaz-Guardamino/L. García Sanjuán/D. W. Wheatley (eds.), The Lives of Prehistoric Monuments in Iron Age, Roman and Medieval Europe (Oxford 2015) 205–224.

Filippucci 2016: P. Filippucci, Landscape. In: F. Stein/S. Lazar/M. Candea/H. Diemberger/J. Robbins/A. Sanchez/R. Stasch (eds.), The Cambridge Encyclopedia of Anthropology 2016, <http://doi.org/10.29164/16landscape> (last access 7.5.2020).

Fowler 2003: P. J. Fowler, World Heritage Cultural Landscapes 1992–2002 (Paris 2003).

García Sanjuán 2017: L. García Sanjuán, Farming Economy and Wealth Economy in the Copper Age of the Lower Guadalquivir River. Debating Strategic Resources at Valencina de la Concepción (Seville, Andalusia, Spain). In: M. Bartelheim/P. Bueno Ramírez/M. Kunst (eds.), Key Resources and Socio-Cultural Developments in the Iberian Chalcolithic. RessourcenKulturen 6 (Tübingen 2017) 237–256.

Gibson 1977: J. Gibson, The Theory of Affordances. In: R. Shaw/J. Bransford (eds.), Perceiving, Acting, and Knowing (Hoboken 1977) 127–143.

Giddens 1984: A. Giddens, The Constitution of Society. Outline of the Theory of Structuration (Cambridge 1984).

Gosz 1993: J. R. Gosz, Ecotone Hierarchies. Ecological Applications 3.3, 1993, 369–376.

Gudeman 2001: S. Gudeman, The Anthropology of Economy. Community, Market, and Culture (Malden 2001).

Gudeman 2012: S. Gudeman, Community and Economy. Economy's Base. In: J. G. Carrier (ed.), A Handbook of Economic Anthropology 2 (Cheltenham 2012) 95–108.

Hamilakis 2017: Y. Hamilakis, Sensorial Assemblages. Affect, Memory and Temporality in Assemblage Thinking. Cambridge Archaeological Journal 27.1, 2017, 169–182.

Hardenberg 2017: R. Hardenberg, Dynamic Correspondences. ResourceCultures. In: A. K. Scholz/M. Bartelheim/R. Hardenberg/J. Staecker (eds.), ResourceCultures. Sociocultural Dynamics and the Use of Resources – Theories, Methods, Perspectives. RessourcenKulturen 5 (Tübingen 2017) 25–34.

Hardenberg et al. 2017: R. Hardenberg/M. Bartelheim/J. Staecker, The ‚Resource Turn'. A Socio-Cultural Perspective on Resources. In: A. K. Scholz/M. Bartelheim/R. Hardenberg/J. Staecker (eds.), ResourceCultures. Sociocultural Dynamics and the Use of Resources – Theories, Methods, Perspectives. RessourcenKulturen 5 (Tübingen 2017) 13–24.

Hausmann/Perreaux 2018: D. Hausmann/N. Perreaux, Resources. A Historical and Conceptual Roadmap. In: I. Amelung/H. Leppin/C. A. Müller (eds.), Discourses of Weakness and Resource Regimes. Trajectories of a New Research Program. Discourses of Weakness and Resource Regimes 1 (Frankfurt am Main 2018) 179–208.

Hemme et al. 2007: D. Hemme/M. Tauschek/R. Bendix, Prädikat „Heritage". Wertschöpfungen aus kulturellen Ressourcen (Münster 2007).

Ingold 1993: T. Ingold, The Temporality of the Landscape. World Archaeology 25, 1993, 152–174.

Ingold 2000: T. Ingold, The Perception of Environment. Essays on Livelihood, Dwelling and Skill (London 2000).

Joyce 2015: R. A. Joyce, Transforming Archaeology, Transforming Materiality. Archaeological Papers of the American Anthropological Association 26.1, 2015, 181–191.

Kloos 2017: S. Kloos, The Pharmaceutical Assemblage. Rethinking Sowa Rigpa and the Herbal Pharmaceutical Industry in Asia. Current Anthropology 6, 2017, 693–717.

Knapp/Ashmore 1999: A. B. Knapp/W. Ashmore, Archaeological Landscapes. Constructed, Conceptualized, Ideational. In: A. B. Knapp/W. Ashmore (eds.), Archaeologies of Landscape. Contemporary Perspectives (Malden 1999) 1–30.

Latour 1996: B. Latour, On Actor-Network Theory. A Few Clarifications. Soziale Welt 47.4, 1996, 369–381.

Latour 2005: B. Latour, Reassembling the Social. An Introduction to Actor-Network-Theory (Oxford 2005).

Lowenthal 1985: D. Lowenthal, The Past is a Foreign Country (Cambridge 1985).

Miller 2005: D. Miller, Materiality. An Introduction. In: D. Miller (ed.), Materiality (Durham 2005) 1–50.

Müller-Christ 2011: G. Müller-Christ, Sustainable Management. Coping with the Dilemmas of Resource-Oriented Management (Heidelberg 2011).

Niemann 2006: S. Niemann, Kontext und Relativität von „Ressourcen". In: D. Hummel/C. Hertler/C. Janowicz/A. Lux/S. Niemann (eds.), Ressourcen und Bevölkerungsdynamiken. Ausgewählte Konzepte und sozial-ökologische Perspektiven. Demons Working Papers 6 (Frankfurt 2006) 7–19, <http://www.demons-project.de/material/demons_wp6.pdf#page=9> (last access 7.5.2020).

Pétrequin et al. 2017: P. Petrequin/E. Gauthier/A.- M. Pétrequin (eds.), JADE 2. Tomes 3 et 4. Objets-signes et interprétations sociales des jades alpins dans l'Europe néolithique. Dynamiques territoriales 10 = Cahiers de la MSHE Ledoux 27 = Presses universitaires de Franche-Comté 1379 (Besançon 2017).

Rao 2018: U. Rao, Biometric Bodies. Or How to Make Electronic Fingerprinting Work in India. Body & Society 24.3, 2018, 68–94.

Rodríguez-Rellán et al. 2019: C. Rodríguez-Rellán/B. Nelson/R. Fábregas Valcarce (eds.), A Taste for Green. A Global Perspective on Ancient Jade, Turquoise and Variscite Exchange (Oxford 2019).

Sacks 1983: R. D. Sacks, Human Territoriality. A Theory. Annals of the Association of American Geographers 73.1, 1983, 55–74.

Salisbury 2015: J. Salisbury, Before the Standing Stones. From Land Forms to Religious Attitudes and Monumentality. In: M. Díaz-Guardamino/L. García Sanjuán/D. W. Wheatley (eds.), The Lives of Prehistoric Monuments in Iron Age, Roman and Medieval Europe (Oxford 2015) 19–33.

Scholz et al. 2017: A. K. Scholz/M. Bartelheim/R. Hardenberg/J. Staecker (eds.), ResourceCultures. Sociocultural Dynamics and the Use of Resources – Theories, Methods, Perspectives. RessourcenKulturen 5 (Tübingen 2017).

Sørensen/Carman 2009: M. L. S. Sørensen/J. Carman (eds.), Heritage Studies. Methods and Approaches (London 2009).

Tilley 1994: C. Tilley, A Phenomenology of Landscape. Places, Paths and Monuments (Oxford 1994).

Teuber/Schweizer 2020: S. Teuber/B. Schweizer, Resources Redefined. Resources and ResourceComplexes. In: S. Teuber/A. K. Scholz/T. Scholten/M. Bartelheim (eds.), Conference Proceedings for "Waters as a Resource" of the SFB 1070 ResourceCultures and DEGUWA (Deutsche Gesellschaft zur Förderung der Unterwasserarchäologie e.V.). RessourcenKulturen 11 (Tübingen 2020).

Wacker/Blank 1999: H. Wacker/J. E. Blank, Ressourcenökonomik II. Erschöpfbare natürliche Ressourcen (München 1999).

Walker Bynum/Gerson 1997: C. Walker Bynum/P. Gerson, Body-Part Reliquaries and Body Parts in the Middle Ages. Gesta 36.1, 1997, 3–7.

Wu 2013: J. Wu, Key Concepts and Research Topics in Landscape Ecology Revisited. 30 Years after the Allerton Park Workshop. Landscape Ecology 28, 2013, 1–11.

Roland Hardenberg

Dwelling in an Animated Landscape

Forms of Attachment Between Environment and People in Eastern India

Keywords: environment, landscape, animism, ontology, values, India

Abstract

This article describes a worldview in which the environment is not seen as something independent and separate, but as part of the social (and cultural) world. The description is based on ethnographic fieldwork among an indigenous community named Dongria Kond whose members live as slash-and-burn cultivators in the mountain areas of eastern India. These people consider their surrounding landscape as a world populated by various animated beings with whom they establish and maintain social relationships. These relationships are shaped by the same everyday activities which also create bonds between community members such as kin, friends and affines. This ethnographic finding is presented within a wider theoretical framework that is inspired by recent anthropological debates on animism, dwelling, assemblage and on cosmologies which do not separate nature from society (or culture). It is argued that Philippe Descola's concept of 'modes of attachment' provides a useful tool for describing a worldview that stresses 'we-ness' and embraces non-human beings as part of society (or culture). Such a perspective on environment may also be helpful to archaeologists for developing new narratives about prehistoric communities.

Introduction: Many 'Animisms'[1]

Two decades ago, Tim Ingold argued that hunter-gatherers do not distinguish between their own culture and an external nature but conceive themselves as part of an encompassing environment. They do not, he claims, consider this environment as consisting of alien, physical objects that humans deal with as mindful subjects. On the contrary, the ontology of hunter-gatherers starts in his view from the assumption that humans like any other beings in this environment are from the beginning in an 'active, practical and perceptual engagement with constituents of the dwelt-in-world' (Ingold 2000, 42). He calls this involvement in the environment 'dwelling', a word that emphasises the active engagement with the surrounding world in everyday activities. His point is that hunting and gathering is not different in this respect from storytelling, singing or narrating myth. Anthropologists have often distinguished the latter as human representations or metaphors from the economic utilisation of nature. All these activities, Ingold argues, are engagements with the environment shaped by the quest for knowledge and revelation.

In a similar way, Nurit Bird-David (1990; 1999), an anthropologist who studied the South

1 Some of the theoretical arguments and ethnographic examples used in this paper also formed the basis for another article by the author: Hardenberg 2019.

Indian hunter-gatherers named Nayaka, describes the worldview of these people as being based on the idea of relations between animated beings. Nayaka do not live in a more or less passive and unintentional environment, but on the contrary are engaged in various forms of conversation with the world around them. In her words: '[…] they are educated to perceive that animals, stones, rocks, etc., are things one can relate with – that they have relational affordances, that is, what happens to them (or how they change) can affect and be affected by what happens to people (or how they change)' (Bird-David 1999, 77). In other words, the Nayaka do neither think about themselves as individuals nor of the objects as separate entities but pay close attention to relations: not how a person speaks but how a person speaks with others. Drawing on the works of Marriott and Strathern she uses their concept of the 'dividual', which contrary to the Western idea of the autonomous 'individual' stresses mutual relationships and sharing. This concept, she claims, does aptly describe the Nayaka's view of their environment. In their daily activities like hunting and gathering they experience the world in relation to themselves, they discover the landscape as a form of relation, in their case first of all as a relation of sharing. When they therefore call certain parts of their environment such as trees, hills, rocks etc. as *devaru* or divine beings they do not, she argues, simply personify the environment as assumed in classic theories of animism. A hill *devaru*, she argues, is not an object that is imagined by the Nayaka as a living entity or individual. Since everything is experienced in a relational mode, a hill *devaru* objectifies the relationships of sharing between the Nayaka and this particular hill. The point is that the objects of the environment are not a priori conceived of as persons but are experienced as persons in relation to oneself during mutual interaction. Hunting and gathering or 'dwelling' in the world becomes therefore a kind of epistemology, a form of learning and getting knowledge about the world. In this process, the environment is not turned into something 'other' but becomes part of 'one's own', or in her words, attention is turned to 'we-ness' through processes of interaction (Bird-David 1999, 73).

This approach shows certain similarities with assemblage theory and the concept of agencement in the works of Gilles Deleuze and Felix Guattari (Deleuze/Guattari 1988). Unlike former uses of the word assemblage in archaeology, art or the natural sciences, the concept agencement does not describe a state of art, a fixed arrangement but the process of arranging. The main question is how various elements come into connection with each other, how they relate to each other through time. Applied to human/environmental relationships this implies that former functional and organic models based on 'factors', 'causes', 'effects' etc. are substituted by historical approaches that capture the emergence of often unstable and heterogeneous assemblages. This focus on the specific, contingent and contextual arrangement of things has its parallels in Bird-David's epistemological approach to animism. In her view, there are many animisms, i.e. various forms of framing things relationally, because each case is embedded in specific histories, local contexts and given cultural concepts or structures.

In this paper, I give an example of one particular form of animism which I encountered during my fieldwork among the Dongria Kond in eastern India. At first, I describe their engagements with the environment from a classic economic perspective by giving an overview of their main subsistence activities. This is followed by a rather different description of the same environment from a socio-cosmic perspective. From the point of view of the Dongria Kond, their landscape is populated by animated beings and their life depends on good relationships with them. It is argued that the Dongria Kond use everyday activities to establish and maintain not only relationships among themselves but also between them and the many animated beings that are part of their environment. Following Descola (2012), I see these activities as modes of attachment because they create socio-cosmic relationships that overcome the classical divide between nature and culture. In the main part of the paper these different actions and the attachments they create are introduced: exchange; reproduction, rearing and care; hunting; sharing; and marrying. In the conclusion, I argue that these actions are often combined in order to express different values that ideally structure relationships between social and cosmic agents. Since this paper is written

in the context of an interdisciplinary project of the collaborative research centre 1070 RESOURCE-CULTURES, which involves archaeologists as well as anthropologists in a joint research on landscapes of the Iberian Peninsula, it ends with a general remark on how the concepts introduced in this paper might change our narratives about societies in prehistory.

Forms of Attachment

Although at the end of her paper Bird-David speaks of given cultural concepts or structures and cites Marshall Sahlins' work, in my view she stresses the epistemological side of human engagement with the environment too much. I understand that her emphasis on dwelling, discovering and experiencing is necessary in order to overcome dominant modernist understandings of animism. Yet this advantage is achieved at the expense of neglecting given cultural concepts as contained in spatial structures, concepts of time, or language categories which frame interaction with the environment. Of course, these concepts are the products of human engagements, but they are not invented anew every time. What I consider as a very valuable aspect of her approach is the emphasis on the plurality of animism. To me this means that sharing, which seems to be the dominant mode of how Nayaka relate to their environment, represents only one way of conceptualising 'we-ness'.

In a more recent paper, Philippe Descola (2012) has also addressed this pluralism and speaks of different 'forms of attachment'. Sharing, or in his words 'gift giving', represents just one of six relational modes that orient practical action and organise the expression of thoughts and feelings. These six modes are: giving, taking, exchanging, producing, protecting and transmitting. Each of these six modes structures the relations between humans and non-humans and usually one achieves a certain dominance in a given society when 'it is activated in a whole range of different circumstances' (Descola 2012, 448). While giving, taking and exchanging can be reversed, producing, protecting and transmitting are unidirectional forms of attachment (Descola 2012, 448 f.).

Fig. 1. Niamgiri mountain range in Odisha, India.

Introducing the Dongria Kond

In my own studies on the Dongria Kond of Odisha (e.g. Hardenberg 2018), I find this approach useful because it draws attention to the ways, these people expressed their engagements with the environment. From 2001 to 2003, I carried out intensive fieldwork among the Dongria Kond who live in the state of Odhisa, in the eastern part of India. They reside in the densely wooded Niamgiri mountain range with altitudes of up to 1600 metres and are considered to be one of about 60 tribal groups to whom special rights are guaranteed by the Indian constitution as aborigines or *Adivasi*. In Orissa, about one million people belong to the tribe of Kond, but only about 8000 of them call themselves Dongria Kond. They speak a Dravidian language named Kui or Kuvi and show many social and cultural similarities with the other Kond communities in the region (see Jena et al. 2002).

The Dongria Kond reside in around 100 villages which are surrounded by mountains that are densely covered by forest with a high variety of trees and plants (*fig. 1*). This land is officially classified as Reserved Forest belonging to the government but the Dongria Kond as *Adivasi* have been given the right to use this land. Each village consists of two rows of houses, nearby stables for cows or goats and small gardens. Villages typically have two entrances, one to the east, the other to the west and are connected by small footpaths which crisscross the forest and mountain streams of the surrounding mountains. This landscape is of high economic importance to the people, because it provides them with everything they need to make a living.

Fig. 2. Mountain slope used for shift-and-burn cultivation.

Fig. 3. Swidden after cutting of trees.

Productive Landscape

The fields (*padara*) are located on the mountain slopes and are divided into land under cultivation (*neta*) and fallow land (*nelu*). Each mountain slope is cultivated for usually three to four years until it is abandoned and slowly turns again into secondary forest which can be re-used for cultivation after at least ten years of fallow. A mountain slope is cultivated from bottom to top. In the first year, the Dongria Kond begin cultivation in the lower parts of the mountain, next year they continue in the middle part, before they finally extend their activities towards the upper part of the mountain. The top of the mountain remains untouched because it is considered a seed source for the whole mountain.

In each year, the Dongria Kond follow a cycle of activities typical for slash-and-burn cultivators in tropical areas with monsoon (see Kunstadter 1987). From February onwards, the trees on the slopes of the mountain are first cut with axes about one meter above the ground, then dried, burned together with the grass and bushes and finally the ash is distributed on the fields. From March onwards, people are relatively free from work, and if the former harvest was good they are able to hold large feasts and buy the animals required for the completion of the wedding ceremony as well as the buffalo sacrifices to the earth goddess. Shortly after this merry-making season, the monsoonal rains set in and people begin to sow seeds in their fields. Long months of weeding and protecting the crops follow until finally in October or November the harvest begins, which ends in January (*fig. 2*).

In each part of the mountain slope Dongria Kond sow a variety of seeds. In the first year, pulses such as cow-peas (*jununga*, *katinga*), beans (*balang*), and most important of all, pigeon peas (*kanga*) are sown as these grow best in a field that has lain fallow for many years. Pigeon peas are always the last crop to be harvested in this first year and have a particular importance for the Dongria Kond diet as they are served in almost every meal. In the second year, mainly various types of millet (e.g. little millet, pearl millet, foxtail millet, sorghum) are sown in the field that was cultivated the year before since these plants also grow on hill plots less rich in minerals (*fig. 3*). The two types of crops forming the basis of Dongria daily nutrition are thus produced in successive years: pulses for preparing sauces and soups (*kachpe* or *jau*) and grains which serve as the staple food (*lahi* or *paga*).

In addition to their cultivation of the hill slopes, most Dongria have small gardens near their houses, collect food in the jungle and hunt small animals. One may summarise all these activities under the rubrics ‘local economy’, ‘subsistence’ or ‘modes of production’. However, such a categorisation would distract us from the people’s perceptions because for them the environment is not simply a place or factor for economic production.

Animated Landscape

This environment plays a major role in the cosmology of the Dongria Kond which is very complex and diverse, as it has never been unified and can therefore vary from village to village, person

Fig. 4. Stone setting of the earth goddess (Dharni Penu).

Fig. 5. House of the earth goddess and sacrificial wall for her husband (Koteiwali).

to person. There are numerous myths that tell of the origin and evolution of the world and of the emergence of Dongria Kond culture and society in many facets (see Jena et al. 2002, 133–176). These myths narrate about the spiritual forces that inhabit the world. The omnipresent gods are called *penu* in the language of the Dongria. These gods are not visible to humans in their true form. Each deity has its own place: there are gods of the forest and the mountains, the rivers and the springs, the house and the village. The celestial bodies, sun and moon as well as the stars, are also regarded as separate deities. There are own and foreign deities, deities that are responsible for certain diseases or for the fertility of the land. One can best imagine the deities as forces which have their own domains and often also very specific functions in the cosmos. Some gods are regarded as great and important deities, such as the sun god or the earth goddess, whose names, stories and abilities are known to all Dongria Kond. These highest gods have their own festivals and rituals, they are embodied in certain objects and are worshipped in specific places (*fig. 4*). Other gods are subordinate deities, often with a very local character, such as a specific mountain river, and with very limited functions, e.g. for a particular disease or the prosperity of a certain plant. The action of the deities can be positive or negative: they give life, fertility, prosperity and joy, but they can also kill, destroy crops, cause poverty and create suffering. The gods give and take the human life force (*jella*) and all diseases are attributed to their will. Dongria Kond can connect with them through shamans on ritual occasions. In trance sessions, the shamans call the gods through ritual language and lend them their voices for communication and their bodies for dancing. The shamans can also worship the gods in diverse physical forms such as bundles of rice, clay figures, bamboo sticks, stones, bronze images etc. The earth goddess (*dharni* or *jakeri*), for example, is represented by a house in the centre of a village which is rebuilt every time the villagers perform the grand buffalo sacrifice (*kodru parbu*) for her. The walls of this house are painted with the patterns of the scarf of a young woman, on the big wooden crossbeams one finds representations of her breasts and the straw on the roof of the house is compared to the hair of the earth goddess (*fig. 5*).

Similar actions are performed for the ‘shadow souls’ (Niggemeyer 1964, 142), i.e. the deceased, whose nature depends on experiences, both in lifetime and at death. Who has died a good death, becomes the predominantly benevolent ancestor (*mahane*). These deceased people prefer certain places in the human environment, can determine human destiny like the gods and can be physically experienced in ritual space. At death, it is thought, the human soul becomes free and transforms into an ancestor who is reborn in a child sometime later. This time span depends on how long the soul wanders around and stays in various places. Basically, these ancestral spirits are considered to be kind to people, who are their relatives, and only if they are neglected can they cause suffering. Much more feared is another category of ‘shadow souls’, the *madanga* or undead. These are the souls of people who died a bad death and are therefore considered to be aggressive and dangerous. These

are mainly people who have died as a result of accidents, such as drowning in the river, being killed by a wild animal or falling from a tree.

Because deities and the deceased have both good and negative powers, the Dongria Kond always see the need to maintain good relations with them. One way to do this is by strictly observing the various rules that apply to the animated environment: one may cut only certain trees, should avoid hunting particular animals, protect some places and avoid others. Another way involves communicating with deities and ancestors through shamans in order to make up for mistakes, to return gifts received or to assure oneself of their benevolence. Thus, illness, misfortune, and death are considered to be the result of a disturbed relationship with certain cosmic forces.

From the point of view of the Dongria Kond this communication with spiritual beings is possible because they have certain qualities. The first is that these forces can be summoned to a place. Some of the great deities, for example, have very specific places inside and outside the village. Thus, the earth goddess Dharni Penu is called to a stone setting in the centre of the village. In irregular intervals of several years, she receives a buffalo sacrifice as a counter-gift for a good harvest and in order to guarantee fertility of land and people in the future. Her husband, the so-called Koteiwali, is worshipped at a megalith stone usually standing west of the house of his consort. Other deities are represented by objects, some of which are of a permanent nature, such as axes, knives or swords, while others are only made for a particular ritual and are not reused, such as clay figures. Rituals are almost always performed at simple shrines, which consist of four posts and a roof covered with leaves; only for the elaborate sacrifices for the major deities an additional carved post or hut is erected.

The second important characteristic of the socio-cosmic forces is that they are hungry and thirsty. Food and drink therefore play an important role in all rituals. Almost every ritual involves the sacrifice of animals, mostly chicks or adult chickens, but also pigs, goats, and even cows and water buffalos. The cosmic forces are offered the blood and liver, which is considered the seat of life, as well as some of the cooked food made of rice and meat. Additionally, palm wine, distilled alcohol and incense, which is produced by burning resins, is offered to deities and souls.

The third characteristic of the cosmic forces is that they can take over a shaman's body and communicate with them through music, dance and song.

In summary one can say that from the point of view of the Dongria Kond these spiritual beings are very similar to humans: they reside in the same environment, have human needs and one can entertain social relationships with them. The major difference seems to be the corporality: spiritual beings are invisible and humans, especially the shamans, must lend their bodies to them so that they can experience the world in its physical, emotional and communicative dimensions.

In many ways the Dongria Kond's ritual ideas and practices thus fall into the classical anthropological category of animism, although they are not predominantly hunter-gatherers: they worship stones, plants, trees, animals, rivers and mountains; they conceptualise their environment as populated by gods, ancestors and spirits who are often localised or can be invited to certain places; they have shamans who can communicate with these non-human beings and they perform extensive rituals to engage in an exchange with them. The mountains are the heroes in their myths and the landscape reminds them of the deeds of their gods and the migrations of their ancestors. The whole environment inside and outside the village is populated by various non-human beings to whom they relate in many ways.

As in an assemblage (see above), this is not a fixed arrangement but in the constant process of becoming: relationships get disturbed and have to be restored, new relationships have to be created or expanded. The question is, how people conceptualise these engagements with their animated environment. In my interpretation of Dongria Kond socio-cosmic views, dwelling in the environment is shaped by relationships based on exchange, rearing, hunting, sharing and marrying, in other words by activities that also structure the relations between humans. This corresponds with Bird-David's observation among the Nayaka that their engagement with the environment is meant to create 'we-ness' instead of maintaining an 'otherness'

of a nature that has to be controlled and exploited by human culture (Bird-David 1999, 73).

Exchange

Following Descola (2012), one may call these activities that create particular relationships between people and their animated environment as forms or modes of attachment. One particularly important activity that forms both relations between people as well as with the spiritual beings populating their environment, is exchange. The giving and taking of things, knowledge, politeness and many other aspects of social life are highly valued among the Dongria Kond. Exchange is considered absolutely essential in order to establish and to maintain good relationships with kin members, friends and neighbours.

As argued above, from the point of view of the Dongria Kond, these spiritual beings who manifest themselves in their environment are also seen as social beings, even as kin members. Thus, they are addressed in the recitations of the shamans as 'father' (*aba*), 'mother' (*aya*), 'father's sister' (*ama*), 'older sister' (*nana*) or 'mother's brother' (*mama*). They are asked to protect and care for their children, the people. But it is not an unconditional caretaking, rather an exchange, because gods, environment and people are connected by giving and taking. Without sacrifices, in which people offer their bodies, their blood or that of an animal or the smell of cooked food, the gods will show their negative side: they let the harvest wither or bring misfortune and illness upon people.

There are thus mutual expectations, shaped by exchange. This was made clear to me once by one of the oldest men of the village in which I lived, using the example of the Salap tree. This is a palm tree that produces a fruit shoot (*sringa*), from which, if trimmed correctly, a sweet juice drips, which ferments quickly and becomes a popular alcoholic drink. During the main bloom, the men gather under the palm tree up to three times a day, a man climbs up, fetches the juice, which is collected in a pot, and distributes it fairly to all present. These trees are planted by the parents and grandparents and take about twenty years to be tapped by the children and grandchildren. The old man explained to me that in his youth he had planted trees and climbed them to bring the juice to others. So, in his view it is now the task of his children to take care of him, even after his death, when he has the right to receive sacrifices as an ancestor (*fig. 6*).

Fig. 6. Salap tree in a swidden field.

This idea of long-term reciprocity makes it understandable why, from the point of view of the Dongria Kond, the earth goddess demanded a child in times of human sacrifice (see Padel 1995): because she gives her own 'children', i.e. the fruits of the earth, to feed people.

Reproduction, Rearing and Care

A second important mode of relationship involves acts of reproduction, rearing and care. Dongria Kond women spend a lot of time caring for their children. They give them massages, oil their bodies and carry their small babies the whole day, even when working on the fields. When the

Fig. 7. Sacrificial place in a Dongria Kond village.

Fig. 8. Hunter in front of his trap.

children grow older, they remain in the village during the day where they are taken care of by the elderly who do not work on the mountain slopes any more. Rituals are seen as a major means for securing welfare for the children. Thus, whenever a child is sick, a shaman will consult different spiritual beings in order to establish the cause of the disease and to make a sacrifice in order to re-establish good socio-cosmic relationships.

In a very similar way, Dongria Kond also take care of plants. The plants on the mountain slopes are seen by them as living beings and worshipped in various rituals. A number of rituals are performed in order to drive away insects, to keep storms away, bring good rain or to prevent any harm to these plants by demons. This care for plants occurs not only by means of ritual, but above all through the daily, tireless work in the fields. Shortly before the harvest almost no one is sleeping in the villages anymore, because everyone is staying in the field huts on the mountain slopes to protect their fields from wild animals like birds, wild pigs, bears and elephants.

The close connection between the reproduction, rearing and care of human beings and of plants growing in the field becomes obvious in the most important ritual event performed by the Dongria Kond, the sacrifice (*kodru parbu*) to the earth goddess. This former human and contemporary buffalo sacrifice can be interpreted as an act that is intended to make the earth fertile or pregnant. The entire sacrificial complex has a number of sexual connotations. Thus, the ethnologist Barbara Boal argues that in a ceremony three months before the actual buffalo sacrifice the earth is impregnated by driving a phallic sacrificial pole into the earth at sunrise (Boal 1999, 368 f.).

The sun god is considered the husband of the earth goddess and this ritual fertilisation takes place when his rays fall on the earth in the morning (*fig. 7*). The actual buffalo sacrifice, according to Boal, marks the moment when three months later the pregnant earth goddess craves a special food (Boal 1999, 369 f.). During the following months, according to Boal, further rituals follow to protect the crops, i.e. the child of the earth, from insects or diseases. After this, in winter time, the harvest rituals are performed in order to celebrate the 'birth' of the grain (Boal 1999, 370–373). The harvest is then brought home where it is converted mostly by women into food that nourishes the family members, who jointly cultivate the fields – the cycle is closed.

Hunting

A third mode of attachment in the relationship between Dongria Kond and between them and the beings populating their environment is linked to their ideas of hunting. Hunting is called *beta* in the language of the Dongria Kond. This term refers to practices that relate to humans, animals and plants. For example, when young, unmarried men go out to meet unmarried women at a party or youth dormitory, they call it *daaska beta*, literally 'girl hunt'. With regard to animals, the Dongria Kond men can be described as cunning hunters who set sophisticated traps to catch birds, lizards, forest rats or other small mammals. Wild bees are hunted with fire by lighting their honeycombs, while monkeys or small deer are hunted with bow

and arrow or slingshot to expand their diet. Collecting certain fruits is also called hunting. For example, when Dongria Kond pick mangos (*amba*), tap palm wine (*kalu*) or gather wild green plants (*kucha*) they refer to these acts as *beta*. Their concept of hunting implies that people acquire something through skillful action that requires learning and experience (*fig. 8*).

From the Dongria Kond's point of view, the god of war and hunting, Lada Penu, is responsible for the success (or failure) of the hunt. This god is continued to be worshipped although hunting animals no longer plays such a major role in the life of the Dongria Kond, who use their guns mainly for driving away animals, especially monkeys, from their fields. Shooting large game is illegal, and since their numbers have declined in recent decades, hunting has become a very difficult and often fruitless affair. Even if hunting is no longer practised in a major way, a relationship with the god of war and hunting as well as knowledge of the use of weapons is still highly valued. Thus, sacrifices to Lada Penu are regularly performed at small stone settings (*walka puja*; lit. stone worship) which are mostly located in the east of the village (Hardenberg 2018, 553–559). The shamans slaughter chicken or goats and perform a dance in his name, which is accompanied by whistles, warlike howls and the sound of drums played by men. At this place of stone worship the villagers also gather to make the young men 'friends' (*tonenga*) of the Lada Penu, i.e. to initiate them into hunting.

Sharing

Hunting is very much related to the fourth mode of attachment, namely sharing between people and their environment. As in the case of the Nayaka described by Bird-David (1990, 191), hunters (and friends) are expected to equally share their 'prey', be it unmarried sexual partners, a deer, mangos, tobacco or palm wine. The sharing of things obtained through either 'hunting' or 'exchange' often occurs in contexts emphasising social unity. Distribution is called *bat kina*, literally 'to make shares', and involves a mode of behaviour different from both the violence involved in hunting and the haggling and bargaining typical for market transactions and rituals. When valuable things are shared, everybody present, irrespective of social status and community, will receive a portion. The amount distributed must be exactly the same for each person and nobody dares to demand more or refuse a share. Taking part in sharing does not leave the receiver indebted to the person who distributed his or her share except in so far as he is expected to share in the same way when the time comes. It is, however, not possible to demand a gift, for example money, in return for a share given as part of a distribution. Public sharing is basically a male affair: men distribute meat, cooked food or alcohol during feasts.

Typical occasions for sharing are hunting expeditions, palm wine drinking, harvesting, and feasts. When a man or a group of men returns from a successful hunt, they are expected to share the meat. They have to give equal shares of the animal at least to their neighbours, if not to the whole village, including all visitors present at the time of distribution. Similarly, whoever joins a drinking party assembling under a palm wine tree must receive an equal share of the sap. The idea of sharing is particularly evident in connection with the 'hunt' on palm wine (*kalu*). During the main flowering, a group of men gathers at the foot of the palm tree up to three times a day. A man climbs the tree with a bamboo ladder, collects the palm wine that drips incessantly into a clay pot, brings it down to the eagerly waiting men, who share it in exactly equal parts. I heard Dongria say that the salap tree is like a girl who grows up, then becomes a young mother producing 'milk', i.e. the palm wine, before finally turning into an old woman 'without sap'. It is said that the palm tree gives its juice to the young men just like a mother who gives milk to her children and that therefore the young men have to share the wine among themselves. Again, the similarities with the Nayaka and other hunter-gatherers discussed by Bird-David, who consider nature as their 'ever-providing parent' (Bird-David 1990, 190), are obvious.

The most important contexts for sharing are food distributions as part of affinal transactions. For example, if a family receives from their in-laws one or more buffaloes as bridewealth (*mahala*) for their daughter, the head of the family is expected to share the meat in a feast with all

those resident in his village and with certain relatives living elsewhere. This shows the high value of marriage and relations of affinity in Dongria Kond society.

Marrying

A fifth important mode of attachment which shapes relationships between the Dongria Kond and their animated environment are wedding rituals. Among the Dongria Kond as in many other ethnic groups of the region, weddings bring about a change in status, promising the potential for reproduction. Such weddings are performed not only for humans but also for establishing a relationship between humans and their environment, for example between a girl and a tree.

Chris Gregory (2004; Gregory/Vaishnav 2003), for example, recorded among the Halbi-Speakers in Bastar an epic about goddess Laksmi with more than 30,000 verses. The epic is about the marriage of the queen with the mango tree and the water pond. Among the Rona in Odisha, Tina Otten documented rituals in which young women achieve a new, reproductive status by being married to tree posts (Otten 2006, 254–260). Peter Berger has also been able to establish affinal relationships with the environment among the Gadaba of Odisha. The Gadaba see the transportation of rice from the fields into the houses as bringing a bride into their groom‘s house (Berger 2015, 469 f.). Among the Dongria Kond the buffalo sacrifice also has many things in common with a wedding. In my interpretation the sacrifice carries out the transition of the earth goddess from a girl to a bride. The sacrificial buffalo is in many ways identified with the earth goddess as a bride. For example, the buffalo is taken to the neighbouring villages by young men. There it is rubbed with oil and fed with rice in front of each house by the women. The same happens with a human bride before the wedding, because she is shown to her relatives and receives food during her visits. The timing of both events is also identical because like a wedding, the buffalo sacrifice always takes place on three consecutive days, from Friday to Sunday, and the guests on both occasions are mainly unmarried young men. Based on the commonalities, one can argue that the sacrifice is actually a wedding during which the earth goddess changes its status and becomes a fertile wife, which is the prerequisite for a good harvest (Hardenberg 2018, 591–594).

Conclusion: A Different Narrative

The slash-and-burn cultivators described in this paper as well as many hunter-gatherers known from anthropological literature have a particular perception of their environment in common. This is characterised above all by the idea that this environment is populated by humans and animated beings who form relationships through everyday activities. Humans are not above or beyond nature, they are part of the environment. Hunting, gathering, cultivating, sharing and so on are not simply economic activities but general social activities that maintain and structure relationships between all beings of the cosmos. They often occur in combination or as consecutive acts: hunting leads to sharing, marrying may turn into reproduction, rearing and care, and exchange accompanies most of these social activities. What all have in common, from my point of view, is that they express social values in the sense of the ‘good’ recognised by members of a society (Robbins/Sommerschuh 2016, 2). All these activities create social relationships between people and the agents of their environment which are highly valued: the relations between givers and receivers, between parents and children, between friends and equals and between affinal partners. Each type of relationship has its own culturally derived characteristics, yet they are all associated with values, i.e. ‘what people want or should obtain’ (Robbins/Sommerschuh 2016, 2).

What does that mean for an interdisciplinary project involving anthropology and archaeology in an attempt to understand changing landscapes on the Iberian Peninsula from prehistory to present times? If the idea that nature is an objective world out there and separate from the subjective human world of culture is a modern invention, then we can assume that societies studied by prehistorians did not share this worldview. We may not know exactly how, for example, people on the Iberian Peninsula have imagined relationships

between them and the environment three thousand years ago, yet anthropological evidence suggests that non-modern people subjectify rather than objectify their environment. This means that nature is not seen as 'the other' but as part of one's society and that features of the environment are conceived of as persons with whom one interacts in a manner similar to that with relatives, friends, neighbours etc. If this is the case, then one may further assume that the landscapes of the past were assemblages created by social, not simply economic activities. This means that the way people performed agriculture or raised animals in a given environment was not simply driven by economic constraints and rational calculations but by social concerns such as raising, caring, protecting, exchanging, marrying, etc. One may not exactly know which form of attachment was dominant, but the whole narrative would change: humans did not use and exploit their environment, they dwelled in it by behaving socially.

Roland Hardenberg
Goethe University Frankfurt
Institute of Social and Cultural Anthropology
Norbert-Wollheim-Platz 1
60323 Frankfurt am Main, Germany
hardenberg@em.uni-frankfurt.de

Bibliography

Berger 2015: P. Berger, Feeding, Sharing, and Devouring. Ritual and Society in Highland Odisha, India. Religion and Society 59 (Berlin 2015).

Bird-David 1990: N. Bird-David, The Giving Environment. Another Perspective on the Economic System of Gatherer-Hunters. Current Anthropology 31.2, 1990, 189–196.

Bird-David 1999: N. Bird-David, 'Animism' Revisited. Personhood, Environment, and Relational Epistemology. Current Anthropology 40.1, 1999, 67–91.

Boal 1999: B. Boal, Man, the Gods and the Search for Cosmic Wellbeing (Bhubaneswar 1999).

Deleuze/Guattari 1988: G. Deleuze/F. Guattari, A Thousand Plateaus (London 1988).

Descola 2012: P. Descola, Beyond Nature and Culture. Forms of Attachment. Journal of Ethnographic Theory 2.1, 2012, 447–471.

Gregory 2004: C. A. Gregory, The Oral Epics of the Women of the Dandakaranya Plateau. A Preliminary Mapping. Journal of Social Sciences 8.2, 2004, 93–104.

Gregory/Vaishnav 2003: C. A. Gregory/H. Vaishnav, Lachmi Jagar. Gurumai Sukdai's Story of the Bastar Rice Goddess (Kondagaon 2003).

Hardenberg 2018: R. Hardenberg, Children of the Earth Goddess. Society, Marriage, and Sacrifice in the Highlands of Orissa (India). Religion and Society 73 (Berlin 2018).

Hardenberg 2019: R. Hardenberg, Dongria Kond. Perspectivism in Tribal India. In: M. Carrin (Editor-in-Chief)/M. Boivin/G. Toffin/P. Hockings/R. Rousseleau/T. Subba/H. Lambs-Tyche (Section Editors), Brill's Encyclopedia of the Religions of the Indigenous People of South Asia Online, DOI.org/10.1163/2665-9093_BERO_COM_031977.

Ingold 2000: T. Ingold, Hunting and Gathering as Ways of Perceiving the Environment. In: T. Ingold (ed.), The Perception of the Environment. Essays on Livelihood, Dwelling and Skill (London 2000) 40–60.

Jena et al. 2002: M. K. Jena/P. Pathi/J. Dash/K. K. Patnaik/K. Seeland, Forest Tribes of Orissa. Lifestyle and Social Conditions of Selected Orissan Tribes. Man and Forest 2 (New Delhi 2002).

Kunstadter 1987: P. Kunstadter, Swiddeners in Transition. Lua Farmers in Northern Thailand. In: B. L. Turner/S. B. Brush (eds.), Comparative Farming Systems (New York 1987) 130–155.

Niggemeyer 1964: H. Niggemeyer, Kuttia Kond. Dschungel-Bauern in Orissa (Frankfurt am Main 1964).

Otten 2006: T. Otten, Heilung durch Rituale. Vom Umgang mit Krankheit bei den Rona im Hochland Orissas. Indus 9 (Münster 2006).

Padel 1995: F. Padel, The Sacrifice of Human Being. British Rule and the Konds of Orissa (New Delhi 1995).

Robbins/Sommerschuh 2016: J. Robbins/J. Sommerschuh, Values. In: F. Stein/S. Lazar/M. Candea/H. Diemberger/J. Robbins/A. Sanchez/R. Stasch (eds.), The Cambridge Encyclopedia of Anthropology (New York 2016), DOI.org/10.29164/16values.

Maike Melles

The Representation of the *Dehesa* Landscape in Spanish Local Museums

Keywords: *dehesa*, landscape, museum, cultural heritage, representation, patrimonialisation

Abstract

The *dehesa* is a landscape located in the southwestern Iberian Peninsula and constitutes a central resource for livestock farmers. Its utilisation relies on partly long-lived farming practices, such as the acorn-based fattening of the Iberian pig in winter time or the extraction of the cork oak bark during the summer's cork harvest. However, the *dehesa's* preservation is also a key concern of processes related to the region's cultural heritage. Key players in the patrimonialisation are two 'museums' or, rather, visitor and marketing centres, which incorporate the landscape as one part of a cultural complex evolving around the region's most renowned product: Iberian ham gained from Iberian pigs. The question arises which consequence the embedding of the *dehesa* in this museum marketing for *jamón ibérico* has for the way this landscape is represented in the two facilities. After establishing the *dehesa* landscape as a social and cultural phenomenon, two contrasting approaches to landscape will be introduced. Whereas one of them stresses the performative and experiential character of landscape, the other points out the transformative nature of archaeological and anthropological research. Subsequently, detailed accounts of the exhibitions of the two museums will be given in order to evaluate the role that each of them ascribes to the *dehesa*. The findings will be interpreted and discussed with special attention to whether and how past and present human lived realities are conveyed.

1. Introduction[1]

Located in southwestern Spain, the *dehesa* landscape constitutes a central resource for local livestock farmers.[2] From a functional perspective informed by agricultural science, it may be termed an agrosilvopastoral landscape which brings together practices of livestock farming with agriculture and forestry, each to a different degree depending on the land's composition. The *dehesa's* distinctiveness as grazing land lies in the high number of oak trees of which holm oaks (*encinas*) and cork oaks (*alcornoques*) are the most prominent. With the production of huge amounts of acorns (*bellotas*) in autumn and winter, the oak trees account, together with the precious bark of the cork oaks, for the *dehesa's* high economic significance. In several areas, the acorns play a central role in the fattening of the Iberian pig, from which the well-known *jamón ibérico de bellota*, Iberian ham, derives.

Etymologically and historically, the word *dehesa* refers to land that has been enclosed in the protection against third-party use (Guzmán Álvarez 2016, 3). In the course of the so-called Reconquista, particularly in the 12th and 13th cent., the *dehesa* became established as a juridical category and could indicate both the common property of a village and the private possessions of the profit-seeking nobility (Carmona Ruiz 2018, 112). Today

1 This chapter is the result of the author's first of two seasons of fieldwork and a paper presented at the EAA annual meeting in Barcelona on September 6th, 2018.

2 This type of landscape is found not only in Spain, but also in Portugal, where it is called *montado*. This contribution's focus is laid on the *dehesa*.

the *dehesa* is mostly privately owned and subdivided into properties referred to as *fincas* (farms) which vary considerably in size and may comprise from one to fifty up to several hundred or even thousands of hectares. These farms used to bustle with activity until the middle of the 20th cent., when labour force was cheap and landowners could afford whole families to work for them and keep their lands in good shape. Today, by contrast, the properties seem neglected and often deserted. Either way, the *dehesa* is of utmost importance and a means of livelihood enabling local extensive pig-farming, an activity carried out mainly in northwestern Andalusia and southwestern Extremadura.[3]

After Spain's accession to the European Union in 1986 and the definite eradication of the African swine fever in 1995, the stock of Iberian Pigs recovered noticeably and raised the production of their best-known product, Iberian ham. However, decades of economic hardship and industrialisation efforts had led to the notable decrease of the *dehesa's* geographic extend in Spain and therefore of the ham's indispensable basis (Lavado Contador et al. 2000). Wherever possible, the prominent oak trees had been removed to turn the *dehesas* into arable land (Guzmán Álvarez 2016, 3) or had been substituted by eucalyptus plantations as suppliers for the big paper mills (Benito Hernández et al. 2001, 76). Economic recovery and ecological reflection have led to an increasing awareness among political actors and stakeholders (farmers, environmentalists and the local population) of the *dehesa's* endangered state and to the recognition of the need to preserve this landscape and related cultural practices.

At the same time, a regional product such as Iberian ham becomes greatly promoted and marketed and, importantly, forms part and parcel of the region's patrimonialisation. Patrimonialisation, the establishment of cultural heritage (*patrimonio* in Spanish), relies on the exploitation of a region's or product's (alleged) historical past and involves administrative and financial preservation efforts which promote local economic development not least by increasing tourist attractiveness (Boltanski/Esquerre 2018, 47 f.). Of course, the efforts to launch the *dehesa* and Iberian ham as cultural heritage also serve to safeguard the landscape as the local population's environment and livelihood. One central element in the establishment of cultural heritage are museums which link the objects displayed in their exhibitions with a story or narrative to valorise them (Boltanski/Esquerre 2018, 34 f.). However, the facilities which call themselves *museos* in the present case are better identified as visitor and marketing centres. Though they provide information on the past and present production of *jamón ibérico*, they do so with one aim in mind, which is to promote consumption and thus increasing sales of the product at the heart of their exhibitions.

In southwestern Spain, there are two local 'museums' dedicated to Iberian ham, one of them in a small town in Andalusia and the other in an Extremaduran village. Both commence their exposition with the introduction of the *dehesa* as the indispensable base for high-quality ham. Furthermore, it is praised as a hotspot of biodiversity and paragon for sustainable extensive livestock farming. To make this landscape's unique character more tangible to the visitor, in both museums columns vested as oak trees are installed. This creative engagement in showcasing the *dehesa* raises interest in the question whether landscape can actually be represented in a museum and, in particular, when the landscape at hand is understood – from an anthropological point of view – as a cultural and social phenomenon. Furthermore, and as the museum is primarily dedicated to Iberian ham, the question arises whether the subordination of the *dehesa* to a regional profitable product and its corresponding representation in these museums have a bearing on how past and present human experiences within this landscape are conveyed?

After exemplifying the *dehesa* as a cultural and social phenomenon, the more general question of how landscape can be conceptualised from an anthropological point of view will be raised. While one approach stresses the performative and experiential character of landscape, the other points out the transformative nature of archaeological

3 In other areas of the region Extremadura, where stretches of *dehesa* still exist, extensive livestock farming rather concentrates on cows (western Extremadura) and sheep (eastern Extremadura).

and anthropological research and introduces the distinction between a primary performative and a secondary indoor landscape. Subsequently, detailed accounts of the exhibitions of the two museums will be given in order to recognise how landscape is embedded and framed in their exhibitions. The findings will be interpreted and discussed with special attention to whether and how past and present human lived realities are conveyed. The incorporation of human experiences is necessary to represent the landscape as a cultural and social phenomenon.

Fig. 1. Cork planks after being boiled in a processing factory.

2. The *Dehesa* from the Anthropologist's Perspective: A Cultural and Social Landscape

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), cultural landscapes are 'combined works of nature and humankind' (UNESCO 2018). Bracketing the question of what 'nature' could refer to, it follows that the *dehesa* without being constantly worked upon with human hands, ceases to exist. The *dehesa* can thus be described as a cultural phenomenon; its resources give rise to cultural practices such as the long-proven craft of the cork harvesters (*fig. 1*) and, equally, the artwork that has evolved around the production and consumption of Iberian ham constitutes the latter as a resource in the first place. Even the species and shape of the oak trees is no coincidence as their growth is carefully controlled for by planting and pruning work; and even the most autochthonous and old-established animals in the *dehesa* are the product of domestic breeding.

Landscape as a resource is, consequently, a result of culture, constituted as such not only by the practices involved in the culturally shaped utilisation of resources such as the *dehesa*, but also by the values and beliefs which underlie these practices (Hardenberg et al. 2017, 19). For instance, today's practices in and discourses on the *dehesa* reveal a high esteem among southern Spanish rural people, in particular farmers, for their origin and way of life – *nuestra tierra* ('our land'), *gente del pueblo*/*gente del campo* ('village people/country people'), *nuestro patrimonio* ('our heritage'). A value repeatedly brought forward in the discourse on the preservation of the *dehesa* is that of the local (*de aquí*) and of sustainability (*sostenibilidad*) or harmony (*armonía*) with the local environment to be found in the allegedly traditional extensive farming practices. Moreover, the Spanish cuisine not only in the rural area consists almost exclusively of food perceived as regional.

However, landscapes are not only a cultural, but also a social phenomenon, that is a resource around which social relations evolve. The farms in the *dehesa* are mostly passed on within the family, and many owners rely on long-established relations with their employees and business partners. In order to keep the *dehesa* in good shape, a variety of activities are carried out by workers employed by the farm owners, workers and technicians from outside, family and friends and the owners themselves. Hence, the *dehesa* also forms part of social relations. These are structured around the daily life in relation to that landscape and imply family relations, social hierarchies, relations of land property, heritage and ownership, work relations, trade relations and relations of friendship and mutual support.

Sociocultural dynamics have a bearing on the valuation, exploitation and utilisation of the *dehesa* as a resource. In the 1960s, numerous inhabitants of the villages sought to escape misery and semi-feudal relations in the rural areas of the South and migrated to cities such as Madrid and Barcelona in search for work and a better life. This led to a dramatic exodus and had many villages

Fig. 2. Two purebred Iberian pigs on a *finca* in the *dehesa*, Jerez de los Caballeros (Extremadura).

more than halved or even quartered their population within ten to twenty years.[4] The ongoing depopulation of these areas is a challenge still of today and is reflected together with the general social advancement in the *dehesas* of the South: some of the properties that used to be worked upon by whole families – usually employed and accommodated in conditions which deserve the label of feudal servitude and exploitation (Conde Caballero 2018, 15) – nowadays seem deserted or are maintained only by one or two farmworkers who may well work on several hundred or even thousands of hectares. However, eco-farming and food trends such as pastured pork and an increasing demand for local and artisanal products, related in particular to the rise of rural tourism, reinforce the livelihood of a resource and way of life that in the course of the industrialisation of agriculture and livestock production ran the danger of being outdated.

In spite of the central role ascribed to the human in shaping the *dehesa*, the transitions between cultivated and forested areas, where red deer, the Iberian lynx and other showpieces of biodiversity can be found, are smooth. Plenty of discrete existences are provable in the *dehesa* but may not always be observed on the face of it – be it the various migrating bird species or the tiniest beetles which make their way through soil and tree, from the immigrated underground fungus-like *phytophthora* killing numerous holm oaks before their time to the ensemble of environmental factors bearing on the trees' amounts of acorns and thus on the livelihood of many pig farmers (*fig. 2*). Therefore, the *dehesa* evades the typical nature-culture distinction so often consulted; it is neither exclusively, but rather a reflection and mediator of what may be called nature, cultural and social life. Reducing landscape to any of these components would deny the complexity of relations inherent to it. Taking into account this finding on the complexity of landscape and in order to approach the question of how the *dehesa* is represented in the two 'museums', it seems reasonable to take a closer look at how landscape can be conceptualised. In the following, two frequent approaches to the issue will be consulted to contrast their different understandings of landscape and the related role of the human being each of them implies.

3. Two Views on Landscape

3.1. Landscape through History: From Politics to Paintings

'Landscape' is related to the German *landschaft*. The latter used to be applied since the early Middle Ages as a political term referring to a collective of people subject to the respective customary laws in areas in the North Sea and western Baltic regions; regions, which due to their geographical qualities and marginal location – and, consequently, their neglect by the ruling centres – possessed a high degree of autonomy (Olwig 2002, xxvi). In this way, the area inhabited by a people was defined by customary law and social practice and thus by the social collective rather than by any imposed territorial limits. Landscape at that time can thus be said to 'denot[e] a collective relationship with land more than a specifically bounded territory' (Cosgrove 2006, 54). However, from the Renaissance onwards the term landscape became more

4 In the representative example of Siruela, a municipality in Extremadura, the number of de jure inhabitants decreased from 5,340 in 1960 to 3,635 in 1970 (-32%). In 1981, the population had shrunken to 2,631, which equals its halving in comparison to 1960 (INE 2020a). According to the latest census as of 1 January, 2020), 1,861 people live in Siruela (INE 2020b).

and more connected to its artistic counterpart, the landscape painting, initially found in the Italian/Dutch tradition (Cosgrove 2006, 55). Landscape as the expression of customary law and a political collective became hence complemented and slowly, though never completely, replaced by an individual observant and aesthetically judging perspective from outside.

The German philosopher Georg Simmel views landscape as the result of a unifying process of the mind through which a new whole, the landscape, is created. For example, a landscape may be perceived to comprise a lighthouse, a dyke, a small flock of sheep, and the seashore behind. However, landscape is not only the result of elements fused together through a subject's creative perception, but also of the dividing view of the human being which turns a piece of the actual whole, of what Simmel calls 'nature', into a unit of its own (Simmel 2008, 42). The artist's landscape painting serves Simmel as a proxy for this contemplative process since the act of painting a landscape is to him the most perfected form of the human individualisation of nature. Simmel concludes that the creation of landscape is at once a seeing and a feeling act (Simmel 2008, 49): whereas the artist is able to conduct both formative acts in pure form and only sees and designs landscape, the rest of humankind can only perceive this unity of landscape through its innate 'mood' while otherwise being subject to analytical or dividing cognitive processes. These lead to the perception of special elements that for them do not fuse into the landscape's whole (Simmel 2008, 52). Still, landscape is for all humans – be they artists or ordinary people – a constructive process of the mind. The 'objectivity', that is the existence of landscape 'out there', applies only within the realm of the human creativity: without human mind, there is no landscape, just nature.

Today's common usage of the term landscape, and, in a similar vein, of the Spanish equivalent *paisaje*, refers to its inherent physical features and its perception by us as '[l]andscapes have an unquestionably material presence, yet they come into being only at the moment of their apprehension by an external observer' (Cosgrove 2006, 50). Therefore, whereas the tangible qualities of landscapes are irrefutable, the fact that a certain

Fig. 3. A group of holm oaks in the *dehesa* in the Spanish-Portuguese border area.

section of land is called a landscape is indeed owed to a perceptive process based on cultural notions of the environment which in Western contexts are frequently expressed in the realm of geography and aesthetics or art (Bender 1993, 1): here, the term landscape often provokes ideas of the neat mapping of a certain area or, contrastingly, a spectacular photograph, the modern version of the landscape painting, which seeks to convey the breath-taking view and endless expanse of nature without human. Even the anthropogenic *dehesa* of the Iberian Peninsula is truly a picturesque landscape. It appears as a heavily cleared forest, thus evading the wood's usual density and narrowness, with extensive and at times rich green pastures around its prominent trees. The *dehesa* impresses with the interplay of strong oaks – which in unity constitute the landscape, similar in shape but each with a slightly different way of arching – and the spaciousness the trees allow (*fig. 3*). However, the value of the *dehesa* lies not only in its aesthetics, but also or rather in its diverse goods which form the basis for people's livelihood – its pastures, the oak trees with their precious acorns and wood, or, in the case of the *alcornoque*, its cork bark, the autochthonous (and other) animals it gives shelter to, such as the Iberian pig, cattle, and Merino sheep. All animals provide meat and the latter, in addition, its sought-after wool. Further goods include honey, mushrooms, or asparagus.

So far, landscape has been introduced as a subjective-relational term as its perception or even creation (Simmel 2008) by the human mind

is required. This notion of landscape relies to a high degree on the figure of the 'external observer' who stands aside and is not involved in their surroundings. Here, landscape is characterised as something distinct and separate, untouched by humans but whose presence depends on human cognition. It resembles the objectification of landscape and places the latter in opposition to the independent subject. What has been left out is the question of how landscape is perceived and thus changes its phenomenal character, if not only observed from the outside, but if the notion of social practice inherent to the term *landschaft* is reintroduced, for example when the human body is perceived as actually 'dwelling' in the landscape (Ingold 1993, 152). As the *dehesa* is a working landscape, it seems reasonable to look at these performative aspects of this human-made landscape in closer detail. Anthropological accounts of landscape are a rare good and frequently view landscape as a performative undertaking that relies on notions of embodiment and temporality (Tilley/Cameron-Daum 2017). This performative concept of landscape was famously championed by Tim Ingold 25 years ago in his essay on 'The Temporality of the Landscape'.

3.2. Ingold's Native Dwelling

To Ingold, landscape is the result of mainly human bodies dwelling in it – though the presence of animals is also admitted (Ingold 1993, 156). It is distinguished from the term environment, which relates to function and affordances and which Ingold conceptualises as a reality for the human being. Landscape, on the contrary, is not function; it is form which is generated through embodiment. To complement this emergent vision of landscape, a dwelling perspective is introduced, 'according to which the landscape is constituted as an enduring record of – and testimony to – the lives and works of past generations who have dwelt within it, and in so doing, have left there something of themselves' (Ingold 1993, 152). Dwelling refers to the tasks carried out by 'a skilled agent in an environment, as part of his or her normal business of life' (Ingold 1993, 158). Ingold emphasises the social character of the performance of these tasks as in even the most technical operations, humans 'attend to one another' (Ingold 1993, 160). This is certainly also true for the *dehesa*, which is maintained by tasks such as the droving and feeding of cattle, the planting and pruning of the *encinas* as well as their felling and cutting up in order to obtain firewood (*leña*) and charcoal (*carbón*). Every seven to nine years the *alcornoques* of the *dehesa* undergo the cutting off of their cork barks by a team of skilful harvesters. Of course, the dwellers not only carry out their works, but in doing so create, maintain and negotiate their social ties.

Interestingly, Ingold resorts to a landscape painting, 'The Harvesters' by Pieter Bruegel from 1565, to exemplify his performative approach to landscape. Just like Simmel, Ingold views the act of painting as the process of contemplating landscape and therefore as a performative act. Consulting and describing the ready-made painting and thus the – though never complete – result of that contemplation process is to him justified as the performance of tasks gives rise to features of the landscape which long after the human dwelling 'remain available for inspection' (Ingold 1993, 162). Roughly speaking, the painting shows the process of harvesting a cornfield by a group of farmhands. On the left side of the picture the cereal is still tall and being reaped, while to the right the corn has already been reaped and is being tied into sheaves. A pathway is visible, through which sheaves are being carried away over the shoulder and water is brought by a man walking towards the resting group of workers who have gathered beneath a tree to eat and drink or just take a nap. The painting is complex and layered as the harvesting process is not only recognisable in the foreground, but also in the background, where an ox cart carrying harvested corn can be seen and there are, even further behind, more hills with fields and another cart can be recognised. The entrance to the village with a vast area in front forms also part of the background and serves as the same to another group of people that seem to be chatting and playing. Furthermore, buildings like the village's church, infrastructure such as the road network and the sea with ships sailing in it serve as the backdrop of the corn harvest.

In a nutshell, 'The Harvesters' shows exactly why landscape ought to be perceived as a cultural

and social phenomenon: people fulfil their tasks and thereby attend to one another, be it during their skilful and exhausting work or during their shared rest. The harvesting activities as a taskscape (Ingold 1993, 153) has a bearing on the landscape and its features: reaped fields, bundled sheaves, fruits from the trees that are collected and thus disappear, pathways and road networks or the flattened grass left behind on the group's picnic spot are examples of how the taskscape 'collapses into' the landscape (Ingold 1993, 153). In the following, however, the focus will be on the fact that Ingold invites us to not only look at the picture, but to go on an imagined journey into the scenery to 'look around' (Ingold 1993, 166). It is remarkable that he applies vocabulary such as 'muscular consciousness' (Ingold 1993, 167) or 'resonance' (Ingold 1993, 171) to capture the supposed bodily experience of landscape while still referring to and describing a landscape painting from almost 500 years ago. It seems that Ingold wants to revive past performance with a 'thick description' of what in the ethnographer's example could be the snapshot from the field. Much as one would like to give in to this invitation to an imagined journey into the rural life of the 16th cent.: with this illustration of his performative approach to landscape Ingold is unconvincing. How does the anthropologist manage to capture landscape in ethnography without turning it into a distant object?

In his piece, Ingold comments on the work of archaeologists and their excavation experiences: to Ingold, the archaeologist's digging and sampling is itself performance, an act of dwelling in the landscape. 'The knowledge born of this practice is thus on par with that which comes from the practical activity of the native dweller and which the anthropologist, through participation, seeks to learn and understand' (Ingold 1993, 152). The excavation work of archaeologists is therefore an extension of the landscape's corresponding taskscape in its substantive and temporal dimension. Dwelling in the landscape, no matter at which time and performing which task, will in any case bring the dweller closer to the lived experience of past or 'native' dwellers. Just by digging deep in the landscape and their presence in it can the archaeologist somehow approximate the complex scenery of the corn harvest from 500 or even thousands of years ago; past social and cultural landscapes are therefore, to Ingold, accessible at any time in the present.

3.3. Native Dwelling Revisited

Almost 25 years later, an actual archaeologist critically appraises Ingold's elucidation of his discipline. Emphasising that the work of archaeology is a 'creative destruction' (Hicks 2016, 13) of the landscape, Dan Hicks wishes the knowledge obtained through excavation and documentation to be understood as archaeological – other than somewhat indigenous – knowledge. Archaeological knowledge 'emerges through techniques of temporal protention, central devices for which include the museum and the archive but also encompass the site and landscape, transformed' (Hicks 2016, 7). Hicks denies that it is possible for archaeologists to go native in hindsight and rather wants his readers to embrace and be aware of the specificities of archaeology as a modern Western discipline – a discipline that has its place and made its contribution within other modern enterprises such as the imperial age or industrialisation processes. What is left behind of the past and can be detected in the presence is better characterised as an archive rather than as a first-hand ancient site.

The reconstruction of the past is at once enabled and limited by the fragmentary remains in the field archaeologists encounter; they rather dwell within their own taskscape, the archaeological practice, than joining or even entering that of people and contexts that ceased to exist long ago. Though the archaeological work on site and in the archive is certainly a performance in and of itself, it is directed at archival objects and only allows for the mediation of once lived realities through documentation and necessarily fragmented representation. 'Performance's only life is in the present' (Hicks 2016, 16). Hicks questions the very idea of Ingold's account on landscape, namely that dwelling researchers could in any way comprehend lived realities of the past just by their working presence in that landscape. Hicks' criticism may be extended to Ingold's idea that the painting of a landscape is also a performance similar to that of

dwelling: there is a difference in painting a landscape, which requires the painter's keen eye for unity and harmony, and the actual performance in the landscape with all its fulfilments and frictions. What is more, museum collections, archives and databases are to Hicks secondary landscapes which may never come close to performed landscape, but which are the only material available to the researcher and in their supposed conclusiveness – 'provisional totality' (Hicks 2016, 14) – allow for a methodologically controlled approach to the past whose result is the archaeological landscape, a place revisited. It may be added that a painting or a photograph also belong to a landscape's archive rather than to its corresponding taskscape.

What can be made of these two contrasting views? On the one hand, landscape as performed through a taskscape is an appealing notion especially to anthropologists who study the cultural practices and values as well as social relations which evolve around landscapes such as the Spanish *dehesa*; on the other hand, Hicks is certainly right in stating that the same performance cannot be saved, let alone re-enacted, through anthropological or archaeological methods. Rather, one sees oneself confronted with a different kind of reality that is indeed objectified once it has been documented. Maybe the underlying question is not so much whether and how to deal with primary or secondary landscapes; what if landscape has never been performative? An anthropologist doing their fieldwork about the *dehesa* by dwelling in this landscape will never hear the people with whom they study, who in most cases are local livestock farmers (*ganaderos*/*ganaderas*), use the term landscape (*paisaje*) to refer to their rural surroundings. They prefer to speak about their *finca*, *el campo*, or *la tierra* to orient and relate themselves to their environment. While the vital discussion of an anthropological understanding of landscape has to be continued elsewhere, the following account of the two local ham museums deals explicitly with the representation of the *dehesa* as it is included into the exhibition of a visitor and marketing centre that is dedicated to an emblematic product. The description should also facilitate to understand whether Hicks' distinction between a primary performative and secondary objectified 'indoor' landscape is useful and which consequences the mode of representation bears for the conveyance of human lived realities.

4. The Representation of the *Dehesa* in Two Spanish Local Museums

There are two local *museos del jamón* (ham museums) in southwestern Spain: one of them was founded in 2012 (readjusted in 2016) and is located at the entrance to Monesterio, a village of 4000 inhabitants in southern Extremadura. The second museum was inaugurated in 2005 and can be found in the centre of Aracena, a small town which is home to 8000 people. Whereas the production of Iberian meat and in particular, Iberian ham, is of high economic importance to both municipalities,[5] Monesterio seems, given its size, almost paved with ham shops – along the thoroughfare of 1.5km length alone there are more than a dozen stores. While the ham museum in Aracena has 30,000 visitors a year, in Monesterio they comprise 10,000 only.[6] This stark difference may also be due to Aracena's location in the Sierra de Aracena y Picos de Aroche, a natural park that is home not only to *dehesas* but also to the Sierra's Mediterranean forest. With more gastronomic and accommodation providers and given its larger size, Aracena's touristic offer is much more diversified (*fig. 4*). It is domestic tourists who account for the vast majority in the regions and the museums, whereas the second-largest group are visitors from other EU member states. Only a minority comes from

5 See the development plans for Monesterio (CEDECO 2014, 42) and Aracena (GDR 2014, 74).

6 According to HuelvaHoy 2017 and ElDiario 2016 – there are no official statistics available – these are the respective numbers of visitors for the year 2016. Interestingly, most recent data provided to me by the tourist office in Monesterio reveal that in 2018, a total of only 3895 and, in 2019, 3888 people visited the museum. This would mean that the number of visitors per year decreased by two thirds within two years. Alternatively, these results may also give reason to reconsider the reliability of the data given for 2016 by the newspaper El Diario. During my stay in Monesterio in November 2017, there were only two museum visitors within a whole week.

non-European countries.[7] Both local museums are dedicated to the regions' most famous culinary product, Iberian ham, and thus subordinate the topic of landscape to this overall theme. Still, each of them dedicates a whole chapter, that is an exhibition room, to the *dehesa* as *un paraje único* ('a unique place' museum in Monesterio).

4.1. Museo del Jamón in Monesterio

According to its website, the museum in Monesterio 'offers a tour full of experiences' (Museo del jamón 2020). It advertises 'the multiple resources that will trap you in each of the rooms, creating a surprising, motivating, fun and above all interactive tour, as many of the resources will be activated with your help, also becoming the protagonist' (Museo del jamón 2020). Its aim is to 'make known the emblematic product of the town of Monesterio: acorn-fed Iberian ham' (Museo del jamón 2020). The visitor starting their tour enters the *dehesa* room and is directly confronted with a life-sized reproduction of an Iberian pig grazing beneath an oak tree. After a short historical introduction on a separate board, the surrounding walls, conveying the *dehesa's* abundance in lush green colour, are divided in one part on *el cerdo ibérico* (the Iberian pig) and another on the oak trees (*Quercus*), with the backdrop of a panorama showing a small herd of Iberian pigs in the *dehesa*. First, the varieties of the Iberian pig breed (*raza ibérica*) are depicted, from the common *retinto* to the endangered *manchado de Jabugo*. Via touchscreens the visitor can learn more about the life cycle of the pigs in relation to their environment, for example that the *montanera*, the fattening of the pigs with mainly acorns in the *dehesa*, takes place in the winter time, from November until February, which is when they are slaughtered (*fig. 5*). In summer, they are fed cereal supplements and the sows give birth to the piglets after five months of pregnancy.

Fig. 4. During *Día del Jamón*, a local event in Monesterio dedicated to Iberian ham, its skilful slicing is demonstrated.

Fig. 5. The acorns of the holm oak play an important role in the fattening of Iberian pigs (*montanera*).

Another green board shows the trees of the *dehesa*, which all belong to the family of the *Quercus* (oak), such as the holm oaks (*encinas*) and cork oaks (*alcornoques*), but also the Portuguese oak (*quejigo*) and the Pyrenean oak (*roble melojo*). Information on their flowering seasons, their acorns and their leaves are given: while the holm and cork oaks commence their flowering in March,

7 Again, I refer to the data provided by the tourist office in Monesterio. In 2019, 2972 of 3888 visitors were Spanish citizens (76.5%, most of which came from Andalusia, Extremadura, and Madrid), 563 (14.5%) from other EU member states and 353 (9%) from outside of the EU.

Fig. 6. A holm oak bearing abundant acorns in Siruela (Extremadura).

Fig. 7. Intimate unity? The life-sized figure of an Iberian pig in front of the facsimile of a holm oak in the Museo del Jamón, Monesterio.

the Portuguese and Pyrenean oaks start in April. All of them end in May but the *alcornoque*, whose blossoming stops in June. Whereas the leaves of the *quejigo* and *roble melojo* fall in autumn until springtime, those of the holm and cork oaks are evergreen and last on the trees either between 13 and 23 months (*alcornoque*) or even between two to four years (*encina*). The most important part, recognisable by the relative size of space it takes up, is that on the oaks' acorns: the Portuguese oaks' acorns are the earliest to ripen, in September and October, whereas those of the other three oak types fall primarily in October and November. The visitors learn that the acorns of the cork and the Pyrenean oak are rather bitter, whereas those of the holm oak are the sweetest and the most abundant in terms of availability.

The oak trees' function for the *dehesa* is also explained: they protect its soil from erosion, regulate temperature and serve as refuge for the local fauna; they shield off frost in wintertime and give shade and cooling in the summer, support the pasture's growth and quality beneath their crown, they protect the soils from insolation and save the water. Finally, their fruits, the acorns, are praised as an important nutritional resource for pigs as livestock which equips their derivative products with quality (*fig. 6*). This is no surprise given the importance attached to the acorns for the fattening of the Iberian pig and thus the production of *jamón ibérico*.

Before finishing the exhibition room on the pigs' environment, the visitors may weigh themselves on a scale that is placed next to the life-size figure of the Iberian pig. The slaughter weight of the pig is indicated in a traditional measurement unit as roughly 16 *arrobas*, corresponding to 184 kilograms (1 *arroba* = 11.5kg). The pig sculpture is placed in a green-edged circle of artificial grass. Behind it, a plastic tree trunk towers above another unit of green plastic soil whose crown is symbolised by three round layers of the same green plastic material, growing bottom-up in circumference so as to imitate the spreading branches of the tree-top. In the tree trunk, there is a hole of the size of a hand which accommodates the plastic copy of a bug, *cerambyx cerdo* (great capricorn beetle), of at least eight times the original size so as to convey the threat this creature presents for the survival of the *dehesa's* stock of oaks. The bugs infest the trees to lay their eggs; later, the larvae eat their way through the trunk and leave behind a tunnel system which is clearly recognisable once the tree has been felled and sawed up. Either way, the ham museum visitor leaves the first exhibition room on the *dehesa* with the impression of the inseparable unity of the Iberian pig and the oak (primarily holm oak) which finds its expression in the local *dehesa* landscape (*fig. 7*).

The next room is dedicated to 'tradition and modernity' (*tradición y modernidad*) with respect to the pigs' slaughter. Traditional utensils are exhibited which are needed for the festive but formerly vital home slaughtering that used to take place by the end of January, the beginning of February. It represents a practice that is becoming

increasingly rare. However, the filmed narrated accounts of village inhabitants of two generations – very elderly and middle aged – who seem to uphold the tradition, deliver information on the course and tasks involved in the *matanza*: while the men are charged with the pig's killing and preparation, women and children would make the sweets (*dulces*) for the habitual coffee break, provide bowls and receptacles and prepare the necessary spices such as black and red pepper, salt and garlic for the production of sausages (*embutidos*) such as *chorizo*. The *matanza* is a social event which not only gathers family and friends, but neighbours and even whole villages in the host's place, which may be a farm or the inner courtyard of a plain house in the village. Everyone partakes in the production and preparation of *jamón*, *embutidos* and other kinds of meat derivatives. Objects such as old bowls and wooden vats for the pig's innards and blood, mortar and pestle for the mixed spices and an ancient manual grinder are exhibited. On the opposite side of the room, the modern version of the *matanza* is shown: the serial killing and processing of numerous pigs in today's factories. The museum labels suggest that only the means have modernised and the elaborative processes have remained essentially the same.

The following room on 'the delicacy of the Iberian pig, the ham' (*el manjar del cerdo ibérico, el jamón*) deals with the consumption of this product which in the same vein becomes 'gourmetised'. Information on the differences in quality of the hams is given: with respect to the breed, 100%, 75% and 50% *ibérico* (of Iberian pig breed) can be distinguished. While 100% means the ham derives from a purebred, 75% means that the father of the pig is only half-Iberian, whereas in the case of 50% only the mother is thoroughbred. Furthermore, the caption *de bellota* indicates whether the pig has gone through at least two months of the *montanera*, the fattening with acorns; this is important for the acquisition of the typical nutty flavour of the hams. The differently coloured product labels for the hams are introduced which are issued on the basis of the quality norm (national level) and the protected designation of origin (EU). They indicate the purity of the breed and whether the pig has passed the *montanera*. Apart from that, the visitor is offered a tactile and olfactory test of ham and videos are displayed demonstrating the artisanal cutting of the ham by hand and the ham knife (*cuchillo jamonero*) or illustrating how to serve its slices on a plate. Next to the screens, in the *bodega* (cellar), several hams are hanging in abundance with a black label and the museum's name as their caption. In the middle, the positive health effects of the ham are praised, due mostly to its relatively high content of unsaturated fats, a particularity of the Iberian breed. Eating Iberian acorn-fed ham is thus not only good for the *dehesa*, but also for one's own body, one's heart and one's muscles.

Finally, a screening room with a few bench rows may be entered: while one movie that is shown is the documentary of the traditional *matanza* in length, the other is a contribution on the *dehesa*, the pig, and its main derivative, the *jamón ibérico*, underlaid with flowery string music, conveying the perfect harmony of animal production and environment and culminating in the pleasure of eating high-quality ham in enjoyable company at a dinner party. All in all, the museum in Monesterio displays detailed technical information within a smooth-running exhibition across three small rooms. Through the careful configuration of colours (lush green, various red tones and black), materials (plastic cladding and screens) and (interactive) media, a 'stylish layout is produced'. Ethnographic data are edited only once in the section 'tradition and modernity'. The *dehesa* landscape is represented here as the 'natural' habitat of the Iberian pig, with which it forms a perfect symbiosis: animal and environment form a natural and seemingly indivisible unity. Furthermore, there appears to be a fluent transition from past to modern slaughtering and processing practices of the pigs. It is striking that with regard to the *dehesa*, the role of the humans is not even indicated; only the pigs seem to dwell in this landscape and the lived realities of the rural people become somehow limited to the sensation of the production and consumption of *jamón ibérico*.

4.2. Museo del Jamón in Aracena

In Aracena, the ham museum was 'created to provide information and spread, in a didactic way,

Fig. 8. Three stages of the cork oak bark are displayed in Aracena's ham museum.

an entire thousand-year-old culture of the sierra passed on from parents to children' (Aracena 2020). It embeds its exhibition in the wider context of the natural park 'Sierra de Aracena y Picos de Aroche', which forms part of the *Sierra Morena*. In the same building, an exposition on the woodland mushrooms of the Sierra can be found, and the last exhibition room after the ham-related parts deals explicitly with the natural park, its ecological aspects and touristic offers. It also seeks to contextualise ham as a regional product on an international scale, mentioning equivalents to *jamón ibérico* such as the Italian *Prosciutto de Parma* or the German *Ammerländer Schinken*. This information can be found in an antecedent space together with a short historical introduction. The first actual exhibition room is on *la fórmula del jamón* and presents the five essential elements of the culture that has evolved around ham on boards of different colours: the Iberian breed, the acorn, the *dehesa*, the climate, and the artisanal knowledge. This 'formula of the ham' may also be regarded as a rudimentary ResourceComplex in the sense of SFB 1070 ResourceCultures. A ResourceComplex is defined as 'contingent and historically grown combination of things or objects, persons or individuals, knowledge, technologies and practices' (Teuber/Schweizer 2020, 12). The five elements of the Spanish ham culture may be regarded as a set of related and interdependent resources, placing the ham in the analytical centre; the absence or modification of only one element would have a bearing on the complex as such and may compromise the quality of acorn-fed Iberian ham.

The following big room is dedicated to the *dehesa*. Information is given on its occurrence, the typical trees, which in the surroundings of Aracena include chestnuts, though to a much lesser degree than the oaks, underbrush like *madroño* (strawberry tree), *romero* (rosemary) and *jara* (rock rose) as well as pasture like *gramíneas* (grasses) and *leguminosas* (legumes). Afterwards, the visitor may watch a documentary film, again underlaid with enthusiastic string music and numerous pictures of pig herds running across the *dehesa* or tourists discovering the environment on a hiking tour. The spectators are seated on benches between three columns intended to imitate three stages of the cork oak: with full-grown cork bark, with reddish brown skin after its recent harvest and with dark brown skin during its recreation after some years have passed (*fig. 8*). To showcase the resource cork to its fullest, a package of cork bark sheets is also exhibited. Here in Aracena, only the columns or 'trunks' are imitated, which reach into the ceiling but do not have any treetops. Next, information on the general type and the two most prominent trees in the *dehesa* are given: *encina* and *alcornoque*. The visitor learns that the acorns of the holm oak are the most abundant and nourishing so that for a pig to gain one kg of weight four times the amount of acorns of the *alcornoque* is needed in comparison to the *encina's* acorns, which is due to their higher energy value. Furthermore, the other resources of the *dehesa* are explicitly showcased, including cork, wild mushrooms, wood, acorns and pasture, and honey.

The next large room is divided into three sections of which the first is dedicated to the Iberian pig, its cultural history, its characteristics and varieties as well as legal norms related to its breeding (*norma de calidad*). Just as in Monesterio, a life-sized pig statue can be found, though not grazing, but apparently in motion, on sparse hilly ground so as to demonstrate its robustness. Next, a juxtaposition similar to that of the museum in Monesterio compares the traditional manual *matanza* with its modern counterpart, the production of ham in factories. In comparison to the equivalent part in Monesterio, fewer objects are exhibited in this part and there are no first-hand narrative accounts on the custom. Finally, the different

processes involved in the elaboration of ham are described, that is its salting, drying and curation in the *bodega*. An olfactory example of a ham is given, and information for its proper slicing. At the end, in the last exhibition room, the visitor learns from large boards how the different body parts of the pig are called and utilised for human diet. Moreover, typical dishes made from these parts are depicted on plastic layers placed in cooking pots that may be looked into.

In comparison to the museum in Monesterio, the exhibition in Aracena is much less streamlined. The rooms are more spacious and the layout is rather classical, with large boards of frosted glass. Some elements, such as the cooking pots, may even be called old-fashioned. As in Monesterio, the only exhibition part relying on ethnographic data is that on the home slaughter. The *dehesa* is again presented as the natural habitat of the Iberian pig, but also as a landscape that can be experienced on hiking tours across the natural park.

To sum up, both museums cover more or less the same main aspects of *la cultura del ibérico*, namely a short historical introduction, the *dehesa* as the environment for raising the Iberian pigs, characteristics and varieties of the breed, the traditional manual and modern industrial slaughtering, the elaboration and preparation of different meat derivatives and in particular of ham. Furthermore, both institutions seek to educate their visitors in order to turn them into responsible consumers of Iberian ham. At a closer look, however, the pieces of information given are also quite complementary: while the museum in Monesterio attaches more importance to the gourmet and trend character of the ham, by dealing with the proper cutting and serving of the ham as well as its nutritional values and health benefits, the ham museum in Aracena is more dedicated to the characterisation of the *dehesa* in terms of its flora and further resources such as wood and honey. What is more, Aracena seeks to embed the ham into a wider context of regionality by comparing *jamón ibérico* to other ham specialities. The museums serve as visitor and marketing centres for *jamón ibérico* and not as real museums. Far from being institutions for public education and without any scientific background, these facilities are the result of the joint forces of the business sector and regional economic policy.

5. Consequences of Embedding the *Dehesa* in Museum Marketing for its Representation

How to summarise and interpret these two examples of visitor and marketing centres for Iberian ham, which call themselves 'museums', and the account they give of their regional environment, the *dehesa*? Firstly, as is clear from the outset, the issue of landscape is completely subordinate to the regions' star product, Iberian ham. The *dehesa* is dealt with in the respective dedicated exhibition rooms and also in the documentary films displayed to give impressive views of the landscape. The pig is the obvious protagonist in the *dehesa*, which not only becomes clear in the movie with herds of pigs running semi-wildly across the fields, but also in the structure of the exhibitions, tracing the life of a pig from its early days of abundance outside to its ending on the plate and palate. One cannot escape the museums' totality with respect to the *dehesa* landscape: the purpose of its existence is mainly to feed the pigs and enrich its derivatives, in particular its back legs or *jamones*. The visitor is left with the impression of an inextricable symbiotic unity of pig and *dehesa*.

Secondly and consequently, landscape appears as something void of humanity. A clear distinction between the outside and the inside is created, and indeed do both museums lead their visitors from the outdoor indoors, starting with the *dehesa* and its acorns as foundation for the ham to turn to the pigs' slaughtering and preparation with just the next showroom. Human activities in the landscape are, if at all, only indicated, as in the case of the three stages of the cork oak trunk. Consistently, the short movies displayed in the museums present the *dehesa* as a landscape where only pig herds dwell. It is a paradox that in a museum about cultural heritage – the production of Iberian ham in southwestern Spain – which is indeed an integral part of the landscape that surrounds it, the *dehesa* somehow loses its character as a cultural and social phenomenon. Through the emphasis on its value in terms of biodiversity and as natural habitat of pigs, in tandem with a lack of emphasis on

the related human labour involved in pig rearing and the maintenance of the landscape, the *dehesa* is naturalised so that culture and social life become something that is practised inside the house or factory. The vitality of the landscape constituted through interaction between humans and their environment is not conveyed. Instead, humans seem somehow confined to a distanced view as spectators from outside. This induces the visitors as well as the curators to turn a blind eye on sociocultural dynamics which are so substantial for any landscape.

A focus on product, in this case Iberian ham, which only takes into account processes outside of the *dehesa* – such as the activities involved in and after the pigs' slaughtering – necessarily neglects human realities in the landscape. It leads to a functional and technical understanding of landscape as a production base. Naturalising the *dehesa* by removing the human beings in turn reminds the visitor of their experience as external observer in art museums, where landscape paintings often convey the harmony of people dwelling in the landscape. This holds also true of the depiction of the *dehesa* as 'the best example for the respect between man and nature' ('el mejor ejemplo del respeto entre el hombre y la naturaleza') (Andalucía de Viaje 2018).

By letting the ham-centred collection and 'land without human' speak for themselves, the problem of the representation of landscape also becomes a problem of the representation of the lived experiences connected to it. Bracketing any human experience in the *dehesa* facilitates, for instance, that the semi-feudalistic relations in southern rural Spain, which prevailed well until the second half of the 20th cent., are not even indicated. Cleared and flourishing *dehesa* landscape used to be owed largely to whole families slaving away on the farms, commonly enough related to other forms of exploitation, such as sexual abuse (Hernández Marrero et al. 2010, 202). Certainly, the knowledge gained on landscape in a museum is entirely different form that which obtained in the landscape itself. Goods and objects, whether tangible (e.g. the instruments for the traditional *matanza*) or intangible (e.g. the oral accounts of the *matanza* from locals which are displayed in videos), are removed from their original contexts and assembled as a collection of their own. Furthermore, the patrimonialisation of the *dehesa* is inextricably linked to the marketing of *jamón ibérico*. Patrimonialisation, or the establishment of cultural heritage, is a process of preservation and protection with the goal of sustaining certain 'inherited' values in times of social and environmental change. A rather market-oriented patrimonialisation process like that of the *dehesa*, however, runs the danger of turning the recent past – which is still traceable and evaluable in the conversations of the elderly people in the rural areas – from an important resource into a pure marketing project that does not do justice to past and present realities.

6. Concluding Remarks

What does the example of the *dehesa's* representation in the local ham museum contribute to a deeper understanding of landscape? In the last section, two perspectives on landscape were contrasted. While one resembles an understanding of landscape as a performative undertaking, the other understanding considers landscape as something objectified and, for the time being, of a certain total character, be it from the painter's or the museum curator's point of view. Surely, once the performance in the landscape is over, it is automatically turned into something subordinate to the discretion of curators, painters or social researchers. Still, human experiences are a central element of landscape – as should be remembered, without the human mind, landscape would not even exist – and if they are omitted, landscape becomes naturalised. When the human role is limited to that of the external observer, frictions become fused into the harmonious unity of the distant landscape. The secondary indoor landscapes of the museum can enhance this reductionist understanding of landscape and disclose its social and cultural character by telling the stories of present and past human experiences.

The Spanish *dehesa* is a cultural and social phenomenon that from an anthropological point of view is truly instructive to look at. Sociocultural dynamics have had a bearing on the valuation and utilisation of the *dehesa* as a resource, and its

social history accommodates a great deal of information on related developments: the transition from manual to industrialised farming and agriculture as well as from semi-feudalistic relations to the working relations of today are obvious examples. As a reflection and mediator of nature, cultural and social life, the *dehesa* deserves close attention beyond its role as the supplier of the well-known *jamón ibérico de bellota*. Two different approaches to landscape, one resembling the perspective of the external observer and the other viewing landscape as a performative undertaking, have helped to evaluate how the *dehesa* has been 'transferred inside'.

This contribution has raised questions on the representation of landscape in museums and on the consequences of a patrimonialisation process that is subordinate to marketing processes which form part of regional economic development. A merely functional understanding of the Spanish *dehesa* as the production base for Iberian ham along with its naturalisation leads to the omission of present and past human experiences in this landscape. This is not only a theoretical impoverishment from an anthropological point of view, but also fatal in terms of the reappraisal of the recent past, which in the case of the *dehesa* is partly characterised by semi-feudalistic relations that used to be exploitative. Though the purely performative aspects of the *dehesa's* native dwellers cannot be kept alive, the archival knowledge on present and past human experience should enrich any exhibition on landscape.

Maike Melles
Goethe University Frankfurt
Frobenius Institute
Norbert-Wollheim-Platz 1
60323 Frankfurt am Main, Germany
maike.melles@posteo.de

Bibliography

Andalucía de Viaje 2018: Andalucía de Viaje, Museo del Jamón de Aracena. Un museo que hace la boca agua, <http://www.andaluciadeviaje.es/ocio/museo_del_jamon_de_aracena_337> (last access 28.02.2020).

Aracena 2020: Ayuntamiento de Aracena, Museo del Jamón, <http://www.aracena.es/es/municipio/museo> (last access 28.02.2020).

Bender 1993: B. Bender, Landscape. Meaning and Action. In: B. Bender (ed.), Landscape. Politics and Perspectives (Providence 1993) 1–17.

Benito Hernández et al. 2001: J. Benito Hernández/J. L. Ferrera Claramunt/C. Vázquez Cisneros/C. Menaya Moreno/J. M. García Casco, El cerdo ibérico. El poblador de la *dehesa*. In: W. Benítez Ortíz/M. D. Sánchez (eds.), Los cerdos locales en los sistemas tradicionales de producción (Rome 2001) 71–96.

Boltanski/Esquerre 2018: L. Boltanksi/L. Esquerre, Bereicherung. Eine Kritik der Ware (Berlin 2018).

Carmona Ruiz 2018: M. A. Carmona Ruiz, La Transformación de los Paisajes Rurales en el Valle del Guadalquivir tras la Conquista Cristiana (siglo XIII). In: J. Torró/E. Guinot (eds.), Trigo y Ovejas. El impacto de las conquistas en los paisajes andalusíes (siglos XI–XVI) (Valencia 2018) 93–117.

CEDECO 2014: Centro de Desarrollo Comarcal de Tentudía, Estrategia de Desarrollo Local Participativo Comarca de Tentudía 2014–2020, <https://tentudia.com/wp-content/uploads/2018/08/2.-I.A.-CEDECO_TERRITORIO.pdf> (last access 28.02.2020).

Conde Caballero 2018: D. Conde Caballero, Tiempos sin pan. Una etnografía del hambre de postguerra en Extremadura. Resumen Tesis Doctoral, <http://e-spacio.uned.es/fez/eserv/tesisuned:ED-Pg-DivSubSoc-Dconde/CONDE_CABALLERO__David_Resumen_Tesis.pdf> (last access 28.02.2020).

Cosgrove 2006: D. Cosgrove, Modernity, Community and the Landscape Idea. Journal of Material Culture 11, 2006, 49–66.

ElDiario 2016: ElDiario, El Museo del Jamón de Monesterio readapta sus contenidos e incorpora nuevos recursos, last updated 27.08.2016, <https://www.eldiario.es/eldiarioex/cultura/Museo-Jamon-Monesterio-contenidos-incorporado_0_552245411.html> (last access 28.02.2020).

GDR 2014: Grupo de Desarrollo Sierra de Aracena y Picos de Aroche, Diagnóstico, <https://www.gdrsaypa.es/wp-content/uploads/documetos/HU05_Ep4.pdf > (last access 30.03.2021).

Guzmán Álvarez 2016: J. R. Guzmán Álvarez, The Image of a Tamed Landscape. *Dehesa* through History in Spain. Culture & History Digital Journal 5.1, 2016, 1–17, <http://cultureandhistory.revistas.csic.es/index.php/cultureandhistory/article/view/90/313> (last access 28.02.2020).

Hardenberg et al. 2017: R. Hardenberg/M. Bartelheim/J. Staecker, The 'Resource Turn'. A Sociocultural Perspective on Resources. In: A. K. Scholz/M. Bartelheim/R. Hardenberg/J. Staecker (eds.), Resource-Cultures. Sociocultural Dynamics and the Use of Resources – Theories, Methods, Perspectives. RessourcenKulturen 5 (Tübingen 2017) 13–24.

Hernández Marrero et al. 2010: J. Hernández Marrero/V. O. Martín Martín/J. M. Rodríguez Acevedo/L. Studer Villazán, La revolución democrática y la línea política del PCE en los años treinta. Cuatro décadas después...que siga el debate. Historia Actual Online 23, 2010, 187–206, <https://www.historia-actual.org/Publicaciones/index.php/hao/article/view/508> (last access 28.02.2020).

Hicks 2016: D. Hicks, The Temporality of the Landscape Revisited. Norwegian Archaeological Review 49, 2016, 5–22.

HuelvaHoy 2017: HuelvaHoy, Reforzarán la promoción turística de Aracena para aumentar las pernoctaciones, 17.05.2017, <https://www.huelvahoy.com/reforzaran-la-promocion-turistica-de-aracena-para-aumentar-las-pernoctaciones> (last access 28.02.2020).

INE 2020a: Instituto Nacional de Estadística, Alterations to the municipalities in the Population Censuses since 1842: Siruela, <https://www.ine.es/intercensal/intercensal.do;jsessionid=FF58856F41B14C0F2CFCD95B14153481.intercensal01?search=1&error1=Debe+introducir+un+nombre+de+municipio.&error2=Debe+introducir+al+menos+3+caracteres.&cmbTipoBusq=0&textoMunicipio=Siruela&btnBuscarDenom=Consultar+selecci%C3%B3n> (last access 28.02.2020).

INE 2020b: Instituto Nacional de Estadística, List of Place Name. Population of the Continuous Municipal Register by Population Unit at 1st January: Siruela, <https://www.ine.es/nomen2/index.do?accion=busquedaDesdeHome&nombrePoblacion=siruela&x=6&y=10> (last access 30.03.2021).

Ingold 1993: T. Ingold, The Temporality of the Landscape. World Archaeology 25, 1993, 152–174.

Lavado Contador et al. 2000: J. F. Lavado Contador/S. Schnabel/R. Trenado Ordóñez, La *Dehesa*. Estado Actual de la Cuestión. Clío: History and History Teaching 17, <http://clio.rediris.es/geografia/*dehesa*.htm#> (last access 28.02.2020).

Museo del jamón 2020: Museo del jamón de Monesterio, Inicio, <http://www.museodeljamondemonesterio.com/index/index.html> (last access 28.02.2020).

Olwig 2002: K. Olwig, Landscape, Nature and the Body Politic. From Britain's Renaissance to America's New World (Wisconsin 2002).

Simmel 2008: G. Simmel, Philosophie der Landschaft. In: G. Simmel (ed.), Jenseits der Schönheit. Schriften zur Ästhetik und Kunstphilosophie (Frankfurt am Main 2008) 42–52.

Teuber/Schweizer 2020: S. Teuber/B. Schweizer, Resources Redefined. Resources and ResourceComplexes. In: S. Teuber/A. K. Scholz/T. Scholten/M. Bartelheim (eds.), Waters. Conference Proceedings for "Waters as a Resource" of the SFB 1070 ResourceCultures and DEGUWA (Deutsche Gesellschaft zur Förderung der Unterwasserarchäologie e.V.). RessourcenKulturen 11 (Tübingen 2020) 11–21.

Tilley/Cameron-Daum 2017: C. Tilley/K. Cameron-Daum, An Anthropology of Landscape (London 2017).

UNESCO 2018: UNESCO, Cultural Landscapes, last updated 17.12.2018, <https://whc.unesco.org/en/culturallandscape/> (last access 28.02.2020).

Helene Simoni, Kostas Papagiannopoulos, Rigas Tsiakiris, and Kalliopi Stara

Local Resource Management Imprinted in the Landscape

Convergent Evolution in Two Greek Mountain-Plains During the Last Five Centuries

Keywords: cultural landscapes, tangible/intangible resources, biocultural diversity, Mt Pindos, Mt Chelmos, Zagori, Kalavryta

Acknowledgements

Maps were based on ASTER GDEM v2 data, a product of METI and NASA. Parts of Helene Simoni's travel expenses for attending the EAA 2018 conference were covered by the University of Patras and by the Department of Geology of the University of Patras. We are grateful to the editors of this volume for organising the Session 275 in Barcelona, and for the stimulating discussion, we had then. Thanks are due to the anonymous reviewers for their insightful comments and to the text editors for improving our text.

Summary

The Greek landscape is adorned with a dynamic relief ranging from gently undulating to rugged slopes of the high mountain zone, only a few kilometres from the coast. Especially in limestone substratum, numerous mountain-plains have been formed within the mountains. Since Antiquity, they have functioned as media of abundant and diverse natural as well as cultural, tangible and intangible resources, and have contributed essentially to the formation a local identity for their inhabitants. This paper presents the convergent evolution of the cultural landscape in two distant mountain-plains by exploring the effect of historical management practices which local communities used to regulate social and economic needs. Data are drawn from interdisciplinary research in Soudena of Zagori (NW Greece) and in Soudena of Kalavryta (SW Greece), stimulated by oral traditions of their inhabitants that they share a common origin, based on the belief that the latter was colonised by Soudeniotes of Zagori during the Ottoman period. Notably, analogous patterns of ancient and modern time trajectories of landscape use have been found. Villages located in the edges of the plateaus, scattered outlying churches, dry-stone walls, wells, threshing floors, handmade drainage canals, and non-intensive agricultural practices are still existing remains of a relict cultural landscape, still in use in both areas. Recent population exodus, partly rearrangement of the most productive land, transition of farmland to pastureland and encroachment of vegetation in the rough surrounding slopes are similar modern transformations. Nowadays, both areas belong to national and international networks for conserving their values, but mountain-plains may hide more interesting bio-cultural secrets.

1. Introduction – The Concept of Resource

The paper addresses the implications of ideas connected with resource management. In particular, it explores

a) the conscious transformation of the landscape by the inhabitants of mountain-plains in order to manage the available resources,
b) various social practices which were employed over the years with respect to crucial resources, such as pastures, forests, and water supply,
c) the socio-cultural dynamics which motivated discrete population groups,
d) the current situation of the land-use,
e) the modern attempts of the inhabitants to introduce new uses of the old resources.

The spatial and historical context of the two case-studies is set in northwestern and southwestern Greece from the beginning of the Ottoman period (15th cent. AD) until nowadays.

The variety of meanings of the concept **resource** in everyday discourse and in various fields of studies has been presented in several texts (see an overview in Hardenberg et al. 2017, 13 f.). The word is derived from the Latin verb *resurgere*, which means 'to rise' and is frequently used in the Anglo-Saxon bibliography. Hardenberg et al. (2017) introduce the work of the collaborative research centre SFB 1070 ResourceCultures, where a new definition of the word has been formulated following a stepwise approach, which criticises standard uses of the word, especially those that focus on economic parameters. In particular, the proposed definition highlights the need to cover intangible dimensions, such as the socio-cultural dynamics, which are linked with the concept (Hardenberg et al. 2017, 13).

In the light of this approach, a brief consideration of the Greek counterpart word might enhance the proposed definition and provide further arguments for the cultural connotation of the word. The Greek language makes use of the word πόρος, an ancient Greek word, met in the Iliad for the first time. The word derives from the verb περάω, and it means 'to pass right across or through a space' (Pantelia 2018). In many Indo-European languages, the original word has survived as 'pore' (English), 'Pore' (German), 'pore' (French), 'poro' (Italian and Spanish) et cetera and means 'a minute opening in a surface, especially the skin or integument of an organism, through which gases, liquids, or microscopic particles may pass' (Oxford Dictionaries).

The earliest written example of the use of the word is by Homer and is defined as 'means of passing a river, a ford' (Iliad 2.592), and 'paths of the sea' (Odyssey 12.259). The meanings which the word received later by various writers, including Hesiod, Aeschylus, Herodotus, Pindar, Thucydides, Sophocles, Euripides, Aristophanes, Xenophon, Plato, and Polybius represent a wide range of literal and metaphorical uses of the original meaning, such as 'bridge' (Herodotus, Histories 4.136), 'path' (Aeschylus, Agamemnon 910), 'way or means of achieving' (Euripides, Medea 1418), 'providing' (Plato, Meno 78), 'journey' (Aeschylus, Seven Against Thebes 546), 'a way of raising money' (Xenophon, Hellenica 1.6.12).

The same meanings are provided in late classical and medieval dictionaries. Hesychius (1867) defines it as 'road, current of river, passage of river, bridge' and Suidas (1705) as 'passage, river, road, water flow, invention, tricks'. Their dictionaries date in the 5th to 6th and 10th cent. AD, respectively.

The idea that resources are defined as 'means to create, sustain and alter social relations, units and identities within the framework of cultural ideas and practices', (Hardenberg et al. 2017, 14, 16) is consonant with the Greek πόρος, which emphasises the human action of passing physically, mentally and spiritually. In this sense, all types of resources, including the natural ones, have been used by humans as means that provide a symbolic passage from one state to another, for example from the state of hunger to the state of fullness, from the state of coldness to the state of warmth, et cetera. The notion of 'symbolic passage' acknowledges their potential to influence social relations and identities in space and time.

The adoption of the term resources has been influenced by the green movement and the rise in the importance of environmental issues from the 1960s onwards (Cleere 1989, 2–4; Hodder 1990, 13). It has been accepted that natural resources are not

inexhaustible (Hardin 1968) and that for resources commonly owned, the likelihood of damage is greater, and policies and actions concerning management and involving social capital are needed (Pretty 2003, 1912).

If natural resources needed management, so did the cultural ones. The term was first used in the United States in the 1970s, and it was associated with the need to protect archaeological finds, during construction works. Conservation Archaeology (Schiffer/Gumerman 1977a) was an alternative term to express the same notion, which acknowledged that cultural resources were under threat and that their preservation consisted of 'the least loss of information concerning past life ways' (Schiffer/Gumerman 1977b, 3). A few decades earlier, awareness for the protection of threatened cultural places connected threat with warfare (see the two Hague Conventions of 1899 and 1907, and UNESCO 1954).

The General Conference of UNESCO in 1972 noted the threat imposed by changing socio-economic conditions in peace periods and adopted the Convention concerning the Protection of World Cultural and Natural Heritage (UNESCO 1972). Soon afterwards, several countries regulated the protection of natural and cultural resources in their legislation and constitutions (see for the Greek Constitution of 1975 and subsequent legislation: Χριστοφιλόπουλος 2002, 24, 50–58). The fact that cultural heritage consists of tangible and intangible resources opened a new path in cultural resource management, and UNESCO emphasised that intangible types of evidence, besides material, were worth safeguarding with the Convention of 2003 (UNESCO 2003).

1.1. Mountain-Plains as Resources

The multiple passages that human actors have opened up to physically move from one place to another, and the means they have used to achieve, to make a living or to raise money are portrayed in this paper, which focuses on two high plateaus in Greece. Due to tectonic and erosional activities in geologically recent years, the Greek landscape has been carved to a dynamic relief. A diverse mosaic, ranging from gently undulating to rugged slopes of the high mountain zone, is intersected with rivers, canyons and lakes, all only a few kilometres from the longest coastline in Europe. The Pindos massif crosses most of the mainland from the NW to the SE and continues further south through the Peloponnese, where the Chelmos range rises. Throughout this mountain chain, dominated by limestone, mountain-plains are a characteristic figure of that substratum forming various karstic landforms, including poljes, sinkholes, dolines or caves. Mountain-plains (Rackham/Moody 1996, 27 f.), high plateaus (Braudel 1995, 53–55), limestone plateaus (Bailey et al. 1993, 301, 303), poljes (Pavlopoulos et al. 2018, 954) and others are different expressions of enclosed, depressed basins surrounded by slopes. The Greek literary word is *oropedia*, but locals name them *kampoi* (plains). They are the result of active tectonics and erosion, which have caused the dissolution of the limestone bedrock and the transportation of sediments to the floors of the basins. Instead of surface rivers, an extensive subterranean drainage network drains surface water through sinkholes (Runnels/van Andel 2003; Pavlopoulos et al. 2018). Parts of the poljes may be covered by swamps and permanent or seasonal lakes. The ground is covered partly with terra-rossa, an iron-rich palaeosol that is favourable for animal grazing (Bailey et al. 1993, 303). Several such plains are located at elevations higher than 800m. Some of them have been inhabited and used from the Antiquity until present times, the most famous being the one near the Ideon Andron in Crete, where according to Greek mythology, god Zeus, the king of the gods, was raised.

Such mountain-plains are not considered as containers of multiple natural and cultural resources, but rather as media for structuring human action and experience (Tilley 1994, 10 f.). To paraphrase Merleau-Ponty's (2005, 284) definition of space, we might as well suggest that we approach the mountain-plains not (as) 'the setting in which things are arranged, but the means whereby the position of things becomes possible'. Braudel (1995, 53) justifies their significance for the Mediterranean region because there 'roads and tracks are comparatively easy to establish'. So, mountain-plains form natural passages that

Fig. 1. The Kampos Soudenon in Zagori (Epirus, NW Greece, © R. Tsiakiris).

Fig. 2. The Kampos Soudenon in Kalavryta (Peloponnese, SW Greece, © V. Zogopoulos).

facilitate the movement, serve as gentle landscapes for the settlement of people, in otherwise steep terrains, which at the same time provide defence and protection. Moreover, they offer symbolic passages, which allow people to transform the landscape and themselves. Transformation can be achieved when people satisfy their physical needs through production and exchange, but also when they construct social representations of them (Bourdieu 1995, 172). Connection with their land can be conceived as the consequence of their involvement in practical activities within specific environmental contexts. In this way they cultivate cultural memory, and lead continual changes and growth (Ingold 2000, 140–150). Such activities include processes and techniques which contribute to the 'production of locality', when they are materialised in space (Appadurai 1995). The use of resources, therefore, presupposes the energetic engagement of people with the environment at an ongoing process that creates, maintains and transforms relationships (Hardenberg 2016, 90).

1.2. Study-Areas

The study-areas are located in the regions of Epirus and Peloponnese, northwestern and southwestern Greece respectively, approximately 250km apart (*fig. 1–4*). Both of them have the same names, *Kampos* Soudenon and (Apano)*kampos*. The *Kampos* Soudenon in Epirus (*fig. 1, 3*) lies at an average elevation of 850–950m within the territory of Zagori (the nearest city is Ioannina). It is located west of the Pindos front, where Mt Timfi and Mt Stouros descend and meet the eastern edge of Mt Mitsikeli. The narrowest point where the mountains meet is less than 350m wide and forms two basins following the prevailing NW/SE direction of the mountains. Archaeological excavations near Vitsa, on the southeastern slopes overlooking the southeastern plain, have revealed a summer pastoral settlement of the 9th to 4th cent. BC (Βοκοτοπούλου 1986). Scattered archaeological remains from other parts of the plains and the slopes verify practices of livestock farming and limited cultivation of the land in the Antiquity (Βλαχοπούλου 2017, 48–50) and the Middle Ages.

The Apano*kampos* or *Kampos* Soudenon in the Peloponnese (*fig. 2, 4*) lies at an average elevation of 940–1100m. It is located in the territory of Kalavryta bounded by low and high peaks of the Chelmos mountain range (the nearest city is Patras). It extends to the west with a maximum length of 4.5km and to the south with a maximum length of 6.5km, approximately. It lies within the realm of Ancient Lousoi, a classical Arcadian city-state (8th cent. BC to 4th cent. AD) and seat of the Panhellenic sanctuary of Artemis Hemera (Mitsopoulos-Leon 2012). Archaeological research

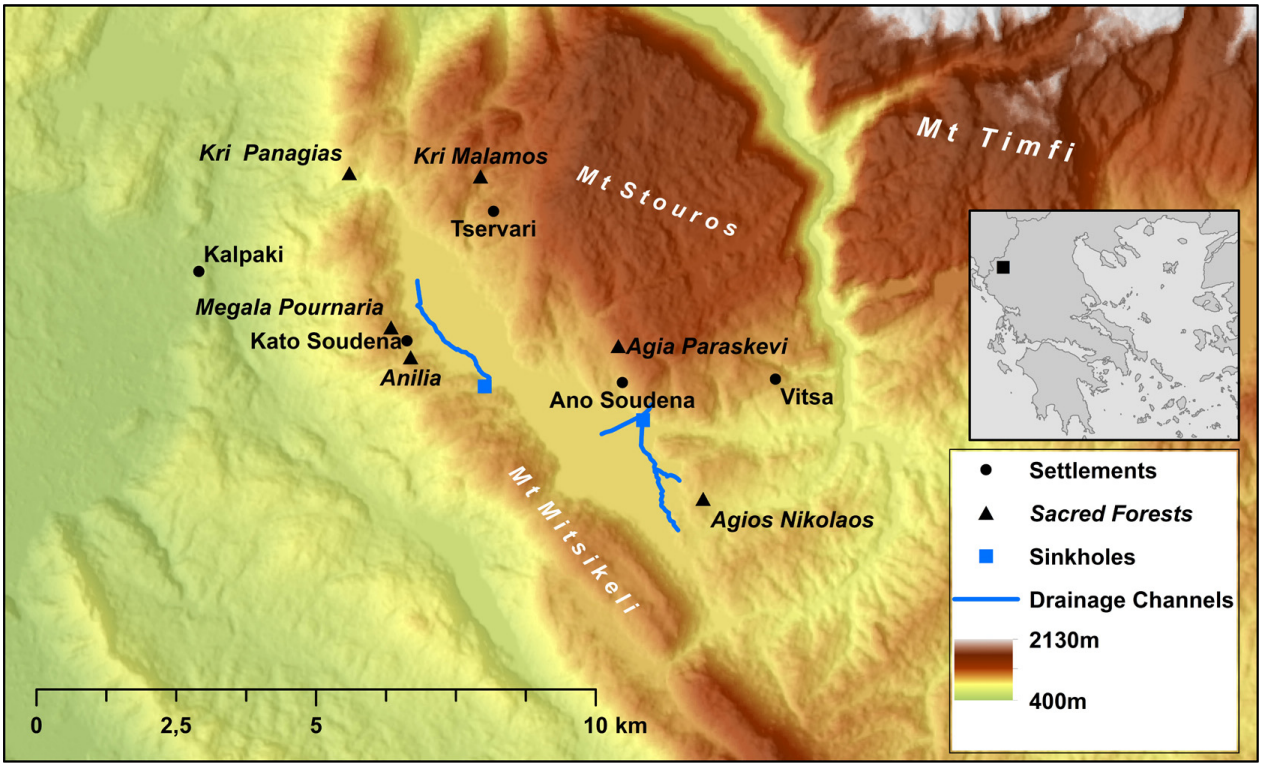

Fig. 3. The *Kampos* Soudenon in Zagori. Settlement pattern and location of sacred forests, mentioned in the text (cartographic composition: H. Simoni).

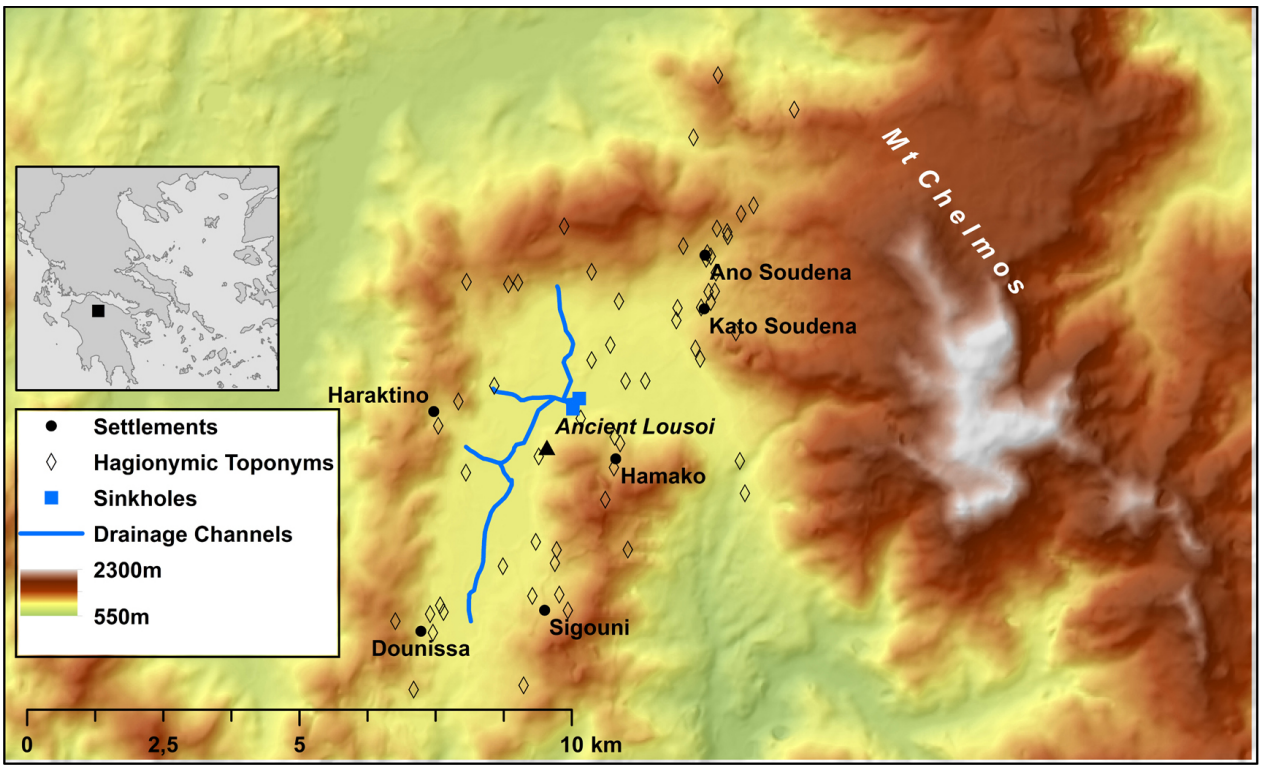

Fig. 4. The *Kampos* Soudenon in Kalavryta. Settlement pattern and distribution of hagionymic toponyms, mentioned in the text (cartographic composition: H. Simoni).

other than the excavations of the classical city has yielded evidence of small agricultural settlements dated mostly in the Classical and Hellenistic times (Αλεξοπούλου 2009, 402–406; Mitsopoulos-Leon 2017). In the Byzantine period, there seems to be a gap until the 12th cent. after which new settlements were established.

On both mountain-plains, there are two villages situated on the hillsides, named Ano Soudena and Kato Soudena in the past. According to local oral traditions, the homonymy of the plains and of villages is attributed to a common origin. At some time during the Ottoman period, *Soudeniotes* (inhabitants of Soudena) of Epirus migrated to the south, where they settled in a Peloponnesian mountain-plain, which resembled their home. The Cultural Association of the Soudeniotes in Peloponnese urged by a deeply embedded belief that their distant provenance could be traced back to the Soudena villages of Epirus turned to the Institute of Local History in order to investigate their roots and examine the truth of their long-standing tradition. As a result, an interdisciplinary research was conducted during 2011–2017 (Simoni/Papagiannopoulos 2017; Παπαγιαννόπουλος/Σιμώνη 2017).

Invaluable information for both territories that once belonged to the Ottoman Empire comes from the Imperial tax archives, which are kept in Istanbul today. As we found out, Ottoman archives dated in 1462 (BOA TT 10), 1512–1520 (BOA TT 80), 1564 (BOA TT 350), 1583 (BOA TT 607), 1602 (BOA TT 586), and 1613 (BOA TT 712), seem to support the oral tradition that the modern settlements of the Peloponnesian Soudena were (re-) established by families from Zagori. The possibility that this is a true story was strengthened by the discovery of the surname *Zagoritis* (meaning a native or inhabitant of Zagori) in the Kalavryta archives of 1462. Three families under this surname lived in a settlement inhabited mainly by Albanians. The Albanians settled in Kalavryta at the beginning of the 15th cent. and the *Zagoritis* families had preceded them. However, the latter are not believed to have settled earlier than the Frankish period, according to medieval pottery finds. Presumably, they came from Zagori and, assuming they remained in contact with their region of origin, this might explain the presence of Peloponnesian pottery in Zagorian Soudena (Παπαγιαννόπουλος 2017a, 421).

Then, a detailed comparison of the family names in the 16th cent. manuscripts from Zagori and Kalavryta revealed some interesting matches. Among them, an otherwise unusual family name was found to be common in both regions, and that is the name Vlassis. Yanis Vlassis was one of the *Voynuks* in the Epirotic Kato Soudena. *Voynuks* were farmer-soldiers in the service of the sultanic army with low participation in the taxation system (Ercan 1986; Sarınay et al. 2009, 1–6). Vlassis family is found in chronological order in the Zagori archive of 1564, the Kalavryta archive of 1583 and again in the Kalavryta archive of 1613. What makes this fact more remarkable is that Vlassis is the earliest surname of the heroic Petmezas family, a leading family of Ano Soudena of Kalavryta, which participated actively in the War of Independence (1821–1828). The name Vlassis is also connected to the oral tradition about the escape from Zagori to Kalavryta.

Based on the names listed in the manuscripts, two waves of migration are discerned. The first wave of migrants was forced out of Zagori at a period of raids and unsafety (late 14th cent.), and the second one at a period of demographic expansion (late 16th cent.). Most of them belonged to the poorest members of the local communities and chose to move to the south and to settle a hardly inhabited plain, 2.5 times as big as the plain at home.

2. Conscious Formation of the Landscape: Baseline Elements of Resource Management

The post-Medieval settlements of the two plateaus were probably founded or were re-established under conditions that prevailed after the Siege of Constantinople by the Crusaders in 1204 (Bintliff/Snodgrass 1989, 294). Their development to a large degree coincided with the Ottoman period. At first, houses were built around a church. Over the time, clusters of houses grew to form multiple neighbourhoods, while those settlements, which remained small, were eventually abandoned. At the final stage, late 16th/early 17th cent. onwards, the neighbourhoods merged and a central public space rose, which was useful for gathering and hosting the central church, the cemetery,

community buildings, and schools. Villages, large or small, occupied the hillsides overlooking that part of the plain that belonged to them, not only for defence reasons but also as the valuable resource of cultivation land should remain free of other uses (Παπιγκιώτης 2017, 176–182; Παπαγιαννόπουλος 2017a).

The location of each settlement was crucial for land division and field patterns (Hütteroth 1974, 41 f.). On the flat ground, the fields formed regularly shaped strips. The plots closer to the edges of the plain and on the slopes had an irregular shape. In Zagori, the toponym *Koulouri* (round in Greek) was ascribed to small fields, often surrounded with low wall and usually located in relatively remote and rugged terrains (Παπαγιαννόπουλος et al. 2017; Κικόπουλος 1991, 36). The fields in both plains were bounded by ditches, hedges or were marked by individual trees, while bushes, gullies or rocks naturally marked the boundaries on the hillsides. Locals constructed retaining walls or, more rarely, dry-stone enclosure walls that were made of stones cleared from the fields. Dry stones were used for the construction of huts, pens and enclosures of house plots, too. Carefully-selected material consisting of local stone that can be easily processed and transformed into square building blocks were used for dwellings. Streets mainly were left unpaved apart from where puddles formed. The village streets converged on one or two roads of the main road network that crossed the space along the foothills. Public spaces, such as the square, the church courtyard, the school courtyard and some streets were adorned with cobblestone pavements.

Other building materials came from the vicinity, too. Where clay could be extracted easily, roofs were covered with ceramic tiles. In Zagori, the extensive use of slates, a material found in abundance throughout the entire region (Stamatopoulou 1998, 23) characterises the late Ottoman times (17th cent. to 1913), and it was adopted by tradesmen who wanted to exhibit their wealth. In the Peloponnesian Soudena, a traveller of the 19th cent. observed roof tiles made of tree bark (Gell 1817, 131). The biggest portion of wood was probably used as fuel (Hughes 1994, 74) in the winter, because of the cold weather. Other parts of trees, their branches and foliage were consumed by animals, or they were used for making furniture and domestic tools (Stara et al. 2015a, 160). Even the branching remnants from shredded trees were useful in cooking with the characteristic *gastros*, a special conical flap lid that needs only small-size branches to bake enough food for an extended family.

The cultivation of the flat ground and animal husbandry were the major activities related with the land. The *kampos* in Epirus totals ca. 820 hectares, divided in two nearly equal-sized segments. Information about the production is deduced by the imperial tax archives. According to the earliest known tax register of 1564, the area was cultivated by the inhabitants of at least 13 settlements. Based on surface archaeological finds (Παπαγιαννόπουλος 2017a, 416–422), the number of settlements would have been higher in the two preceding centuries. During the late Ottoman period, four villages comprised the settlement network that commanded the plateau and the surroundings, a total surface of 6260 hectares. Most of it contained steep mountainous relief. Three out of the four villages, namely Ano Soudena, Kato Soudena, and Tservari possessed a kind of reserve flat lowland of 710 hectares, 3–4km west from the plateau, in what is now the newly established village of Kalpaki and its surroundings (*fig. 3*). Parts of both grounds were subject to seasonal flooding.

The size of the Peloponnesian *kampos* is 2100 hectares. The earliest tax register of 1462 lists five settlements. One of them contained four *mezraas* (Κοντόλαιμος 2017a, 435), that possibly represented older deserted settlements. In the Venetian (Παναγιωτόπουλος 1985, 268–270) and the late Ottoman periods (17th cent. to 1830), three communities consisting of three large villages and three small ones are recorded (*fig. 4*). A seasonal lake of 400 hectares existed in the centre (Μανσόλας 1867, 99; Martel 1892, 4 f., 9). The remaining out of a total 6730 hectares consisted of high slopes and rugged terrain.

Cultivation in all plateaus was practised on a rational basis. Yields were important for subsistence and tax-payment. Although the areas are mountainous, poor seasonal water availability limited the agricultural production to cropped cereals. Wheat, barley, rye and others dominated most of the plain-beds (Κοντόλαιμος 2017b,

Fig. 5. The village of Kato Soudena in Zagori at the edge of the mountain plain. Above the village on the ridge, the sacred forest of Megala Pournaria still exists, while a series of community wells located on the plain, provided water for its inhabitants, their flocks and their vegetable gardens (© R. Tsiakiris).

85–87). Crop rotation on a two to three-year basis and fallowing were common techniques that enriched the soil with nutrients, enhanced fertility, and provided grass fodder. In addition, animals were free to graze after harvest in order to fertilise the fields with their manure. Despite the slow growth of wheat due to the high altitude, these plateaus were very important because production there served the needs of numerous villages in the vicinity. According to oral traditions from Zagori, these mountain-plains served as regional granaries (Λαμπρίδης 1993a, 40 f.). Hundreds of threshing floors in all the villages of both plains confirm the tradition. Especially in Kato Soudena of Zagori, a unique cluster of more than 50 threshing floors and their accompanying huts have been designated as cultural monuments.

Viticulture was practised at the periphery, on slightly inclined, well-drained slopes. Fruit trees did not flourish due to late frosts, and cereals were exchanged with fruits from other areas, while corn grew mainly in the lowlands of Kalpaki, which were watered from the sources of the Kalamas river. According to oral testimonies, habitation there was not possible due to frequent raids. Furthermore, seasonal wet grasslands were reserved for grazing of working animals. A portion of the fields that lay fallow, amounting to one-fifth of the total arable land in the Peloponnesian *kampos*, was used for grazing of very few domestic and working animals (Σιγαλός 1998, 51).

Water availability was a limiting factor. Series of community wells supplied water for domestic use (*fig. 5*). On the Epirotic plain, cisterns collected the water from snow. Ponds (and recently cement tanks) served the watering needs of animal flocks. On the Peloponnesian plain, there are abundant springs. High precipitation and temporary storms formed seasonal wetlands in the lowest parts of the plains, which added to the troublesome situation the farmers faced.

The need for irrigation culminated in the summer, and many techniques were employed; handmade drainage channels, called *Manna* in Kalavryta (*fig. 4*), were used to drain the flooded fields and to direct the excessive water

towards two sinkholes at the edge of the plains (Χαραλαμπόπουλος 2017). In any case, vast stretches were not under irrigation, and where the soil was moist, the farmers cultivated corn or rice.

3. Pastoralism, Forest Management and Sacred Forests. A Case-Study from the Epirotic Soudena

The known Ottoman archives contain very limited information regarding livestock-farming and its products, presumably because such information lies in manuscripts that we have not recovered yet. Judging from the traditional practice of the villagers, former grazing activities can be divided in three different systems. First, there were relatively small-scale moving large flocks belonging to local stockbreeders, which were moving in close altitudinal areas. Second, there was the (mostly extinct nowadays) 'community shepherding'. In this case, every household possessed ten to twenty domestic animals, which covered their needs. Joint village herds were formed every day. They consisted of all the animals that the households possessed and they were tended by paid shepherds. Such herds were grazing near each village and were guided either to the hilly surroundings or towards the fields after harvesting; animals were kept inside the houses during the snow-capped winter days. Third, there was transhumance, an extensive form of livestock breeding that dates back at least to the Bronze Age and it has shaped the cultural landscapes of Mediterranean mountains (Blondel/Aronson 1999, 217–220). The practice of transhumance consists of biannual movements of herds and flocks between a lowland area and a mountain area of contrasted climate. *Sarakatsani*, semi-nomad shepherds, used to graze their flocks on the higher slopes of the mountains of northern Greece and have appeared in Zagori from the beginning of the 19th cent. They used to pass there the dry summer period, where pastures stay green, and drinking water is available, while during the remainder of the year, when harsh winter and snow covers the highest mountain areas, they moved to the coastal plains or lowlands (Campbell 1964, 14). The system is still alive today, although some *Sarakatsani* have settled in Zagori after the onset of the 20th cent.

Palaeo-environmental and archaeological evidence in Pindos confirms that transhumant activities shaped the present-day cultural landscapes in the Pindos mountains, at least from ca. 3000 BC on (Willis 1992, 132–138).The results of paleoecological and palynological studies conducted at different altitudes of Pindos show that the change of vegetation at mountainous and semi-mountainous areas is connected to the presence of man, mainly because of extensive livestock farming still practised today. Grazing and shredding of tree branches for fodder, together with the use of fire, has been reducing the former lush vegetation to an open forest with a high proportion of grasses.

Except for secular land-use, the presence of the sacred is a distinguishing element of the cultural landscape that characterises the domestication of the land. In mountainous Greece, sacred natural sites are characterised mainly by the presence of outlying churches or icon-stands accompanied by solitary mature trees or groves. These trees keep a maiden form that distinguishes them from surrounding 'working trees', which are pollard or shredded. As a result, old maiden trees and their associated churches or icon stands are emblematic for the sacred in rural Greece (Κυριακίδου-Νέστορος 1989, 25).

Such vegetation formations are conceptualised as encircling and magically guarding settlements against the external 'wilderness', blocking epidemics and evil powers and safeguarding community's and villagers' life (Λαγόπουλος 2002, 13; Stara et al. 2015b, 888). In addition, larger areas in the form of sacred groves or forests serve as protective wood belts above villages against natural hazards or define and protect important resources held in common (Stara et al. 2016, 293 f.).

A sacred status of trees goes along with taboos against cutting them down. This idea goes back to pre-Christian beliefs in spirits living in mature trees. Violation of the taboos is believed to result in bad consequences for the economical situation or health of the wrong-doer or his family (Stara et al. 2015b, 885). Taboos prevented private exploitation. Controlled exploitation for the benefit of the entire community or cultural modification for ritual use was occasionally allowed because

Fig. 6. The sacred forest of Megala Pournaria in Kato Soudena in Zagori, a rare forest vegetation formation of the flammable prickly oaks that exists mainly in shrubby forms in rangelands all over Greece (© K. Stara).

sacred forests were part of a strategy to control management and to secure moral respect towards important common resources, such as forests (Stara et al. 2016, 293 f.).

Sacred forests were found near all Zagorian villages, located either above the village 'to protect village water resources and buildings from avalanches, and rock falls' according to oral history or to function as reservoirs in extreme weather conditions. Besides, they served special needs. For example, Megala Pournaria (big prickly oaks, *Quercus coccifera*, in Greek), the sacred forest of Kato Soudena (*fig. 3, 6*), could offer the shade of its bigger trees during dry summers as *stálos*, literally livestock shelter from the sun in the summer heat. Besides, as it consisted mainly of evergreen prickly oaks, they could offer their foliage as fodder during long winters and especially in cases of severe snowfalls. In such cases, harvesting was controlled by the community through communal agreements. Harvesters paid a certain fee to the church. Sacred forests could also provide an income for the church, serve the community's everyday requirements, and satisfy the lower social strata's needs. Moreover, they were appreciated for their aesthetic qualities and ritual use as festive places (Stara et al. 2016, 293 f.).

Based on this peculiar network of ancient protected forest patches located near every village, and old-growth trees, that sometimes exceed 300 years of age, the reconstruction of the past vegetation of the upland plateaus and the wider area of northern Pindos is possible. This network of sacred forests could be characterised as a locally adapted conservation system that has been applied very successfully for at least three centuries (Tsiakiris et al. in press). In sacred natural sites, the protection of the trees from cutting enables us to find hard evidence of the history and the evolution of the vegetation growth under the influence of past climate conditions, including some extremes, and with minimal human intervention. However, researchers should be very careful when studying such forests because sacred areas should not be considered as 'no-entry' areas. For example, grazing the understorey, obtaining dry branches or logging in special cases of extreme need was by exception permissible. In any case, the composition of these forest patches offers a strong basis for comparison and an irrefutable sample of the potential growth and composition of the local vegetation according to regional geological and climatic conditions.

In the ever-changing landscape of the region, the sacred forests should be considered stable for a long period, but so far, there is no archaeobotanical research. However, sporadic indications of archaeological evidence in sacred sites exist, for example Agia Varvara in Kato Soudena (Βλαχοπούλου 2017, 50). Moreover, according to an oral tradition, the sacred forest of Agios Nikolaos of Livadakia in Vitsa used to be a satellite settlement, which was abandoned, and its inhabitants moved to modern Vitsa. Nowadays, the central church of the abandoned settlement serves as an outlying church; villagers visit the site to attend the service and participate at annual celebrations on May 20th.

The Pindos mountain plateaus, due to their geological features, have been used as agricultural land for centuries. Aerial photographs from the 1940s show that the grasslands, shrubs and sparse woods prevailed when the population in each village was high; such vegetation types are preserved to this day, albeit at a smaller scale. Evergreen shrubs, such as the prickly oak, a species flexible and well adapted to grazing, dominates mostly limestone, or even flysch if the area is heavily grazed by goats. In sacred forests, evergreen prickly oaks are found in their tree-form, while broadleaves show how vegetation could develop without human intervention (*fig. 6*).

Fig. 7. The archaeological site of Ancient Lousoi overlooking the mountain plateau (© V. Zogopoulos).

Several sacred forests are located in the nearby area (*fig. 3*), consisting mainly of dense or open wood pasturelands. The oldest dense oak forest within the Epirotic Soudena plateau is the broadleaved deciduous sacred forest of Agios Nikolaos of Livadakia near Vitsa (4.9 hectares). It contains several oak species aged about 250 to 343 years (Kyparissis et al. 2015), mixed with other broadleaved and evergreen scrubs in the undergrowth, which is also the oldest example of such a coherent forest in the area (Tsiakiris et al. in press). In the surroundings of the sacred forests, the prickly oaks bear the form of a dwarf tree or a pyramid scrub, shaped mainly by goat grazing in open places, and remain as low shrubs, often only a few centimetres high, sculptured by cutting, grazing and wildfires. However, they take a tree-form only within protected unburned forests or sacred sites (Stara et al. 2015b, 895). Their scrubby form is characteristic of the understorey of these human-made ancient broadleaved oak forest types (Marini-Govigli et al. 2017). The same is true for other tree species, an overgrown forest section, which retains its special form from seasonal grazing based on community rules, as grazing is allowed only in specific time-periods, mainly during summer.

On the contrary, prickly oak forests in protected sacred forest patches of these mountain-plains show a very different vegetation composition. Huge prickly oaks prevail, some of which comprise ancient suckers of huge decayed tree stumps, presumably destroyed some centuries ago by fire, as charcoal is still present in their basis. Therefore, prickly oaks persist as gigantic tree remnants of the wider area, but can also be found in these forests mixed with maples, deciduous oaks, other broadleaves and sometimes with scattered junipers depending on the specific site history. Especially, the presence of maple trees in the upper part of the forest crown together with prickly oaks is extremely important for forest ecologists, as such forests with the semi-deciduous Montpellier maple (*Acer monspessulanum*) are scarce and unique. We suppose that several such forests in the area have been destroyed by fires since this zone is very flammable and only permanent grazing of the understorey can keep vegetation open

enough so that forest fires burn only the understorey and do not rise to the forest crown. Indications of fire damage have been found in Kato Soudena, Ano Soudena and Tservari.

Moreover, several non-strictly protected forested areas, especially those composed of scattered old-growth deciduous broadleaved oak trees, are surviving also in nearby areas near the Albanian borders. These have an open savanna pastoral woodland appearance, and tree forms are shaped by periodical shredding or pollarding.

A similar study from the Peloponnesian mountains does not exist. Other evidence suggests that sacred natural sites may have existed here, too. Numerous hagionyms and outlying churches accompanied by mature oaks exist in the area, while a temple devoted to Artemis, goddess of hunt and forests, was founded on a slope overlooking the Soudena plain, in the 8th cent. BC. Polybius (Histories IX 34,9 and IV 18,9) mentions the existence of cattle of the goddess that comprised property of the temple (*fig. 7*). The cult of Artemis and the cattle presumably indicate the existence of two elements that shaped the landscape, that is protected sacred forests or groves and cattle raising for agriculture.

Nowadays, the numerous chapels, icon-stands and the surviving hagionymic toponyms (Χαραλαμπόπουλος 2017) located on the low hills surrounding the plain seem to offer extra protection and to secure the preservation of old-growth tree-clusters and of solitary trees (*fig. 4*). The chapels of Agios Konstantinos, Agia Varvara, Agia Paraskevi, Agios Athanassios and Panagia (virgin), with their centuries-old trees, are the most characteristic examples and the four latter have their homonym counterparts in Zagori, also accompanied by their mature trees and groves. According to the locals in Peloponnesian Soudena, trees are absolutely connected with the sanctity of the place. Therefore, cutting down the trees is considered equivalent to demolishing the church and the one who dares it will receive a similar punishment.

In Zagori, Stara (Στάρα 2009) visited eleven sacred sites in Ano Soudena, eleven in Kato Soudena, 14 in Tservari and 18 in Vitsa. These are very often located in prominent places marking boundaries, liminal places, important resources or abandoned settlements, memorialising deceased members of villagers' families, representing contracts with the divine and symbolically protecting community's life and prosperity. Most of the above churches or icon-stands are dedicated to Panagia, followed by those dedicated to Agios Nikolaos, Agios Georgios, Agios Athanasios, Agia Paraskevi, Prophet Elias, Agioi Taxiarches and Agios Dimitrios who act as intermediaries between people and God (Stara 2015b, 888). It is worthwhile to mention that Agios Nikolaos is the protector of travellers in folk religion and thus beloved in Epirus, where every family had migrant sons. A similar chapel dedicated to Agios Nikolaos lay at the exit of the Peloponnesian polje. However, his spring celebration in Zagori coincides with the period that shepherd families return from winter to summer pastures and is accompanied by passage rites such as food offerings and celebrations (Stara et al. 2016, 292).

4. Population in Motion: Social Representations of Hierarchy and Power

The homonymy of the two Soudena plains reminds of the two migration movements that brought migrants from the northern plain to the southern one. Yet, there is hardly any common material culture or common customs apart from the oral tradition. In fact, the populations seem to respond differently to the challenges they face, ever since. The main reasons for this are the poor economic and social status of the migrants, their long stay in a new cultural environment and their progressive mixing with the Albanian population. On the other hand, the Zagorians entered European trading and established companies in major European cities (Δαλκαβούκης 1999). Their success brought them wealth, which is evident in material culture, and especially in the local architecture of the 18th and 19th cent. (Stamatopoulou 1998, 14; Ρουσοπούλου/Παπαγιαννόπουλος 2017, 231–248).

The Peloponnesian Soudeniotes became famous for handling weapons. They rose as proponents of the War of Independence, during which almost the whole male population participated in the operations (Παπαγιαννόπουλος 2017c, 124–126). The leading family of Vlassis-Petimezas were *kapoi* on the eve of the war. *Kapoi* were armed non-Muslim citizens whose primary task was the

guard of the local Christian notables (Alexander 1985). After independence, *kapoi* expressed loyalty to the state and the state institutions. In this way, they pursued a better status; they took possession of national land and achieved a career in politics and the army (Κουτρουβίδης 2017, 131, 139–141).

The location which community members occupied within a settlement reflected their social and economic position. In small and scattered settlements, these variations were not particularly visible. Nevertheless, settlement patterns were not without meaning, and rules were based mainly on ethnic and professional identity. In Peloponnesian Soudena the 15th cent. Greek settlements were located in the north-east edges of the plateau, while the Albanian settlements occupied the west/south-west edges (Κοντόλαιμος 2017b, 88 f.; Παπαγιαννόπουλος 2017a, 401–403). In the Epirotic Soudena the *Voynuks*' settlements lay at the foot of the hills, alongside the road (Κοντόλαιμος 2017c; Παπαγιαννόπουλος 2017a, 395 f.). The change of their status in the early 17th cent. forced them to leave the settlements and join other larger ones (Λαμπρίδης 1993a, 27 f.).

At a second stage, wealthy families tended to move towards the centre of the village, forcing other families from peripheral neighbourhoods to surround them. In this way, settlement patterns became more compact, while at the same time, the notion of community was being forged (Παπιγκιώτης 2017, 176 f.). In the Ottoman period, belonging to a community was absolutely vital because it increased families' ability to control their affairs. As the taxes were paid in cash, a number of poor families with limited access to resources could not usually afford their obligations. In Zagori, the community could overcome this weakness by the institution of *allilegiisis* (collective solidarity). According to this, the community borrowed money from outside in order to cover the part of the levied taxes that individual households could not pay, or these households were omitted from the tax-payers' catalogues deliberately. In case of persistent poverty, the community had the right to auction the households' belongings in order to eliminate their debts (Παπαγεωργίου 1995, 138–158; Παπαγιαννόπουλος 2017b, 114 f.). The *allilegiisis* gradually weakened during the early 19th cent. and it was replaced by the phenomenon of *evergesia* (benevolence), while some Epirotic communities which rented communal pastures to transhumant groups, used the money they gained in order to help poor families to pay their taxes (Παπαγεωργίου 1995, 158).

Newcomers, who constituted distinct social groups, settled the outskirts and very seldom did join community life (Ρουσοπούλου 2017, 353). In the Peloponnesian Ano Soudena Roma occupied the lowermost part of the village, called *Gyftorouga* ('the street of the Gypsies'). Conversely, the uppermost part was called *Archontorouga* ('the street of the nobles'). In Zagori also, Roma were originally attracted to the plains at the prospect of employment as land-workers, along with immigrant groups from poorer adjacent regions, thus forming the lowest social strata. In Kato Soudena, they resided in the *Anilia* ('non-sunny') side of the village just below the threshing floors and the huts where villagers used to store hay. In Tservari, they used to live firstly in the cells of an outlying church, and then in dry-stone huts which they had rented (Κικόπουλος 2008, 186). In Vitsa, they used to live even in an enclosure at the periphery of the village called Gyftika ('of the Gypsies'), stating isolation and marginalisation (Δαλκαβούκης 2001, 47). Normally, they had no property at all. Over the time, they obtained private property at the village edges. Their traditional occupation and primary source of income except of seasonal landwork was iron-work, shoe-making and the like. Moreover, they used to work as servants in rich houses and occasionally as very successful musicians of traditional folk music (Σιμώνη 2017, 336, 339; Χαραλαμπόπουλος 2017, 481, 483). Because of heavy social discrimination and long-standing exclusion in many parts of Greece, they did not boast their collective identity. Eventually, after the WWII they claimed identity based on the place and not on their origin (for Zagori see: Δαλκαβούκης 2001, 320).

In the beginning of the 19th cent., *Sarakatsani* were attracted to the region of Zagori, when massive migration left free the summer pastures, which were then offered for renting. Since 1938 the majority of these shepherd families have enjoyed the same citizenship and grazing rights as the sedentary villagers of Zagori from whom previously they had to rent their pastures (Campbell

Fig. 8. Romiodromos running through the Soudena villages in Kalavryta (© K. Papagiannopoulos).

1964, 16), and some of them have even settled in the villages as permanent inhabitants. In the beginning, some of them managed to connect through weddings with less-favoured inhabitants of the villages. Later they bought abandoned properties within the confines of the existed settlements and gained social recognition (Παπιγκιώτης 2017, 183; Ρουσοπούλου 2017, 347–351).

Ottoman authorities hardly ever visited the villages themselves. Tax collection was a task for the local Christian notables. Contacts between Christian Greeks and Muslims at the village level were limited and scarce. Since the last quarter of the 18th cent., the locals also avoided the use of high roads, and the main reason for this was the obligation to feed the officials and their escorts, and in particular, the Albanian military troops charged with street control (Ανωγιάτης-Πελέ 1985, 420–422). In people's language, the high road became then *tourkodromos* (Λαμπρίδης 1993b, 42 f.), *Tourkostrata* (Χαραλαμπόπουλος 2017, 490) or *beylitikos* (Leake 1830, 329, 337; 1835, 257), which mean the Turks' road. In contrast, a track that connects two Peloponnesian villages is called *romiodromos* ('Greeks' road') (*fig. 8*). Nowadays, such roads belong to rural networks.

5. New Uses of Old Resources: Value for Nature and Culture in the Modern Times

The industrialisation of agriculture has dramatically affected the rural life in both mountain-plains. It has led to the abandonment of the least productive areas and intensification in areas where agriculture could be mechanised easily.

Soudeniotes of Kalavryta were the first who left the mountains in order to settle in the fertile lowlands of north-western Peloponnese in the second half of the 19th cent. There, they were hired as land-labourers to cultivate blackcurrants, the most profitable agricultural product of that period, which was exported from Patras. The newcomers worked in the fields, lived in accommodations provided by these landowners, and eventually received a plot of land as a reward for their service. Nowadays, a thriving population of Soudeniotes lives and works in the lowlands, only to return to their mountain homes on holidays.

Although both mountainous regions became theatres of the Civil War (1946–1949), the trend of intensification and abandonment appears to be independent and follows a common pattern, at a small scale, though. Thus, parts of the mountain-plains were flattened by heavy machinery, small land-plots were merged, and seasonal wetlands were drained. Intensive cultivation took place on the most productive land, while marginal land was maintained or it was transformed to rangeland for grazing. There, small parcels of former agriculture land still surrounded by hedgerows, scattered trees and diversity of the habitats preserve their original structure. Nowadays, both mountain-plains are mainly used for the cultivation of clover used as fodder, while large areas are not cultivated at all and are only used for hay production. Livestock animals no longer graze in the surrounding hills, because there are no goats to maintain the *sclerophyllus* scrubland open enough for other animals to follow. Therefore, only small flocks of sheep (up to 300 animals) that are subsidised with EU money graze the formerly cultivated land and still produce enough quantities of milk that can be sold to nearby milk and cheese factories, just like the meat-producing cows that are subsidised for their meat and are sold in the nearby town for local consumption. It is important to note here that intensive livestock farming in enclosed farms was never practised, but intensive poultry farms appeared during the last six decades in Zagori as well as in the wider area of Epirus.

Both territories are now UNESCO Global Geoparks because of their high geologic and

geomorphologic value characterised mainly by their famous rough gorges. The territory of Zagori is situated within the Vikos-Aoos UNESCO Global Geopark. The territory of Kalavryta lies within the Chelmos-Vouraikos UNESCO Global Geopark. The conservation value of their biodiversity is also expressed in the numerous protected areas that they embrace, such as National Forests, NATURA 2000 Sites, Wildlife Refuges, European Important Bird Areas, European Special Protected Areas and others. Deep cultural imprints composed of prehistoric caves, archaeological sites, monasteries, and abundant vernacular architecture mark both of them. The sacred forests of Zagori and the nearby region of Konitsa were inscribed in the National Inventory of Intangible Cultural Heritage[1] in 2014. In the Peloponnese, the E4 European Long Distance Path crosses Kalavryta and passes Soudena.

As a result, there is a clear change in the use of natural resources from the primary sector in the past to tourist business nowadays, moving values accordingly from utilitarian to aesthetic and thus, from productivity to beauty and landscape consumption (Stara et al. 2015a, 161 f.). Changes in land-use are reflected in people's movements. Recently, tourism in Zagori and Kalavryta has become an important new economic activity, which has slowly emerged as an additional income for locals, also attracting investment and inward migration. Educated people from big cities of Europe or Greece, also known in the literature as 'lifestyle migrants', are attracted there searching for a better quality of life or a 'rural idyll' in an attractive built and natural environment (Λαμπριανίδης/ Μπέλλα 2004; Stara et al. 2015a, 155). The tourist industry has also attracted migrants from Albania to work in limestone masonry and the tourist sector.

However, abandonment of the built environment and of the countryside is obvious today and is mirrored in demography. The impressive prosperity of previous centuries was followed by degradation, which started in the second half of the 19th cent. in Kalavryta and at the beginning of the 20th cent. in Zagori. It was then, when the industrial revolution in Europe dealt a severe blow to the settlements there. Between 1940, when Greece entered the Second World War, and 1970, Zagori and Kalavryta lost their populations, following the pace of the Mediterranean mountainous regions. It was not before 1980 that migration was partly reversed thanks to the return of some retired people back to their native villages. Present population structure shows signals of ageing, fall of birth-rate and rise of mortality. However, communities remain alive because locals use their family house as one of the multiple places where they live during the year. This results in a seasonal fluctuation of the population, which is almost tripled during summer (Δαμιανάκος et al. 1997). Nevertheless, the municipalities of Zagori and Kalavryta are today among the least populated regions of Greece (Ελληνική Στατιστική Αρχή 2011).

6. Conclusion

The interdisciplinary study of the Soudena mountain-plains in Epirus and Peloponnese, though 250km apart, demonstrate interesting analogous patterns of continual convergent landscape shaping that has taken place over the centuries. The land has always been a crucial resource, which triggered the evolution of complex resources in the form of human action and passages. The inhabitants managed the land, and they developed identities for themselves and the others. The way they participated in resource management led them to the sanctification of certain localities, the construction of social hierarchies and the relocation in search of new resources.

However, land abandonment of both areas after WWII, following the general trend of rural depopulation of mountain areas of the Mediterranean, changed significantly the present day countryside, although, ancient landscape characteristics are here still alive. This is due to maintenance, even at a smaller scale, of the long-established past agricultural activities, serving as a scientifically characteristic example of the long-term stability of successful survival strategies of mountain communities.

Nowadays, the locals return to the abandoned mountain-plains in search of resources, which are

1 http://ayla.culture.gr/en/purpose/ (last access 02.04.2021).

not connected to subsistence and survival, but to aesthetic pleasure, which the interaction of nature and culture provides. Despite the fact that the plains contain internationally acclaimed sites of natural and cultural significance, there is still a need for in-depth studies of their hidden values with regard to their long-term land uses if these unique mountain landscapes and their bio-cultural heritage are to be conserved in the new era.

Helene Simoni
University of Patras
Department of Geology
26504 Patras, Greece
hsimoni@upatras.gr

Kostas Papagiannopoulos
Institute of Local History
25002 Kαmenitsa, Greece
insti.gr@gmail.com

Rigas Tsiakiris
Forestry Service of Ioannina
Decentralized Administration of Epirus -W. Macedonia
45445 Ioannina, Greece
rigastsiakiris@gmail.com

Kalliopi Stara
University of Ioannina
Department of Biological Applications and Technology
45110 Ioannina, Greece
kstara@uoi.gr

Bibliography

Alexander 1985: J. C. Alexander, Toward a History of Post-Byzantine Greece. The Ottoman Kanunnames for the Greek Lands, circa 1500–circa 1600 (Athens 1985).

Appadurai 1995: A. Appadurai, The Production of Locality. In: R. Fardon (ed.), Counterworks. Managing the Diversity of Knowledge (London 1995) 208–228.

Bailey et al. 1993: G. Bailey/G. King/D. Sturdy, Active Tectonics and Land-Use Strategies. A Palaeolithic Example from Northwest Greece. Antiquity 67, 1993, 292–312.

Bintliff/Snodgrass 1989: J. Bintliff/A. Snodgrass, From Polis to Chorion in South-West Boeotia. In: H. Beister/J. Buckler (eds.), Boiotika. Vorträge vom 5. Internationalen Boötien-Kolloquium zu Ehren von Professor Dr. Siegfried Lauffer, Institut für Alte Geschichte, Ludwig-Maximilians-Universität München, 13.–17. Juni 1986. Münchener Arbeiten zur Alten Geschichte 2 (München 1986) 285–299.

Blondel/Aronson 1999: J. Blondel/J. Aronson, Biology and Wildlife of the Mediterranean Region (Oxford 1999).

BOA: Başbakanlık Osmanlı Arşivi [İstanbul]: TT 10, TT 80, TT 350, TT 586, TT 607, TT 712.

Bourdieu 1995: P. Bourdieu, Outline of a Theory of Practice. Translated by R. Nice (Cambridge 1995).

Braudel 1995: F. Braudel, The Mediterranean and the Mediterranean World in the Age of Philip II, 1 (Berkeley 1995).

Campbell 1964: J. K. Campbell, Honour, Family and Patronage. A Study of Institutions and Moral Values in a Greek Mountain Community (Oxford 1964).

Cleere 1989: H. F. Cleere, Introduction. The Rationale of Archaeological Heritage Management. In: H. F. Cleere (ed.), Archaeological Heritage in the Modern World (London 1989) 1–19.

Ercan 1986: Y. Ercan, Osmanlı İmparatorluğunda Bulgarlar ve Voynuklar. Ankara: Türk Tarih Kurumu Basimevi/Atatürk Kültür, Dil, ve Tarih Yüksek Kurumu, Türk Tarih Kurumu yayınlarından VII, Dizi, 88 (Ankara 1986).

Gell 1817: W. Gell, Itinerary of the Morea. Being a Description of the Routes of that Peninsula (London 1817).

Hague Convention 1899: Convention with Respect to the Laws and Customs of War on Land (Hague, II), 29 July 1899, <http://avalon.law.yale.edu/19th_century/hague02.asp> (last access 15.01.2019).

Hague Convention 1907: Convention Respecting the Laws and Customs of War on Land, (Hague IV), 18 October 1907, <http://avalon.law.yale.edu/20th_century/hague04.asp> (last access 15.01.2019).

Hardenberg 2016: R. Hardenberg, Beyond Economy and Religion. Resources and Socio-Cosmic Fields in Odisha, India. Religion and Society: Advances in Research 7, 2016, 83–96.

Hardenberg et al. 2017: R. Hardenberg/M. Bartelheim/J. Staecker, The 'Resource Turn'. A Sociocultural Perspective on Resources. In: A. K. Scholz/M. Bartelheim/R. Hardenberg/J. Staecker (eds.), Resource-Cultures. Sociocultural Dynamics and the Use of Resources. RessourcenKulturen 5 (Tübingen 2017) 13–23.

Hardin 1968: G. Hardin, The Tradegy of the Commons. Science 162, 1968, 1243–1248.

Hesychius 1867: Hesychii Alexandrini Lexicon. Sumptibus Hermanni Dufftii (Ienae 1867), <https://books.google.gr/books?id=0mcvAAAAQAAJ&pg=PP7&dq=Hesychii+Alexandrini+Lexicon.+Sumptibus+Hermanni+Dufftii&hl=el&sa=X&ved=2ahUKEwjWuq_S6NzvAhVSKewKHc6VAsUQ6AEwAHoECAAQAg#v=onepage&q=Hesychii%20Alexandrini%20Lexicon.%20Sumptibus%20Hermanni%20Dufftii&f=false> (last access 02.04.2021).

Hodder 1990: I. Hodder, Archaeology and the Post-Modern. Anthropology Today 6, 1990, 13–15.

Hughes 1994: J. D. Hughes, Pan's Travail. Environmental Problems of the Ancient Greeks and Romans. Ancient Society and History (Baltimore, Md. 1994).

Hütteroth 1974: W.-D. Hütteroth, The Influence of Social Structure on Land Division and Settlement in Inner Anatolia. In: P. Benedict/E. Tümertekin/F. Mansur (eds.), Turkey. Geographic and Social Perspectives (Leiden 1974) 19–47.

Ingold 2000: T. Ingold, The Perception of the Environment. Essays on Livelihood, Dwelling and Skill (London 2000).

Kyparissis et al. 2015: A. Kyparissis/S. Stagakis/N. Markos/V. Vanikiotis, Study of Climatic and Cultural Effects by Dendrochronology of Selected Trees. Report to Thalis-SAGE Project, University of Ioannina, Greece (Ioannina 2015).

Leake 1830: W. M. Leake, Travels in the Morea 2 (London 1830).

Leake 1835: W. M. Leake, Travels in Northern Greece 4 (London 1835).

Marini-Govigli et al. 2017: V. Marini-Govigli/R. J. Healey/L. G. J. Wong/K. Stara/R. Tsiakiris/M. J. Halley, Similarities in Tree Species Composition across Fragmented Patches. The Case of Sacred Groves in Northern Greece. 18ο Δασολογικό Συνέδριο & International Workshop. Πρακτικά 18ου Δασολογικού Συνεδρίου & International Workshop: Ελληνική Δασοπονία μπροστά σε σημαντικές προκλήσεις: αειφορική διαχείριση δασών, δασικοί χάρτες, περιβαλλοντικές τεχνολογίες – δικτύωση και προστασία φυσικού περιβάλλοντος. Ελληνική Δασολογική Εταιρεία (Thessaloniki 2017) 1279–1287.

Martel 1892: M. E.-A. Martel, Les catavothres du Péloponèse. Extrait de la Revue de Geographie. Institut Geographique de Paris Ch. Delagrave (Paris 1892).

Merleau-Ponty 2005: M. Merleau-Ponty, Phenomenology of Perception. Translated by C. Smith (London 2005).

Mitsopoulos-Leon 2012: V. Mitsopoulos-Leon, Das Heiligtum der Artemis Hemera in Lousoi. Kleinfunde aus den Grabungen 1986–2000. Österreichisches Archäologisches Institut, Sonderschriften 47 (Wien 2012).

Mitsopoulos-Leon 2017: V. Mitsopoulos-Leon, Hellenistische Häuser in Lousoi. Keramik und Kleinfunde aus den Grabungen 1983–1994. Österreichisches Archäologisches Institut der Österreichischen Akademie der Wissenschaften, Sonderschriften 55 (Wien 2017).

Oxford Dictionaries: Oxford Dictionaries, <https://en.oxforddictionaries.com/definition/pore> (last access 02.04.2021).

Pantelia 2018: M. Pantelia (ed.), Thesaurus Linguae Graecae® Digital Library. University of California, Irvine, <http://www.tlg.uci.edu> (last access 25.09.2018).

Pavlopoulos et al. 2018: K. Pavlopoulos/A. Leontaritis/C. D. Athanassas/C. Petrakou/D. Vandarakis/K. Nikolakopoulos/L. Stamatopoulos/K. Theodorakopoulou, Last Glacial Geomorphologic Records in Mt Chelmos, North Peloponnesus, Greece. Journal of Mountain Science 15.5, 2018, 948–965 DOI.org/10.1007/s11629-017-4563-0.

Pretty 2003: J. Pretty, Social Capital and the Collective Management of Resources. Science 302, 2003, 1912–1914.

Rackham/Moody 1996: O. Rackham/J. Moody, The Making of the Cretan Landscape (Manchester 1996).

Runnels/van Andel 2003: C. N. Runnels/T. H. van Andel, The Early Stone Age of the Nomos of Preveza, Landscape and Settlement. In: J. Wiseman/K. Zachos (eds.), Landscape Archaeology in Southern Epirus, Greece 1: The Nikopolis Project. Hesperia Supplement 32. American School of Classical Studies at Athens (Athens 2003) 47–134.

Sarınay et al. 2009: Y. Sarınay/M. Budak/Ö. Bayır/A. Özkılınç/A. Zeki İzgöer, 174 Numaralı Hersek Livâsı _icmâl Eflakân ve Voynugân tahrîr defteri (939/1533). Dizin ve tıpkıbasım. T.C. Başbakanlık Devlet Arşivleri Genel Müdürlüğü, Defter-i hâkânî dizisi 15 (Ankara 2009).

Schiffer/Gumerman 1977a: M. B. Schiffer/G. J. Gumerman (eds.), Conservation Archaeology. A Guide for Cultural Resource Management Studies (New York 1977).

Schiffer/Gumerman 1977b: M. B. Schiffer/G. J. Gumerman, Cultural Resource Management. In: M. B. Schiffer/G. J. Gumerman (eds.), Conservation Archaeology. A Guide for Cultural Resource Management Studies (New York 1977) 1–17.

Simoni/Papagiannopoulos 2017: H. Simoni/K. Papagiannopoulos, Integrating Local History and Landscape Archaeology. Two Case Studies from Western Greece. Journal of Greek Archaeology 2, 2017, 321–333.

Stamatopoulou 1998: C. Stamatopoulou, Greek Traditional Architecture. Zagori (Athens 1998).

Stara et al. 2015a: K. Stara/R. Tsiakiris/J. L. G. Wong, Valuing Trees in a Changing Landscape. A Case Study from Northwestern Greece. Human Ecology 43.1, 2015, 153–167.

Stara et al. 2015b: K. Stara/R. Tsiakiris/J. L. G. Wong, The Trees of the Sacred Natural Sites of Zagori, NW Greece. Landscape Research 40.7, 2015, 884–904.

Stara et al. 2016: K. Stara/R. Tsiakiris/V. Nitsiakos/J. M. Halley, Religion and the Management of the Commons. The Sacred Forests of Epirus. In: M. Agnoletti/F. Emanueli (eds.), Biocultural Diversity in Europe. Environmental History 5 (Cham 2016) 283–302.

Suidas 1705: Suidae Lexicon, Græce & Latine Tomus III. Typis Academicis (Cantabrigiæ 1705), <https://archive.org/details/suidaelexicongr03suid/page/156> (last access 9.11.2018).

Tilley 1994: C. Tilley, A Phenomenology of Landscape. Places, Paths and Monuments (Oxford 1994).

Tsiakiris et al. in press: R. Tsiakiris/K. Stara/V. Marini-Govigli/J. Wong, Walking in Sacred Forests with Oliver Rackham. A Conversation about Relict Landscapes in Epirus NW Greece. In: I. D. Rotherham/J. Moody (eds.), Countryside History. Collected Essays in Honour of the Late Professor Oliver Rackham (in press).

UNESCO 1954: Convention for the Protection of Cultural Property in the Event of Armed Conflict, 1954, <http://portal.unesco.org/en/ev.php-URL_ID=13637&URL_DO=DO_TOPIC&URL_SECTION=201.html> (last access 15.01.2019).

UNESCO 1972: Convention Concerning the Protection of World Cultural and Natural Heritage, 1972, <http://portal.unesco.org/en/ev.php-URL_ID=13055&URL_DO=DO_TOPIC&URL_SECTION=201.html> (last access 15.01.2019).

UNESCO 2003: Convention for the Safeguarding of the Intangible Cultural Heritage, 2003, <https://ich.unesco.org/en/convention> (last access 15.01.2019).

Willis 1992: K. J. Willis, The Late Quaternary Vegetational History of Northwest Greece 3. A Comparative Study of Two Contrasting Sites. New Phytologist 121, 1992, 139–155.

Αλεξοπούλου 2009: Γ. Αλεξοπούλου, Συμβολή στην αρχαιολογία και τοπογραφία της Αζανίας (Βόρειας Αρκαδίας) επαρχία Καλαβρύτων (Βολος 2009).

Ανωγιάτης-Πελέ 1985: Δ. Ανωγιάτης-Πελέ, Σχέσεις δρόμου και χωριών στην Βαλκανική χερσόνησο τον 18ο αιώνα. Τα Ιστορικά 2.4, 1985, 405–422.

Βλαχοπούλου 2017: Α. Βλαχοπούλου, Αρχαιολογική τοπογραφία της περιοχής Άνω Πεδινών (Πάνω Σουδενών), Ελαφότοπου (Τσερβαρίου) και Κάτω Πεδινών (Κάτω Σουδενών) Ζαγορίου. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & αρχαιολογία των μετακινήσεων (Λουσικά 2017) 43–56.

Βοκοτοπούλου 1986: Ι. Βοκοτοπούλου, Βίτσα. Τα νεκροταφεία μιας μολοσσικής κώμης (Αθήνα 1986).

Δαλκαβούκης 1999: Β. Δαλκαβούκης, Μετοικεσίες Ζαγορισίων (1750–1922). Προσεγγίσεις στις διαδικασίες προσαρμογής μιας τοπικής κοινωνίας στην ιστορική συγκυρία (Θεσσαλονίκη 1999).

Δαλκαβούκης 2001: Β. Δαλκαβούκης, Ζαγορίσιοι, βλάχοι, σαρακατσάνοι, γύφτοι. Εθνοτοπικές ομάδες στο Ζαγόρι τον 20ο αιώνα (Θεσσαλονίκη 2001).

Δαμιανάκος et al. 1997: Σ. Δαμιανάκος/Ε. Ζακοπούλου/Χ. Κασίμης/Β. Νιτσιάκος, Εξουσία, εργασία και μνήμη σε τρία χωριά της Ηπείρου. Η τοπική δυναμική της επιβίωσης (Αθήνα 1997).

Ελληνική Στατιστική Αρχή 2011: Ελληνική Στατιστική Αρχή, Στατιστικές-Γενικές απογραφές κτιρίων και Πληθυσμού-Κατοικιών 2011, <http://www.statistics.gr/el/2011–census-pop-hous> (last access 15.01.2019).

Κικόπουλος 1991: Μ. Σ. Κικόπουλος, Ελαφότοπος (Τσερβάρι). Ιστορική μονογραφία (Γιάννινα 1991).

Κικόπουλος 2008: Μ. Σ. Κικόπουλος, Ελαφότοπος (Τσερβάρι). Λαογραφία, Β Έκδοση (Γιάννινα 2008).

Κοντόλαιμος 2017a: Π. Κοντόλαιμος, Παράρτημα 1– Τα Οθωμανικά κατάστιχα. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & αρχαιολογία των μετακινήσεων (Λουσικά 2017) 433–451.

Κοντόλαιμος 2017b: Π. Κοντόλαιμος, Τα Σουδενά (Λουσοί) και η περιοχή των Καλαβρύτων κατά τον 15ο και 16ο αιώνα στις Οθωμανικές πηγές. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & αρχαιολογία των μετακινήσεων (Λουσικά 2017) 81–90.

Κοντόλαιμος 2017c: Π. Κοντόλαιμος, Οι Βοϊνούκοι από τα Σουδενά (Πεδινά) Ζαγορίου, σύμφωνα με τις Οθωμανικές πηγές του 16ου αιώνα. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & αρχαιολογία των μετακινήσεων (Λουσικά 2017) 99–101.

Κουτρουβίδης 2017: Σ. Κουτρουβίδης, Η οικογένεια Πετμεζά. Μια ιστορία, ένας μύθος. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & Αρχαιολογία των μετακινήσεων (Λουσικά 2017) 131–141.

Κυριακίδου-Νέστορος 1989: Α. Κυριακίδου-Νέστορος, Λαογραφικά μελετήματα τόμος 1. ΕΛΙΑ (Αθήνα 1989).

Λαγόπουλος 2002: Α. Φ. Λαγόπουλος, Ο ουρανός πάνω στη γη. Τελετουργίες καθαγίασης του ελληνικού παραδοσιακού οικισμού και προέλευση τους (Αθήνα 2002).

Λαμπριανίδης/Μπέλλα 2004: Λ. Λαμπριανίδης/Ι. Μπέλλα, Η εγκατάσταση κατοίκων των αστικών κέντρων στην ύπαιθρο και η αναπτυξιακή δυναμική της. Τόπος 22/23, 2004, 135–154.

Λαμπρίδης 1993a: Ι. Λαμπρίδης, Ηπειρωτικά μελετήματα, τεύχος όγδοον. Ζαγοριακά, μέρος πρώτον (Ιωάννινα 1993[1889]).

Λαμπρίδης 1993b: Ι. Λαμπρίδης, Ηπειρωτικά μελετήματα, τεύχος έννατον. Ζαγοριακά, μέρος δεύτερον (Ιωάννινα 1993[1889]).

Μανσόλας 1867: Α. Μανσόλας, Πολιτειογραφικαί πληροφορίαι περί Ελλάδος (Αθήναι 1867).

Παναγιωτόπουλος 1985: Β. Παναγιωτόπουλος, Πληθυσμός και οικισμοί της Πελοποννήσου, 13ος–18ος αιώνας. Εμπορική Τράπεζα της Ελλάδος, Ιστορικό Αρχείο/Μελέτες Νεοελληνικής Ιστορίας 1 (Αθήνα 1985).

Παπαγεωργίου 1995: Γ. Παπαγεωργίου, Οικονομικοί και κοινωνικοί μηχανισμοί στον ορεινό χώρο. Ζαγόρι (μέσα 18ου–αρχές 20ου αι.) (Ιωάννινα 1995).

Παπαγιαννόπουλος 2017a: Κ. Παπαγιαννόπουλος, Από Σουδενά σε Σουδενά. Παραδόσεις μετακινήσεων και επιστημονική έρευνα. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & Αρχαιολογία των μετακινήσεων (Λουσικά 2017) 389–427.

Παπαγιαννόπουλος 2017b: Κ. Παπαγιαννόπουλος, Ο δημόσιος βίος στα Σουδενά Ηπείρου και Καλαβρύτων (1700–1830). Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & Αρχαιολογία των μετακινήσεων (Λουσικά 2017) 102–118.

Παπαγιαννόπουλος 2017c: Κ. Παπαγιαννόπουλος, Πόλεμος και επανάσταση στο Ζαγόρι και στα Καλάβρυτα (1430–1830). Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & Αρχαιολογία των μετακινήσεων (Λουσικά 2017) 119–130.

Παπαγιαννόπουλος et al. 2017: Κ. Παπαγιαννόπουλος/Ρ. Τσιακίρης/Κ. Στάρα, Παράρτημα 7–Τοπωνύμια Σουδενών Ηπείρου. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & Αρχαιολογία των μετακινήσεων (Λουσικά 2017) 473–479.

Παπαγιαννόπουλος/Σιμώνη 2017: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & αρχαιολογία των μετακινήσεων (Λουσικά 2017).

Παπιγκιώτης 2017: Β. Παπιγκιώτης, Η νεότερη ιστορία των Πάνω Σουδενών Ζαγορίου μέσα από τα τοπικά αρχεία.Μεγάλες και μικρές πτυχές της ζωής του χωριού. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & Αρχαιολογία των μετακινήσεων (Λουσικά 2017) 174–194.

Ρουσοπούλου 2017: Μ. Ρουσοπούλου, Μνήμες των Σουδενιωτών για τη διαχείριση της καθημερινής ζωής σε διαφορετικά περιβάλλοντα. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & Αρχαιολογία των μετακινήσεων (Λουσικά 2017) 342–378.

Ρουσοπούλου/Παπαγιαννόπουλος 2017: Α. Ρουσοπούλου/Κ. Παπαγιαννόπουλος, Η Σουδενιώτικη κατοικία. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & αρχαιολογία των μετακινήσεων (Λουσικά 2017) 231–264.

Σιγαλός 1998: Π. Γ. Σιγαλός, Το χωριό μου Κάτω Σουδενά (Κάτω Λουσοί) Καλαβρύτων (Πάτρα 1998).

Σιμώνη 2017: Ε. Σιμώνη, Το πολιτισμικό περίγραμμα των Σουδενιωτών από τη σκοπιά της θρησκευτικής πίστης. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & αρχαιολογία των μετακινήσεων (Λουσικά 2017) 327–341.

Στάρα 2009: Κ. Στάρα, Μελέτη και καταγραφή ιερών δασών και δασυλλίων στον Εθνικό Δρυμό Βίκου-Αώου. Παραδοσιακές μορφές διαχείρισης, αντιλήψεις και αξίες των τοπικών κοινωνιών για τη διατήρηση του φυσικού τους περιβάλλοντος (Αδημοσίευτη Διδακτορική Διατριβή Πανεπιστήμιο Ιωαννίνων, Φιλοσοφική Σχολή, Τμήμα Ιστορίας και Αρχαιολογίας (Ιωαννίνα 2009).

Χαραλαμπόπουλος 2017: Π. Χ. Χαραλαμπόπουλος, Παράρτημα 8 – Τοπωνύμια τέως Δήμου Σουδενών Καλαβρύτων. Σε: Κ. Παπαγιαννόπουλος/Ε. Σιμώνη (επιμ.), Οι ρίζες των Σουδενιωτών. Τοπική Ιστορία & Αρχαιολογία των μετακινήσεων (Λουσικά 2017) 480–492.

Χριστοφιλόπουλος 2002: Δ. Χριστοφιλόπουλος, Πολιτιστικό Περιβάλλον – Χωρικός Σχεδιασμός και Βιώσιμη Ανάπτυξη (Αθήνα 2002).

Oscar Jané, Oliver Vergés, Carles Gascón, and Carlos Guàrdia

Abandoned Villages

An Archaeological Approach to Studying Social and Landscape Transformations in the Pyrenees

Keywords: contemporary archaeology, abandoned villages, conflicts, landscape, cultural heritage, resources

Abstract

In the region of the Iberian Peninsula bordering on France, some inhabitants used to travel to find work abroad. Eventually this led to permanent emigration, resulting in the abandonment of many Pyrenean villages. This process, intensified by the Spanish Civil War, gave rise to two or three new migratory waves: the first one composed by those who exiled during the war itself; shortly after, the migration was enhanced both by the proximity of the frontier and by the effects of the guerrilla warfare and the Franco regime's repression during the post-war period; finally, the last wave during the 1960s, linked to pure economic motivations.

In this regard, the role of archaeology is paramount. The large number of abandoned or semi-inhabited villages have preserved many signs of this places' life up to the 20th cent. This study has several aspects: the archaeological study itself and the observation of the process of the collapse of a site; the analysis of the true reasons for abandonment, such as economic problems or socio-economic repression; understanding the informal networks, either social or political, in the Pyrenees and the transformations of the landscape linked to the abandonment of the villages.

All this requires archaeological and historical research in order to see that, as we can observe by early signs, many such decisions were planned and not involuntary. Thus, the Pyrenees have become a large-scale open-air site with a multiplicity of abandoned villages. All in all, the systematic study of abandoned villages in the central and western Catalan Pyrenees can provide data on the real effects of economics, politics, social behaviours and ideologies during the 20th cent.

Introduction

The Iberian Peninsula has a large number of abandoned villages, whose inhabitants have often departed for economic reasons. The area of the Pyrenees has witnessed major migratory movements since the 19th cent. As a border region, some of its inhabitants have taken advantage of the proximity to France and started to migrate for work-related reasons, which eventually led to permanent emigration. This has resulted in the abandonment of many Pyrenean villages. Studying this, it is also necessary to focus on the effects of the Spanish Civil War, which gave rise to two or three new migratory waves: firstly, those who went into exile during the war itself; secondly, the movements due to the proximity of the frontier and the effects of the guerrilla warfare and the Franco regime's repression during the post-war period; and a final wave during the 1960s, linked to economic motivations.

This article is part of a wider research project underway, related to the depopulation that has affected the Catalan Pyrenean region over the last one hundred and fifty years. The project in question, in which university research centres, local authorities and study centres and independent researchers are already participating, is transversal and multidisciplinary as it encompasses various branches of knowledge such as archaeology, history, geography or anthropology among others. In this text we present the basic lines of the possible future development of this research, based on an initial contextualisation of the topic. It is intended that the final results of the work will throw light on what factors caused the depopulation, as well as its impact on society, always with an international comparative outlook (Di Figliaa 2016).

In this regard, the role of archaeology is fundamental. A large number of abandoned or semi-inhabited villages have preserved many signs of life in the 20th and earlier centuries. Studying them offers several opportunities, among them: the archaeological study in itself and observation of the reverse process of the collapse of a site; the analysis of the real reasons for abandonment, whether economic problems or economic and social repression; understanding social and political networks in the Pyrenees, and the landscape transformations associated with the abandonment of these villages. This process requires archaeological and historical research in order to confirm that, as is suggested by initial indications, many such decisions were planned rather than involuntary.

1. Conceptualisation

The Catalan Pyrenees region has a large number of abandoned or uninhabited villages. The distribution of these deserted settlements and the information that they can provide is of interest as instruments for research purposes. However, how to refer to these villages and what kind of settlements are being talked about?

In the different schools of thought on the question, whether in the field of demography, geography or history a variety of terminology is used ranging from ‘abandoned villages’ and ‘uninhabited villages’ to ‘depopulated places’. However, denominations such as ‘dead villages’, ‘ghost villages’ or ‘deserted villages’ can also be found (Marisa/Mascarenhas 2011). In this case, we have opted to use the expression ‘abandoned villages’, following international criteria and the need for comparison, above all at a European level (Wolski 2016).

The term village here is understood as a unit of settlement, including traditional (nucleated) villages and groupings of (scattered) houses, farmhouses and company towns (Catalan *colònies*). An initial approach that involves comparison at a national and international level through the analysis of the research carried out to date is required. At the same time, the study also takes into account the settlements that, for different reasons, have undergone a process of partial or total recovery, whether successful or not (the case of the majority) as a result – largely – of private initiatives: outsiders seeking a quiet life far from cities; returnees and second homes for tourism, etc. Thus, should an abandoned village converted into a group of second homes, a fact that often influences the population registration figures, continue to be regarded as such? In other words, can a village that was uninhabited fifteen years ago but is now a village of second homes still be considered in this category even though it is empty for six months or more a year? Does the fact that it has services and pays local taxes make it a living village? These are some of the questions that, because of the most recent case studies, may modify some of the perspectives adopted in this study.

2. The State of the Art

This study aims to establish some working guidelines and an initial approach as a starting point to carry out a broader comparative research project. For this reason, it lays down some basic lines seeking to systematically explore what work has been undertaken on abandoned villages in the Iberian Peninsula and Europe in general and looks at what has been done from an archaeological point of view and what has been carried out within the fields of geography, history, archaeology, ethnology and heritage specifically in the Pyrenees. It also seeks to establish a typology of settlements

and to draw conclusions as regards the interest of this project for local, national, European or world history.

In our case, we take the following analyses, almost the only general considerations in existence, as our starting point: the studies by Joan Manuel Soriano, Ignasi Aldomà and a few others (Soriano 1994; Aldomà 1999), who, in the 1990s, undertook a survey of the demography and mobility of the Pyrenean region studied here, and the geographical and demographic studies carried out by organisations such as CEDDAR (in Aragón: Centro de Estudios sobre Despoblación y Desarrollo de Áreas Rurales) and the Fundació del Món Rural (Rural Foundation) (Aldomà et al. 2017). However, there is hardly anything specifically on uninhabited settlements or a regional-territorial-zonal inventory of abandoned villages, or a chronological inventory either.

3. Reasons for Using Alt Pirineu and Aran as a Case Study

The choice of the region of Alt Pirineu and Aran, made up by six *comarques* or districts, namely Cerdanya, Alt Urgell, Pallars Sobirà, Pallars Jussà, Alta Ribagorça and Vall d'Aran, is not a matter of chance. In the first place, it reflects a territorial division administratively defined by the Generalitat of Catalonia, with an institutional body that binds it into a coherent whole (the Institut de Desenvolupament de l'Alt Pirineu i Aran, l'IDAPA)[1] and has a relatively homogeneous set of physical, human and social characteristics. These features make it possible to extract conclusions that can be extrapolated to a greater or lesser degree within the same territorial area. In addition, statistics to analyse within this administrative framework are available. Moreover, this area of study offers a very wide range of causes and effects of depopulation, many of which are also visible elsewhere, although the variety may be more specific and limited. Finally, Alt Pirineu and Aran has a high concentration of deserted or semi-deserted settlements that enable the phenomenon to be studied from several points of view and using a long-term perspective. Some villages have been uninhabited since the 19th cent., whereas others have only suffered this fate in very recent times. For all these reasons, we consider that Alt Pirineu and Aran to be a paradigmatic example for the study of

Fig. 1. Location of Catalonia in Europe, <https://ca.m.wikipedia.org/wiki/Fitxer:Catalonia_location_map.png> (Creative Commons) (last access 02.2020).

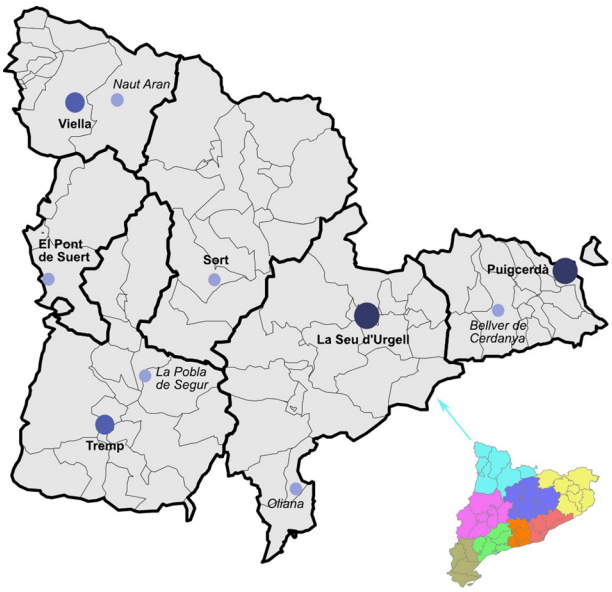

Fig. 2. Maps of the location of Alt Pirineu i Aran in Catalonia and of the villages with the highest number of inhabitants in Alt Pirineu i Aran, <https://es.m.wikipedia.org/wiki/Archivo:Mapa_poblacions_Alt_Pirineu_i_Aran.svg> (Creative Commons) (last access 02.2019).

1 For further information about the role and norms of the Institut de Desenvolupament de l'Alt Pirineu i Aran consult the following web page: <http://sac.gencat.cat/sacgencat/AppJava/organisme_fitxa.jsp?codi=13437> (last access 05.06.2020).

depopulation in the Iberian Peninsula and Europe as a whole (*fig. 1–2*).

This concentration of such remains (in a better or worse state of preservation; semi- or completely ruined) provides a focal point whose study will help us to understand the evolution of Pyrenean societies in recent centuries in social, economic and political terms. This perspective combines a component of historical study and an archaeological approach by means of a field survey. At the same time, it represents an instrument and a unique source both for researchers and students. The collapsing process of buildings in abandoned villages can be observed and analysed by archaeologists, thus allowing a better comprehension of strata deposition while digging a building from an actual site. This analysis could even allow researchers to tell how much earlier the building collapsed before being covered. Otherwise, this study is concerned with the impact on the environment: we clearly observe an abandonment of the landscape that has consequences on possible recovery and daily life and, at the same time, allows an analysis of an environment without human presence even though the traces remain.

4. The Demographic Data of Depopulation

Between 1857 and 2007, the population of the districts of Alt Pirineu and Aran declined by 29.6%, falling from 105,036 to 73,906 inhabitants (Guirado et al. 2008, 230). Although the early 21st cent. economic boom limited this trend, the crisis of the last few years has once again had negative consequences, and between 2011 and 2017 there was a renewed demographic decrease of approximately 7% (from 77,189 to 71,637 inhabitants).[2] In one and a half centuries, Alt Pirineu and Aran lost almost one in every three of its inhabitants. The current population density in this region is 12.46 per km^2 (with areas where this falls to 4 or 5 per km^2), whereas the overall figure for Catalonia is 235.33 per km^2 and for the world as a whole it is 58.04 per km^2.[3] As has been pointed out, the trend towards depopulation is visible and ongoing, and the data clearly reflects it: 19.6% of the population of the region is aged over 65, while under-15s represented only 13.6% of the population in 2017 (*fig. 3*).[4]

5. The Causes of Depopulation

Even though depopulation in the Pyrenees is largely related to economic factors, in fact it has not only come about as a consequence of one specific cause; it is multifactorial in nature. On this question, see the case study of Alt Urgell and Cerdanya in J. M. Soriano (1994), and as a general starting point, Ignasi Aldomà's contribution (1999) referring to rural Catalonia is of interest. Not all these causes have had the same impact in all the depopulation processes or at all points in time over the last century and a half. Taking this premise into account, the following reasons can be put forward.

5.1. Economic Factors: Transformations in Agriculture and Livestock Farming

The transformations of agriculture and livestock farming explain a substantial part of the causes of depopulation. The transition from a system of self-sufficient production to one of a basically commercial nature produced a shift towards less diversified production and the inhabitants' consequent need for the region to move to a different economic framework in which they had to acquire goods that they had hitherto produced themselves (Soriano 1994, 153). In this new situation (19th to 20th cent.), the area no longer had the capacity to maintain the same population; at that moment emigration started, initially seasonal in nature, but

2 Data obtained from the Institut de Desenvolupament de l'Alt Pirineu i Aran (IDAPA) at: <http://territori.gencat.cat/ca/06_territori_i_urbanisme/idapa/documentacio/indicadors/> (last access 05.06.2020).

3 World Bank data downloaded from: <https://datos.bancomundial.org/indicador/EN.POP.DNST?view=chart> (last access 05.06.2020).

4 Data obtained from the Institut de Desenvolupament de l'Alt Pirineu i Aran (IDAPA) at: <http://territori.gencat.cat/ca/06_territori_i_urbanisme/idapa/documentacio/indicadors/> (last access 05.06.2020).

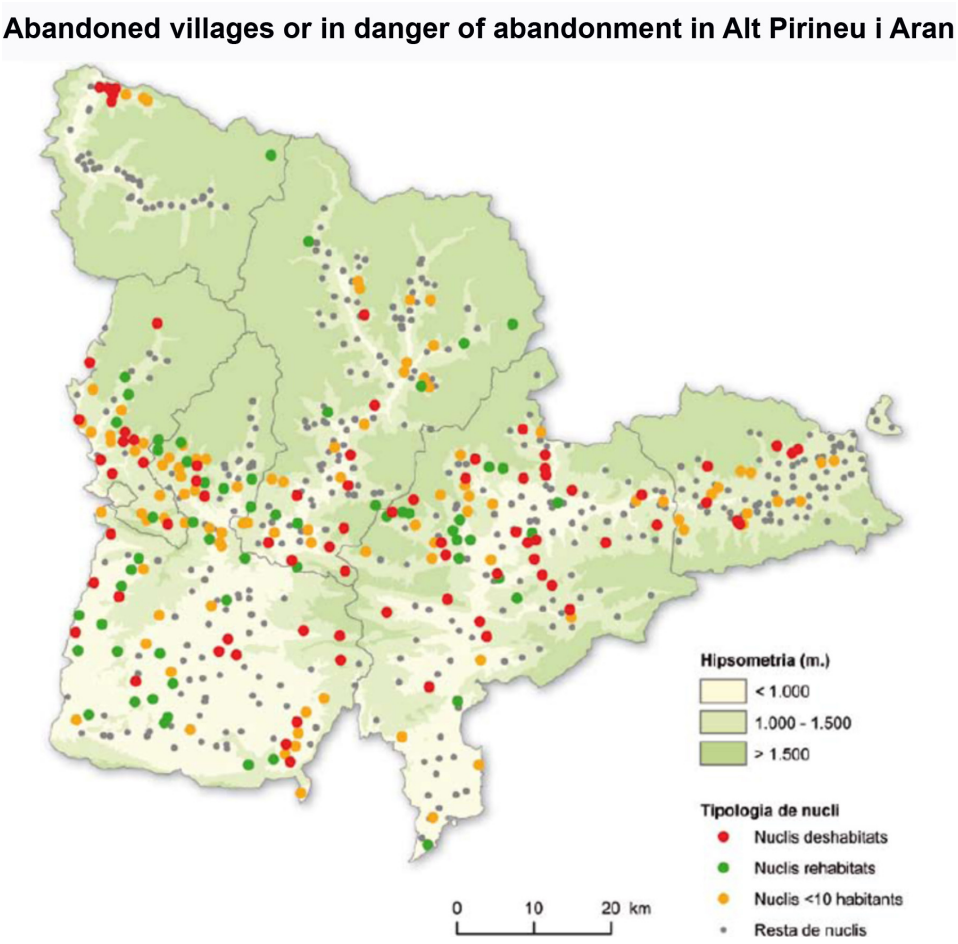

Fig. 3. Abandoned villages or in danger of abandonment in Alt Pirineu i Aran (Aldomà 2009, 49, <https://en.calameo.com/read/00061431026388e1375b5> [Creative Commons] [last access 05.06.2020]).

subsequently permanent, in order to work elsewhere, such as in the south of France or central or coastal Catalonia. Furthermore, the mechanisation experienced from the second half of the 20th cent. resulted in a large proportion of the workforce no longer being necessary, since a single tractor could carry out the work done by several day labourers. Many of these individuals also eventually emigrated.

Mechanisation affected both agriculture and livestock farming, a sector that followed a trend towards milk production instead of more extensive forms of farming in the second half of the 20th cent. Milk production was centralised on farms that did not require a large amount of labour, at the same time as many agricultural establishments focused on the production of livestock fodder to the detriment of a wider range of production for human consumption. This was a further factor favouring depopulation (Gascón 2015). Moreover, milk production also experienced its own crisis, to a large extent caused by the European Union's policies that encouraged the closing of farms in the late 20th and early 21st cent.

In addition to all this, it should not be forgotten that, despite the wish to dedicate oneself to agriculture and livestock farming, it is extremely difficult to compete in a totally globalised world with products that, even though they are produced farther away, offer the consumer a lower final price.

5.2. The Demand for Labour in the Industrialisation Process (19th to 20th cent.)

Apart from the transformations themselves and the difficulties involved in managing to live from these activities, it should also be borne in mind that, from the mid-19th cent. onwards, Catalonia underwent an intense process of industrialisation that produced a great demand for labour, both in

the Barcelona area and in company manufacturing towns (*colònies industrials*). Many families saw this as a way to escape from and improve their almost subsistence-level existence and to seek greater well-being and a better way of life. In the context of the above-mentioned economic changes, the city became a pole of attraction and an option that offered stable employment.

5.3. Wars

Wars, from the Carlist Wars (in the 19th cent.) to the Spanish Civil War (1936–1939), did not lead to large-scale migration in the Pyrenees, but they did affect certain specific locations, because a war usually results in one side being victorious, and the victors often hound the vanquished, not only at a state but also at a local level. Reprisals and repression might lie behind a family's abandonment of a specific place and even more so in small place with few inhabitants. Furthermore, the Pyrenees became a battle front during the 1936–1939 conflict (Pallars, Ribagorça), with the inevitable consequences for the population. Furthermore, the region continued to form part of this war zone for several years afterwards because of its frontier nature where anti-Franco *maquis* or guerrilla fighters were active.

5.4. Poles of Attraction: The Search for Well-Being

The question of the search for well-being led to migrations to outside the Pyrenean region, but also to internal movements, in which the village of origin was abandoned in order to look for a better life in the settlements in the valleys or nearby districts. The capitals of these *comarques* or districts became regional poles of attraction because of the possibilities that they offered for work and a higher standard of living. As a result, La Seu d'Urgell became a centre of attraction because of the rise of its milk-processing plants and Andorra because of the work opportunities that it made available in sectors such as tourism and trade, which closer locations could not offer.

5.5. Facilities, Infrastructure and Regional Planning

Another aspect related to well-being is that government decisions had a noticeable impact on the region, above all with regard to the management of services and infrastructure. The closure of schools in small villages in favour of centres of education in larger towns or the fusion of municipalities are examples of the restriction of services in certain places, to the benefit of others. In the same regard, the radial nature of infrastructure in Catalonia means that services (highways, hospitals, health centres, etc.) are concentrated in the centre to the detriment of the periphery, a distribution that also follows this pattern at the level of the regions and smaller districts. Thus, many places were abandoned by their inhabitants because they ceased to have a town hall, school and other services, to which they only had access if they made a journey every day. The search for well-being led many people to decide to abandon their villages and settle in larger urban centres with these facilities (Sabartés 1993).

This concentration of infrastructure or services, among which we might even include the church with a priest, did not occur by chance, but rather was the result of a specific approach to regional planning. Hence, in this respect, depopulation should not only be understood as a result of the inhabitants wishing to have a certain service at their disposal, but also of an erroneous or clearly intentional regional planning policy. For this reason, it might be claimed that depopulation was caused by poorly managed policies or an approach to regional planning management with vested interests in mind (to achieve greater social control, for example).

5.6. The Difficulties of the Pyrenean Physical Environment

The question of the physical environment must be added to all these aspects. The abrupt relief of the Pyrenees and a climate with long, hard winters are factors that tend to make the above-mentioned economic activities (agriculture and livestock

farming) difficult and to complicate investment in building certain infrastructures because of the large amount of resources required.

5.7. Other Factors

Apart from that, a number of specific factors that cannot be generalised may explain the depopulation of a particular place. Such is the case, for example, of Pont de Bar after the intense rainfall of 1982. Flooding swept the village away and the new settlement was built on a different site, but with a smaller number of inhabitants because of the deaths that had occurred in the tragedy and since some inhabitants decided to move elsewhere such as to La Seu d'Urgell. In the same context, one should also take into account the construction of reservoirs, leading to the disappearance of some villages, thereby obliging the inhabitants to move elsewhere.

6. The Pyrenees, a Large-Scale Open-Air Archaeological Site

Bearing in mind the depopulation figures, the large number of abandoned villages and the multiplicity of factors behind this trend, the region of Alt Pirineu i Aran is an ideal space for studying this phenomenon in overall terms, archaeologically speaking. In the last few years, the archaeology of the recent and contemporary past has come to have a more prominent role, although there is still a long way to go, and one of the aspects on which this discipline might be able to focus its interest is precisely related to the archaeology of abandoned settlements, not only because this is a practically untouched field in the Iberian Peninsula but also for the possibilities that it offers (Solé/Jané 2014).

The Pyrenees is in effect an open-air archaeological site. Disused structures can be found everywhere as evidence of the abandonment process of the last one hundred and fifty years. Unlike what happens in other cases, for instance the archaeology of antiquity or the medieval period, in which excavation, the act of unearthing, of digging up, is fundamental, in this case it is by no means a crucial issue. Many of the buildings are in ruins or in falling into ruin, but they are clearly visible. This means that it is possible to study them *in situ* without the need to undertake a true excavation, with all that it implies and involves (permits, report publication, etc.).

When we speak of the archaeology of abandoned Pyrenean villages, we are not only referring to the remains of dwellings, but also to the objects that have been left behind in a settlement, which enable us to understand the everyday life of a period in the not-so-distant past. Hence, we may locate agricultural implements, building materials, architectural traditions, or even objects related to daily life, such as a hand-powered washing machine or a spinning wheel. All this material can also be studied so as to see the transformations of modern-day society.

Furthermore, if we broaden our focus of attention, we realise that the sites are not only limited to the settlements themselves, but that it is also essential to take into account everything related to the human activity of the people that used to live and carry out their economic activity there. Here we refer to the paths and tracks as well as the buildings associated with agriculture and livestock farming, such as fields, terraces, drystone walls and huts or *orris* (buildings or enclosures for milking sheep and making cheese). The study of tracks enables us to gain knowledge of the communication routes and also past settlement dynamics, since a track is always a response to a need for communication (from outlying settlements to the centre of the municipality, from this centre to the district capital, transhumance routes, trading routes, etc.). Tracks, therefore, explain the reality of the landscape and of the people that lived there; they are fundamental to understanding the economic and social dynamics of a settlement. At the same time, the fields and terraces often explain the types of farming, the forms of exploitation, etc., in the same way as the *orris* enable us to trace livestock farming activities, which in the Pyrenees often, although not always, involve climbing to higher pastures during the summer.

In this case, archaeological research on the recent and very recent past enjoys the advantage of having access to a greater range of documentary

evidence for the period under study. As far as the most recent cases are concerned, it may even have evidence of oral history, whether directly recounted by the individuals concerned or through recordings. In this respect archive research (in public archives or private ones, of a personal nature, such as the documents for a house; as well as oral history that may still also be collected) may be far more enlightening than in other cases; this is an aspect that should not be neglected.

In addition, the case under study is interesting for the training of archaeologists. As has been mentioned, many buildings are falling into ruin, and this enables us to see not only how they were built, but also how structures collapse. For archaeologists, this is very useful information to gain an understanding of the process of how buildings fall into ruins, which may help in the future when excavating already ruined features on other sites.

Finally, we would like to raise the question of the effects on the countryside itself as abandonment has implications for the landscape. Former agricultural or livestock raising landscapes have been converted into woodlands. The increase in forest cover often accompanies these abandoned structures, from tracks and terraces to houses and *orris* being hidden. This is just one of the consequences that the abandonment process has had for the landscape, but a significant one for the training of the archaeologist, in order to see the mid- and long-term impact of this phenomenon.

7. Methodology

The methodology consists of measuring the impact of abandonment for the district (*comarca*)/territory: degree, index, all the elements, etc. With that, we use different instruments. The indices and instruments for measuring the impact of abandonment may include reforestation (there is an index of the development of forest cover in Catalonia) and a study of the same by zones-*comarques*. At present, woodland covers about 60% of the land. The possibility of drawing comparisons with previous years as regards the presence of livestock, services, economic activity or other things needs to be considered. This comparison should be extended to include mountain or rural zones in other parts of Europe.

We carried out the analyses on the basis of: the present-day and historical cartography; the use of aerial and personal photographs (pictures of buildings and fields etc. in order to draw comparisons and to locate sites); the use of software to reconstruct and to represent spaces and volumes; oral sources and public and private archive collections.

Finally, we made a diagnosis of the aims. The systematic study of abandoned villages can contribute knowledge as regards the assumed effects of the economy, politics and social and ideological behaviour in the 20th cent. through an inventory, interdisciplinary research and practical studies carried out by students.

Once the general data has been obtained and as a result of the visibility of the remains, one of the aims is to determine whether any specific areas where these processes are concentrated stand out by numbers and to convert them into a subject for interdisciplinary analysis, which might contribute specific information as regards historical, economic, social and cultural processes as well as define their future potential.

In overall terms, work has begun on the project starting with two lines of approach, namely research, in which a proposal for an inventory record sheet has been presented and a university teaching project in which both academic staff and students of archaeology take part.

8. The Features and Experience of a Multidisciplinary Research Project: Banyeres and Llastarri

After explaining the reasons for choosing the area to be studied – the depopulation figures for Alt Pirineu i Aran, the different reasons for this depopulation and the overall attraction that this area offers as a large-scale open-air site of interest from different standpoints – it is now time to analyse two particular cases as examples in order to see studies of specific instances.

8.1. Banyeres (Alt Urgell)

The village of Banyeres is located at the headwaters of the River Bona, in the municipal district of la Vansa i Fórnols (Alt Urgell). It is a nucleated settlement located at an altitude of 1300m, near the ridge that separates the valley of La Vansa from the Tost valley. It has not been inhabited since about 1980 (Gascón 2016, 56 f.) (*fig. 4*). From the administrative point of view, the village used to belong to the municipality of La Vansa, the valley of which it forms part. Both, because of its geographical location and because of the mountainous relief of the terrain, it was far from easy to live in Banyeres, and it became even more complicated when the social and economic transformations of the modern world started to modify the panorama of the Pyrenees.

The village was not particularly large and by the 1940s it only had three inhabited houses, which were relatively scattered. It stood at a distance of some 10km as the crow flies from the urban centre of the La Seu d'Urgell district, although the journey to reach that town was longer, taking some three hours by mule. It should be borne in mind that Sorribes de la Vansa, the administrative centre of the municipality to which Banyeres belonged, was 4km away as the crow flies but it took about two hours to walk there. Communications were therefore not at all easy, and that undoubtedly conditioned settlement in the area, above all if we take into account that there was no road to get there, only footpaths and trails. To a large extent, the economy of the district, based on the primary sector, relied on milk production for the economic subsistence of many families in the 20th cent. (Gascón 2015). However, in Banyeres it was impossible to produce milk for sale because it could not be transported to a point that lorries were able to reach. For this reason, the economic transformations and the lack of services, in this case infrastructure in the form of a road sounded the death knell for human settlement in Banyeres.

The question of the lack of services can also be seen in other aspects, which might nowadays be considered to be of secondary importance, but which might not have been so for the inhabitants

Fig. 4. View of Banyeres.

of the Pyrenees in the last century. Apart from the lack of municipal services, infrastructure or a doctor's surgery, for instance, the village did not have a curate and there was no parish priest in the two closest inhabited villages (Adraén and Fòrnols). In order to be able to attend religious services, the inhabitants of Banyeres had to travel a considerable distance or go to fetch the priest and return him after Mass. The same situation arose as regards the school; the children in Banyeres, who numbered four or five in the mid-20th cent., had a two-hour walk to reach their school, located in Sorribes de la Vansa, and took another two hours to return home. The journey might take even longer in bad weather (Gascón 2016).

Although depopulation started in the Pyrenees in the mid-19th cent., the 1960s were especially intense in this respect, and Banyeres, where there was still no running water or electricity, and which the dairy-farming economy of the district had passed by, was no exception. When the inhabitants of one of the houses left the village and tried their luck working for someone else near La Seu d'Urgell, only one house remained occupied; its residents were a widowed mother and her son, both of whom died in a fire in 1983 in their home that nobody was able to extinguish. In the 1990s there was an attempt at resettling the village, but it also ended tragically.

This was how the village of Banyeres, a place that had been continuously inhabited since the medieval period, if not earlier, was abandoned; partly because of circumstantial factors, but above all as a result of a systemic crisis that affected (and

Fig. 5. Banyeres, remains of the church of Sant Vicenç.

continues to affect) the area of the Pyrenees, the common denominators of which have already been mentioned in previous sections (Soriano/ Tulla 2002). Unlike other places, the lack of a road to the village has made it impossible, for example, for Banyeres to become a centre of second homes or for tourism, a transformation that can be seen in other nearby villages in the adjoining district of la Cerdanya.

At present, there are still many remains of the village of Banyeres, although their state of preservation varies considerably. Thus, while Cal Poblador, the last house to be abandoned, is relatively well preserved, other buildings are in a worse state, such as, for example, the church of Sant Vicenç (*fig. 5*).

This fact, added to the total abandonment of the village, enables it to be studied as an open-air site, where both the process of a building falling into ruin and the former communication routes and disused livestock farming infrastructures can be analysed. Thus, we can better understand everyday life, the economic processes and the evolution of habitats through a study of the state of these buildings and their collapse process. An initial analysis shows how it was depopulated around the 1960's and the material remains have been intact ever since.

8.2. Llastarri (Alta Ribagorça)

This case study is the example of a project carried out by students of the Universitat Autònoma de Barcelona together with one of the authors of this paper, a lecturer at the same university, Oscar Jané, demonstrating the interrelationship of research and teaching – an example of work done by a group of students of archaeology (UAB) (Mayoral et al. 2013).

The village is located near the *coll* (pass) of Llastarri, in the Catalan Pyrenees, overlooking the village of Sopeira (Aragon). It has formed part of the municipal district of Tremp (Pallars Jussà) since 1970, although beforehand it belonged to the district of L'Espluga de Serra (Alta Ribagorça). The UTM coordinates are: 31T x: 316130 y: 4687092. Altitude: 1180.2masl (*fig. 6–8*).

Thanks to oral sources, the village community is known to have consisted of four families in the 19th and 20th cent., but at a certain point this number fell to three. In the 19th and part of the 20th cent. the population continued to live from agriculture and livestock farming, although bee-keeping was also added to these activities (Guirado et al. 2008).

The village is at present abandoned. The houses are in ruins, the church only has two walls left standing and the roof has collapsed and the village cemetery is very difficult to find as it has become overgrown with plants that stop people from entering. Even though the village is abandoned, by contrast its meadows are not. A family living nearby still takes their livestock to graze there. It is curious that this family rented the usufruct of the land from some of the old owners, which means that they still retain awareness of their rights and are in contact. At the same time, certain lengths of the path leading to the village are used for bee-keeping. A recent investigation allowed us to understand the importance of this area for the analysis of depopulation, natural elements, material culture and others that lie there (Sancho Reinoso 2011).

No archaeological excavations have ever been carried out in the village of Llastarri, apart from some small-scale field surveying by J. Mayoral, A. M. Moragues, C. Sánchez, M. Solanes, C. Subiabre and O. Jané, which failed to produce much evidence (Mayoral et al. 2013). But it has been possible to detail the structure of the village, its antiquity, the ancient roads and the relations between peoples, as well as the basic commodities of subsistence and the economy of its inhabitants. Even so, the following proposal to carry out an

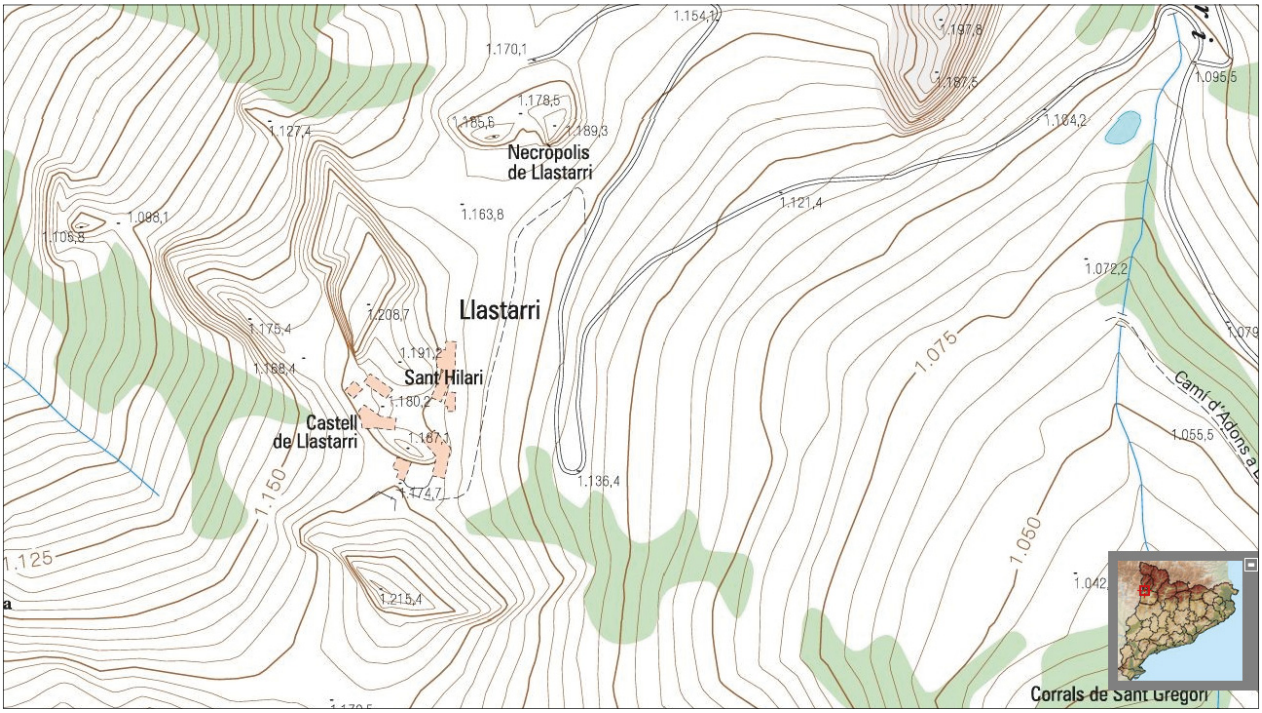

Fig. 6. Geographical map of the location of Llastarri (Map derived from the Orthophoto of Catalonia 1:5.000 of the Institut Cartogràfic i Geològic de Catalunya [ICGC], used under a CC BY 4.0 license).

appropriate field survey has been put forward. Aerial photography would be of great use and would contribute a substantial amount of information about the zone, which is rather abrupt and uneven, making it difficult to walk over. A second useful survey technique would be magnetic or geophysical methods to measure the variations of underground objects and features, which act like small magnets. In this way we, could see if there are other elements of buildings under the village since they are less magnetic than the sediment surrounding them. There are two key advantages to using this method in this case: firstly, as it is a rural setting, the system would not be affected by the magnetic contamination typical of urban areas; and secondly, it is a technique that does not need the terrain to be surveyed to be a flat surface.

Prior to starting survey work with this method, however, the terrain would have to be cleared, as it is covered in rubble and wild plants that make movement very difficult. This clearing process would also be necessary before excavation, so that it is essential to carry it out. Once the field survey has been completed and the results studied, the task of excavation would begin, depending on the results obtained. Due to the irregular nature of the terrain, the site would be divided into sections

Fig. 7. Aerial view of Llastarri. In the coloured polygones the location of the abandoned village (Image derived from the Orthophoto of Catalonia 1:5.000 of the Institut Cartogràfic i Geològic de Catalunya [ICGC], used under a CC BY 4.0 license).

Fig. 8. Aerial view of the abandoned village of Llastarri.

Fig. 9. View of the abandoned village of Llastarri: disposition and structure of the village.

Fig. 10. View of architectural remains of Llastarri.

at different levels, as if they were agricultural terraces. Subsequently, excavation would proceed following stratigraphic principles. At all times the whole excavation would be accompanied by the necessary site record: the register of stratigraphic contexts (features and layers), the drawing of archaeological plans, and the photographic record (*fig. 9, 10*).

Once the excavation has come to an end, the remains found would be classified and studied and, if appropriate, a process of restoration would be undertaken. This would be the approach adopted from the field of teaching applied to *in situ* research in an abandoned village in a medium- or high-altitude mountain environment.

9. Conclusions

In summary, as we have mentioned at the beginning, this text outlines a proposed project for which several preparatory steps already are taken. The combination of archaeological and historical studies helps in understanding the effects of policies, economic measures and ideologies on the settlements in the Catalan Pyrenees.

Thus, the Pyrenees, with a substantial number of abandoned villages, could become a large-scale open-air archaeological site. In brief, the systematic study of abandoned villages in the central and western Catalan Pyrenees can provide data on the real effects of the economy, politics and social behaviour and ideologies in the 20th cent. It is being carried out thanks to a large inventory, multidisciplinary research and a teaching practice that is already in place. This said, apart from the academic study, the results have to be crossed with other types of studies on resettlement to optimise territorial distribution (Pallarès 2014).

Given the studies carried out in recent years, in which the Pyrenees are the settlement of very ancient populations (Garcia 2018), the interest in better understanding their evolution, abandonment and interaction with the environment has increased. With this large number of open-air sites and the weight of history, it is clear that the Pyrenees are a historic landscape, the study of which can give us tools for an understanding that go far beyond the idea of the Pyrenees as a simple landscape. This study fully enters the idea of archaeology of conflict (social, economic, natural, etc.) that opens the door to a multitude of local studies that must gradually add up their results.

The traditional landscape resources with which its inhabitants have coexisted to this day are related to agriculture and livestock. All this represented a traditional whole landscape. However, in the last 100 to 150 years, the need for natural resources multiplied the number of coal mines (which were abandoned towards the 1960s) and the extension of the use of electricity increased the number of hydroelectric plants and dams that divided territories and isolated villages. These decisions, together with the political repression of the Francoism, had very negative effects on the survival of these villages.

Let us try to sum up the first conclusions, we are able to get to after having exposed the two subjects of study, given that what we have presented so far is a proposal for a larger project. One of the aims of this project is to also explain the different

reasons of the abandonment. Abandonment is often assimilated to subsistence reasons alone. However, subsistence and poverty issues have both been in the background of the exodus started in the 19th cent. from the countryside to larger cities. Industrialisation and modernisation are the main attractive points for people whose lives, until that moment, moved around the agricultural life and, with it, climate. Nevertheless, and despite having lost population between the 19th and 20th cent., some of these villages had maintained a certain amount of activity. Which, then, have been the final reasons why these villages were abandoned? It's possible to reach similar and diverse conclusions in both the examples presented in the paper, Banyeres and Llastarri. The oral sources study, the structure analysis and a historical study of the place and area have led us to deduce that: economic concentration in larger villages or even cities and difficulties in these smaller villages to move around make inhabitants of the latter move to the former. This works for both the examples. However, Llastarri was relatively near the 1938/1939 war front, which made it experience a complicated post-war, with a so named low-intensity repression, which consists in making everyday life more difficult to workers, and to directly point to those who are enemies of the regime. The physical repression could, in some cases, mean imprisonment. Consequently, there was a general decision to send sons and daughters to large cities, like Lleida or Barcelona, to avoid this situation.

Finally, with these new approaches the interest of the interrelation between archaeology, history and geography has been made clear. The practical application of archaeology in the pedagogical area allows students – archaeologists-to-be – to obtain knowledge on the territory – far away from cities – and on the collapsing process of buildings when it comes to their future work in underground archaeological sites, in addition to this knowledge's social contribution. Indeed, its study has, even all these years later, a clearly social side, when contemplating the social and political causes of this abandonment. What's more, it allows a study of the historical human environment within a landscape that has been in constant change, having experienced a great reforestation in the late years, which leads to increased danger of great fires in medium and high mountain areas. Human traces, such as villages, tracks, huts and structures built on fields, have been swallowed up by nature and now this makes it difficult to study the area if there is not a deep knowledge of it *in situ*.

Oscar Jané Checa
Universitat Autònoma de Barcelona
Departamento de Historia Moderna y Contemporánea, Edificio B
08193 Bellaterra (Cerdanyola del Vallés), Spain
Oscar.Jane@uab.cat

Oliver Vergés i Pons
Universitat Autònoma de Barcelona
Institut d'Estudis Medievals, Edificio B
08193 Bellaterra (Cerdanyola del Vallés), Spain
oliver.verges@gmail.com

Carles Gascón Chopo
Universidad Nacional de Educación a Distancia
Dpto. Historia Medieval y Ciencias y Técnicas Historiográficas,Centre Associat de la Seu d'Urgell
Edifici Cultural les Monges, 2, 2ª planta
25700 La Seu d'Urgell, Spain
cargascon@seu-durgell.uned.es

Carlos Guàrdia
Universidad de Barcelona
Dpto. Geografia, C/ Bisbe Guitart
47. Esc D. 3er-1ª
25700 La Seu d'Urgell (Lleida), Spain
cguardia.carbonell@gmail.com

Bibliography

Aldomà 1999: I. Aldomà, La crisi de la Catalunya rural. Una geografia dels desequilibris comarcals (1960–1991) (Lleida 1999).

Aldomà 2009: I. Aldomà, Atles de la nova ruralitat. Fundació del Món Rural (Lleida 2009), <http://www.agroterritori.org/ficha.php?doc=411&cid=1> (last access 05.06.2020).

Aldomà et al. 2017: I. Aldomà/J. R. Mòdol/M. Guerrero, Patrimonis rurals. Reconeixement i perspectives (Lleida 2017).

Di Figliaa 2016: L. Di Figliaa, Turnaround. Abandoned Villages, from Discarded Elements of Modern Italian Society to Possible Resources. International Planning Studies 21.3, 2016, 278–297.

Garcia 2018: D. Garcia, Arqueologia d'un territori d'alta muntanya del Pirineu Central. Persones, ramats i prats al llarg de la història al Parc Nacional d'Aigüestortes i Estany de Sant Maurici (PhD-Thesis Universitat Autònoma de Barcelona 2018), <https://www.educacion.gob.es/teseo/mostrarRef.do?ref=1719432> (last access 05.06.2020).

Gascón 2015: C. Gascón, Cadí. 100 anys de Cooperativa (La Seu d'Urgell 2015).

Gascón 2016: C. Gascón, Vius a la Vansa, morts a Adraén. Cadí-Pedraforca 21, 2016, 56–58.

Guirado et al. 2008: C. Guirado González/E. Mendizábal/J. Nadal Tersa/A. Pèlachs Mañosa/A. Solé Figueras/J. M. Soriano/A. F. Tulla i Pujol, La resolució espacial com a condicionant del resultat cartogràfic. Un estudi sobre el despoblament pirinenc. Treballs de la Societat Catalana de Geografia 65, 2008, 228–237.

López Palomeque et al. 1996: F. López Palomeque/R. A. Felip Fillat/A. F. Tulla Pujol/J. M. Soriano López, Revitalització de pobles deshabitats del Pirineu (Barcelona 1996).

Marisa/Mascarenhas 2011: F. Marisa/J. Mascarenhas, Abandoned Villages and Related Geographic and Landscape Context. Guidelines to Natural and Cultural Heritage Conservation and Multifunctional Valorization. European Countryside 3, 2011, 21–45.

Mayoral et al. 2013: J. Mayoral/A. M. Moragues/C. Sánchez/M. Solanes/C. Subiabre, Llastarri. Un poble abandonat però no oblidat. Research Work for the Subject "Archeology of the Modern and Contemporary World" (Bellaterra 2013).

Pallarès 2014: M. Pallarès, Estratègies de desenvolupament local rural, gènere i processos innovadors en la nova ruralitat. L'aportació de les dones al desenvolupament, la innovació i la governança territorial a l'Alt Pirineu i Aran (Catalunya) (PhD-Thesis Universitat Autònoma de Barcelona, Department of Geography 2014).

Sabartés 1993: J. M. Sabartés i Guixés, L'Èxode pallarès. Crisi demogràfica i davallada poblacional als Pallars i a l'Alta Ribagorça 1857–1991 (Tremp 1993).

Sancho Reinoso 2011: A. Sancho Reinoso, Canvi rural, transformació del paisatge i polítiques territorials a la Terreta (Ribagorça, Catalunya/Aragó) (PhD-Thesis Universitat de Barcelona 2011).

Solé/Jané 2014: Q. Solé/O. Jané, L'arqueologia del món modern i contemporani. Afers, Fulls de recerca i pensament 29.78, 2014, 305–316.

Soriano 1994: J. M. Soriano, El procés de despoblament a les comarques de la Cerdanya i l'Alt Urgell. Documents d'anàlisi geogràfica 25, 1994, 41–163.

Soriano/Tulla 2002: J. M. Soriano/A. F. Tulla, El repoblament del Pirineu català. Desig o realitat. Mètode 36, 2002, 65–70.

Wolski 2016: J. Wolski, The Landscape of Abandoned Villages in the Western Bieszczady. The Problem of Definition and Classification. Geographia Polonica 89.3, 2016, 371–387.

Leonardo García Sanjuán, Raquel Montero Artús, and Coronada Mora Molina

Waterscapes Through Time

The Menga Well as a Unique Hydraulic Resource in its Geographic and Historical Context

Keywords: megalithism, landscape, hydrology, ecology, economics, water resources, beliefs

Acknowledgements

This research has been funded by two projects of the National R&D Plan of the Spanish Government: Megalithic Biographies: The Antequera Megalithic Landscape in Its Temporal and Spatial Context (HAR2017-87481-P, 2018–2021), and Nature, Society and Monumentality: High-Resolution Archaeological Investigations of the Antequera Megalithic Landscape (HAR2013-45149-P, 2014–2017). All work undertaken within this research has been authorised as part of the General Research Project Societies, Territories and Landscapes in the Prehistory of Antequera (Málaga) of the Ministry for Culture and Historical Heritage of the Andalusian Government (2013–2021).

Abstract

The discovery of the Menga dolmen water well in 2005 raised a number of scientific challenges. The obvious connection of this great megalithic monument with water demands an entirely new approach to its geographical and historical context. To achieve this, a complete analysis of the geochemical characteristics of the well's water is undertaken and the hydrological context of the surrounding region is examined. The results of this study are discussed within the context of the complex economic, social and cultural history of water resources in Lands of Antequera, which are reviewed on the basis of archaeological, historical and geographic data. Altogether, this approach reveals a completely new dimension of this great megalithic monument, in which ecology, water resources, economy, architecture and beliefs are interwoven into one of the most complex and persistent monumental landscapes of European Prehistory.

1. Menga: A Dolmen in a Waterscape

Located in southern Spain, Malaga province (*fig. 1*), Menga is one of the most remarkable megalithic constructions in the world. Listed in the UNESCO World Heritage List since July 2016 as part of the Antequera Megalithic Site,[1] Menga is unique because of its architecture (both in terms of scale and building technique) (Carrión Méndez et al. 2009; 2010; Lozano Rodríguez et al. 2014), because of its landscape dimension (visual relationship with La Peña de los Enamorados mountain and association with the Late Neolithic occupation of the surrounding region) (García Sanjuán/Wheatley 2009; 2010; García Sanjuán et al. 2015;

1 The site includes three megalithic monuments (Menga and Viera dolmens and El Romeral tholos) as well as two natural-cultural monuments (La Peña de los Enamorados and El Torcal karstic formation).

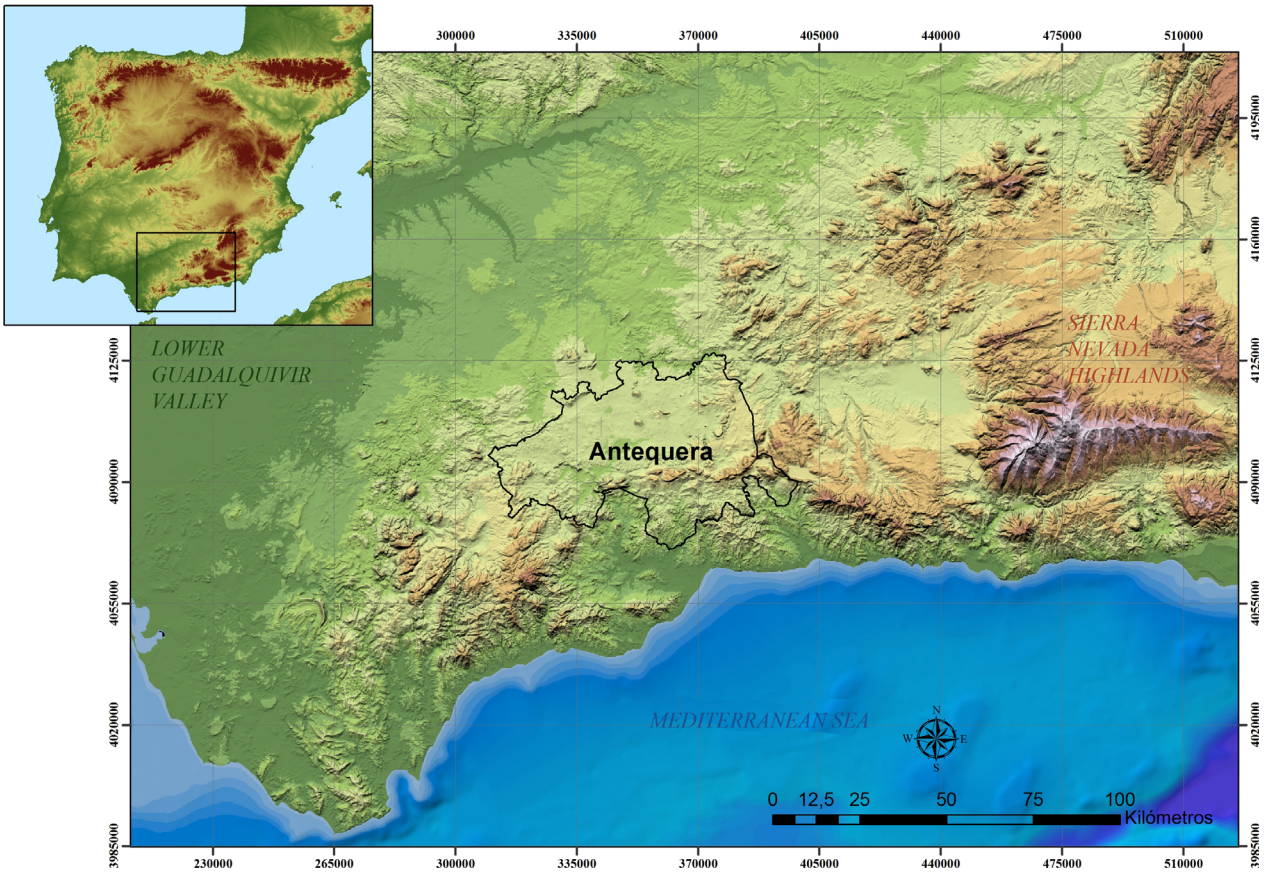

Fig. 1. Location map of Antequera in southern Iberia (Design: María del Carmen Moreno Escobar and Leonardo García Sanjuán).

Bradley/García Sanjuán 2017; Rogerio-Candelera et al. 2018), and also because of its remarkable biography as a monument, which spans the last six thousand years and reflects the constant cultural changes experienced by a region that represents a true 'cross-roads' in southern Iberia (García Sanjuán/Lozano Rodríguez 2016; García Sanjuán et al. 2018a).

Part of Menga's grandiosity lies in its architectural genius, based on the creation of an internal space made with an overwhelming mass of stone. Built with 25 uprights (twelve on each side, and one backstone), and five huge capstones, with a total length of 24.9m, a maximum width of 5.7m in the back of the chamber, and a height that rises from 2.65m at the entrance of the chamber to 3.45m at the rear, Menga is by far the largest megalith in Iberia, only matched by Anta Grande do Zambujeiro in Portugal. The combined weight of its stones rises to nearly 900t. The three pillars, which appear aligned at the centre of the chamber, are a highly unusual architectural device intended to support the massive capstones. The mound that covers the megalithic space, 50m across and built with a very stout fabric of alternating layers of stone and clay, provides further stability to the enormous construction. The very fact that Menga has stood on its feet for the past six millennia in a highly seismic region bears witness to the quality of its architectural design and the mastery of its builders.

No less remarkable is the relationship of this magnificent monument with the landscape surrounding it. Firstly, Menga's axial orientation towards the northeast (north of the summer solstice sunrise) is quite anomalous in terms of the standard pattern found of Iberian megalithic monuments. Recent research has shown that Menga's axial orientation towards La Peña de los Enamorados can be explained because of the importance of Late Neolithic activity on the northern sector of this mountain, where the schematic rock art shelter of Matacabras and the site of Piedras Blancas are located (for more detailed descriptions

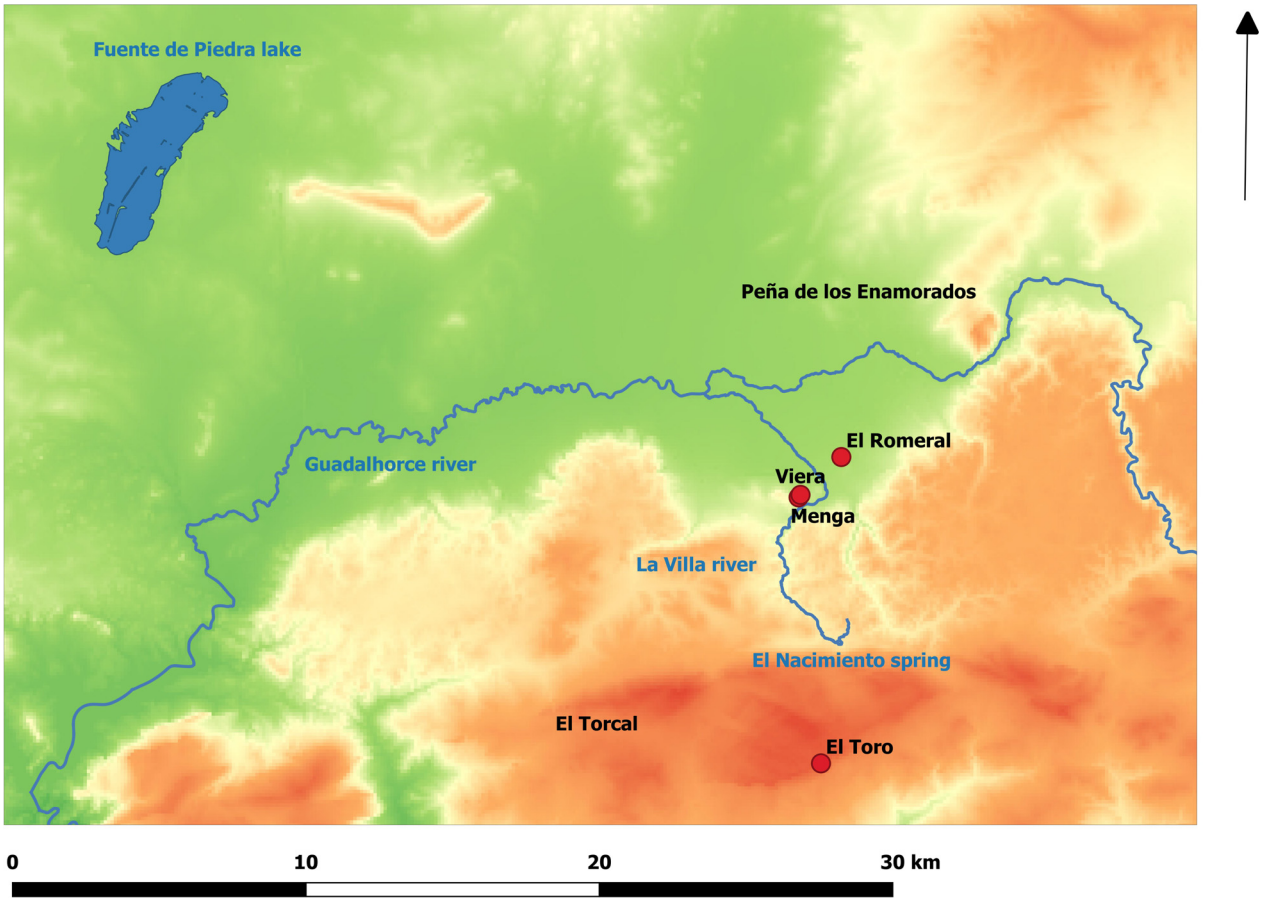

Fig. 2. Location map of the main hydrological and topographical features mentioned in the text (Design: Raquel Montero Artús).

see García Sanjuán/Wheatley 2009; 2010; García Sanjuán et al. 2015; Rogerio-Candelera et al. 2018). Therefore, although sunlight does play a role in Menga's design (see Lozano Rodríguez et al. 2014), its orientation was also intended as a tribute to a pre-existing ancestral place. Secondly, Menga was built on a very special location, sitting as it is on a small elevation of the Betica sierras that leans over the fertile plain of the Guadalhorce river, with commanding views of the two exceptional natural formations so present in the region: El Torcal karst to the south and the La Peña de los Enamorados limestone massif to the east, both characterised by conspicuous natural forms and silhouettes (*fig. 2*). Furthermore, Menga is located exactly where the La Villa river runs onto the alluvial plain of the Guadalhorce river, of which it is a tributary. It is important to note that the La Villa river springs from the base of El Torcal's northern face, literally bursting off the karstic formation from within an underground cavity known locally as El Nacimiento ('the Birth'), where a subterranean lake is often formed. This spring is, in fact, a natural outlet of El Torcal's aquifer, a gigantic mass of water that lays underneath the karstic formation and which, through the La Villa river, provides a steady supply of fresh water throughout the year[2] (*fig. 3, 4*). Upon reaching the plain, the La Villa river surrounds and envelops the hill where Menga (and later, Viera) was built, running a short distance across the plain just before it joins the Guadalhorce on its path westwards and then southwards towards the Mediterranean. With an Arabic name that roughly translates as 'river of the wheat' (Fernández 1842, 240), the Guadalhorce river cuts across one of the most fertile lands of Andalusia.[3]

2 Historically, this spring has supplied the bulk of Antequera's fresh water for human consumption and in fact, it does so even today despite the population being much larger – with basically no prior chemical treatment.

3 Rafael Mitjana y Ardison, the first scholar to study the Antequera monuments, already noted Menga's advantageous topographic location, next to 'two sources of wealth, El Nacimiento and its lowlands', which have turned the city

Fig. 3. La Villa river running a few metres down El Nacimiento spring (Photograph: Leonardo García Sanjuán).

Fig. 4. El Nacimiento spring cavity and underground pond (Photograph: Leonardo García Sanjuán).

Some 15km to the west is the endorheic Fuente de Piedra lake, remarkable because of its salty waters.

In summary, Menga was built where the perennial fresh water descending from underneath El Torcal meets that of the Guadalhorce river, which runs from La Peña de los Enamorados, on the exact location where views of the two conspicuous natural formations are possible, and facing the ancestral (perhaps very 'archaic') rock art sanctuary of La Peña's northern cliff. The fact that the city of Antequera itself is basically in the same location as Menga (ancient and medieval Antequera were located on a slightly higher hill about a mile west of Menga) is hardly random. The city is, quite literally, a 'gift' of El Torcal's aquifer, whose high-quality water flows all year-round from El Torcal onto the plain. By occupying the lowest elevations of the Baetic system, just where La Villa runs onto the Guadalhorce plain, the Late Neolithic settlers of the region secured a steady supply of fresh water, access to first-rate agricultural land and a great diversity of abiotic resources (including, among others, high-quality flint as well as, crucially, salt), as well as, of course, a privileged geo-strategic position at the cross-roads of Andalusia's main natural routes.

The UNESCO declaration establishes that Antequera represents one of the oldest and most original monumentalised landscapes by integrating stone architecture and natural formations. Basically, this landscape dates back to the late 5th mill. BCE (Late Neolithic) but has deep roots in the Early Neolithic (late 6th and early 5th mill. BCE) through the occupation of El Toro, a cave located in El Torcal karstic massif. However, the cultural significance of the Antequera megalithic landscape goes well beyond the Neolithic period. In fact, it is impossible to understand its full significance without looking at the wider picture of the Late Prehistory and History of the surrounding region. Nowhere becomes this more obvious than when considering Menga's water well, a feature that, while part of the megalithic monument, highlights the relationship between this monument and the local waterscapes, a relationship that, as has been discussed above, is, already from a purely locational point of view, quite strong.

2. The Water Well

2.1. Morphology and Infill

Once inside Menga, the visitor may be surprised not by the colossal stones around and above him/her, or by the beautiful human-like silhouette of La Peña de los Enamorados cutting the eastward skyline just across the entrance to the monument,

and its region into a successful agricultural and manufacturing economy (Mitjana y Ardison 1847, 13). He also described how the Guadalhorce river ran through the 'vega', watering multiple crops ('wheat, barley, corn and all sorts of seeds that could be turned into flour, olives, good fruit and legumes in general') (Mitjana y Ardison 1847, 13). In his view, this wealth had propitiated a steady and substantial human occupation in the region, dating back to 'the highest Antiquity, two thousand years before Christ' (Mitjana y Ardison 1847, 13).

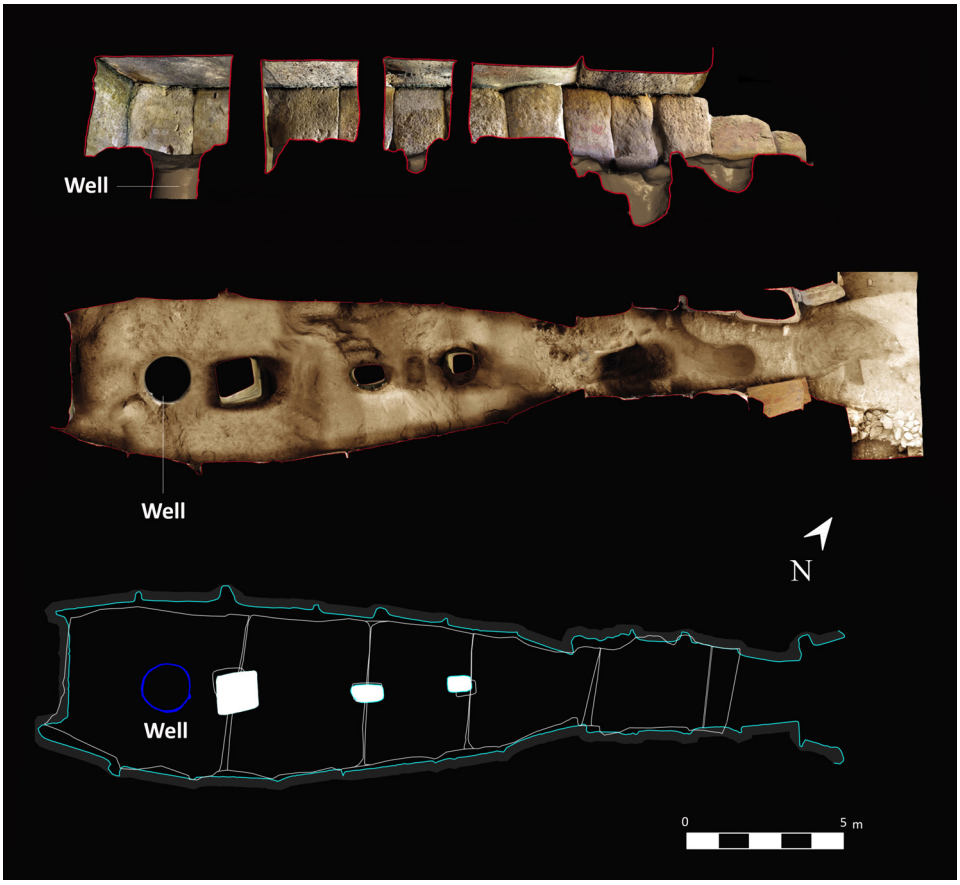

Fig. 5. Plan of Menga showing the location of the water well at the back of the chamber (García Sanjuán et al. 2016).

but by the remarkable water well located at the back of the great megalithic chamber. The water well, so to speak, steals the show – an otherwise excellent show.

The Menga well was discovered in the spring of 2005 (García Sanjuán/Mora Molina 2018). Although it has already been described in Spanish (García Sanjuán et al. 2016; 2018b), given its centrality for the argumentation presented in this paper, it will be summarily described here in order to facilitate its knowledge by a more international readership.

The well is located at the rear of Menga's chamber, almost perfectly centred with regards the backstone (2.3m away) and the two orthostats on the sides (2m away) (*fig. 5, 6*). It is circular in plan, presenting a diameter of 1.7m to 1.6m on its mouth and 1.1m at the bottom, with a depth of 19.4m, and it reaches the local water table at approximately 17m (*fig. 7, 8*). It was cut into the calcarenite geological substrate and shows a fairly regular finish throughout. No lining of any kind (wood, brick) was used to coat or cover its walls. It presents 77 putlog holes from its upper rim down

Fig. 6. View of Menga's water well without the protection set up to guarantee visitor safety (García Sanjuán et al. 2016).

Fig. 7. David García González descends into the Menga well to continue the excavation of its infill, late in 2005 (García Sanjuán et al. 2016).

Fig. 8. Start of the water table inside Menga's well as it was discovered at -17.55m late in 2005 (García Sanjuán et al. 2016).

to 17m of depth, of which 67 are on the northeast side, forming two roughly parallel columns separated by 40cm, whereas the remaining ten appear on its south-western side, forming a single column at between -10.4m and -17m (García Sanjuán et al. 2016, 206). Numerous marks on its sides bear witness to the careful quarrying work undertaken to make it.

Although its discovery in 2005 was a major surprise, subsequent research soon revealed that the well had already been known in the 19th cent. Probably, the first mention of it is to be found in Rafael Mitjana y Ardison's memoir, which he wrote to account for the excavations he carried out in Menga in the second half of the 1840s. In his report, he mentioned that his excavations inside the monument reached a depth of between 5.4m and 7m, a search that he regarded as mostly 'fruitless' as it yielded no vestiges of 'cadavers' or 'urns' (Mitjana y Ardison 1847). Although he never used the word 'well' (*pozo* in Spanish) in his brief report, it does not seem possible that he reached such depth unless he ran into the well and partly emptied it. The absence of an explicit description of the well in his report may be explained simply by the misplaced expectation he may have had about the discoveries awaiting him and which, by his own admission, were frustrated.[4] The hypothesis that Mitjana y Ardison found the well is backed by the fact that, barely three years after the publication of his booklet, in 1850, Louisa Tenison, a British traveller touring southern Spain, mentioned it explicitly as part of her account of her visit to the great dolmen (Tenison 1853).

The only other two explicit references to the well come from two short journalistic pieces published some years later by Trinidad de Rojas y Rojas (1861, 295; 1874, 58; 1879, 25). However, it is important to note that in the book Antigüedades Prehistóricas de Andalucía ('Prehistoric Antiquities of Andalusia'), published in 1868 by Manuel de Góngora y Martínez, a pioneer of Andalusian prehistory, Menga was described in full, but without any reference to the well. Perhaps, even more revealing is the fact that the sketch of Menga's plan made by hand by Manuel Gómez-Moreno González also in 1868 (Moya Morales 2004, 20) does not portray the well (*fig. 9*). Therefore, it seems likely that by the late 1860s, the well had been fully backfilled, and the reference made by Trinidad de Rojas y Rojas in 1874 and 1879 was

4 It is hard to know what preconceived ideas Mitjana y Ardison may have had about the nature of Menga, which he referred to as a 'druidic temple', at a time when so little was known about megalithic monuments or indeed about the Prehistory of Europe.

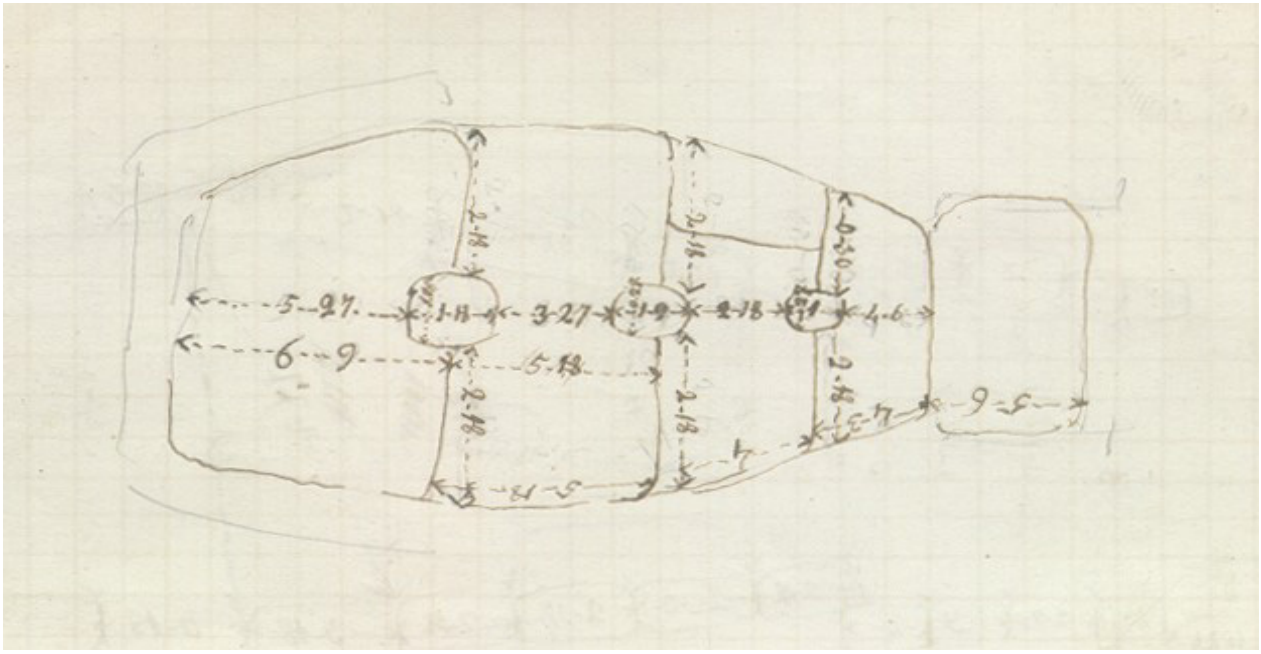

Fig. 9. Hand-made sketch plan by M. Gómez-Moreno González in 1868, showing the internal dimensions of the dolmen and the uprights (Moya Morales 2004, 20).

based on earlier reports, in his own recollections or in deductions based on Mitjana y Ardison's report. Whatever the case, between 1879 and 2005, no published description of the dolmen would ever mention the well again, which means that, at some point between 1850 and 1868, it was backfilled and its existence forgotten (García Sanjuán et al. 2018b, 339).

In light of this, it seems probable that the first six meters of infill excavated in 2005–2006 were the backfill used to refill the well after Mitjana y Ardison's excavations, whereas the infill found between -6m and -19.4m would correspond to an earlier episode of backfilling. And this is exactly what the radiocarbon-based chronometric model obtained on the basis of the animal bones found as part of the infill (cow, horse, donkey, dog, cat and hare), some of them in primary (articulated) position, suggests. This Bayesian model sets the formation of the 'original' infill in the first half of the 18th cent. CE, in a relatively short time span, probably not longer than 35 years (68% probability)

Event	Chronology	Evidence
The well is carved	?	None
The well is backfilled	Early 1700s	Radiocarbon-based chronometric model
Mitjana y Ardison excavates first 6m to 9m of the infill	Late 1840s	Deduction based on his own description
Louisa Tenison sees the well	1850	Her own description
The section of the well emptied by Mitjana y Ardison is backfilled	1850–1868	Deduction based on contemporary references
The well is no longer visible	1868	Hand-made sketch of Menga's plan made by Manuel Gómez-Moreno González
The well is discovered again by Verónica Navarrete Pendón	2005	Her own description

Tab. 1. Time-line of the Menga water well in the last three hundred years.

(García Sanjuán et al. 2016). Table 1 summarises the main known events in the timeline of the well in the last 300 years.

The infill between -6m and -19,4m presented a large amount of sandstone blocks not unlike those used to build the dolmen's sturdy mound, as well as wheel-thrown typologically-modern pottery, iron objects (nails, buttons, horseshoes), fragments of large tiles like those found forming ancient graves around Menga and Viera, and hammerstones similar to those found in other parts of the dolmen itself or at Piedras Blancas I, in the northern sector of La Peña de los Enamorados. Therefore, it seems clear that, as could be expected, whoever backfilled the well in the early decades of the 18th cent., worked in an essentially opportunistic manner, making use of the filling materials available at hand, and probably dismantling part of the mound in the process. This is hardly surprising. Considering that the well has a volume of 35.36m^3 (35360 litres), filling it must have involved the carrying and dumping of more than 51 tonnes of material, roughly equivalent to the load of six regular dump-trucks (García Sanjuán et al. 2016, 220). Why would have anyone gone any farther to find the necessary filling material when there was plenty of it just outside the megalithic 'cave'?

Of course, the discovery of the water well inside Menga raises a number of major scientific questions. The character and chronology of its infill seem to have been established fairly securely, but when was the well cut and for how long was it in use? And above all: what relationship was it intended to have with the megalithic monument? Although Menga was conceived and built in the Late Neolithic (probably between the 38th and 36th cent. BC), the currently available evidence suggests it was in use essentially uninterruptedly since its construction all the way to the 18th cent. CE, in what is possibly one of the most remarkable 'megalithic biographies' known to date. Did the water well play a major role in this biography? Was it made before the construction of the dolmen? Or was it open at the same time the dolmen was built? Or sometime after? And if so, how long after? These questions are fairly difficult to answer in the present state of our knowledge. However, any attempt to answer them must take into account the role of water resources in the Antequera region. In this context, and given the absence of direct dating evidence, the study of the hydrological background to the well (i.e. the water history of the surrounding region) becomes a highly necessary task.

2.2. Hydrology

Ever since human societies became sedentary, inhabiting more or less permanently the same pieces of land, water supply became a major concern. Since the Neolithic, access to water has often been achieved through wells. Thus, natural settings and climatic conditions played a major part in the decision of when and where to settle and where to open wells. In this sense, what are the hydrogeological characteristics of the Antequera region?

First of all, it is important to note that Antequera is located in the Mediterranean hydrological and climatic domain, where surface water availability is subject to intense annual fluctuations (including summer dryness) and cyclic long-term fluctuations with periods of reduced precipitations or even drought. In addition, from a geological viewpoint Antequera presents rather special hydrogeological features. On the one hand, the El Torcal limestone massif was sculpted by erosion into one of the most spectacular Iberian karstic landscapes. The lithology, the presence in wide areas of virtually horizontal layers, the intense breakage, the high precipitations and the gelifraction have all favoured remarkable karstification processes whereby soluble rocks (limestones, dolomites) have been dissolved by water. Over time, this process produced numerous rocky formations on the surface and underground cavities, while at the same time, a large aquifer was formed underneath (López-Geta et al. 2010).

The geologically oldest materials in Antequera are the Triassic ones, of between 230 and 195 million years of age. The prevailing lithology of this period includes clays and gypsum clays of various colours (red, grey, green) often integrating isolated layers of gypsum, limestone, sandstone and ophites. It is also common to find high contents of halite (common salt) and sylvite (potassium chloride). These formations with gypsum and salty

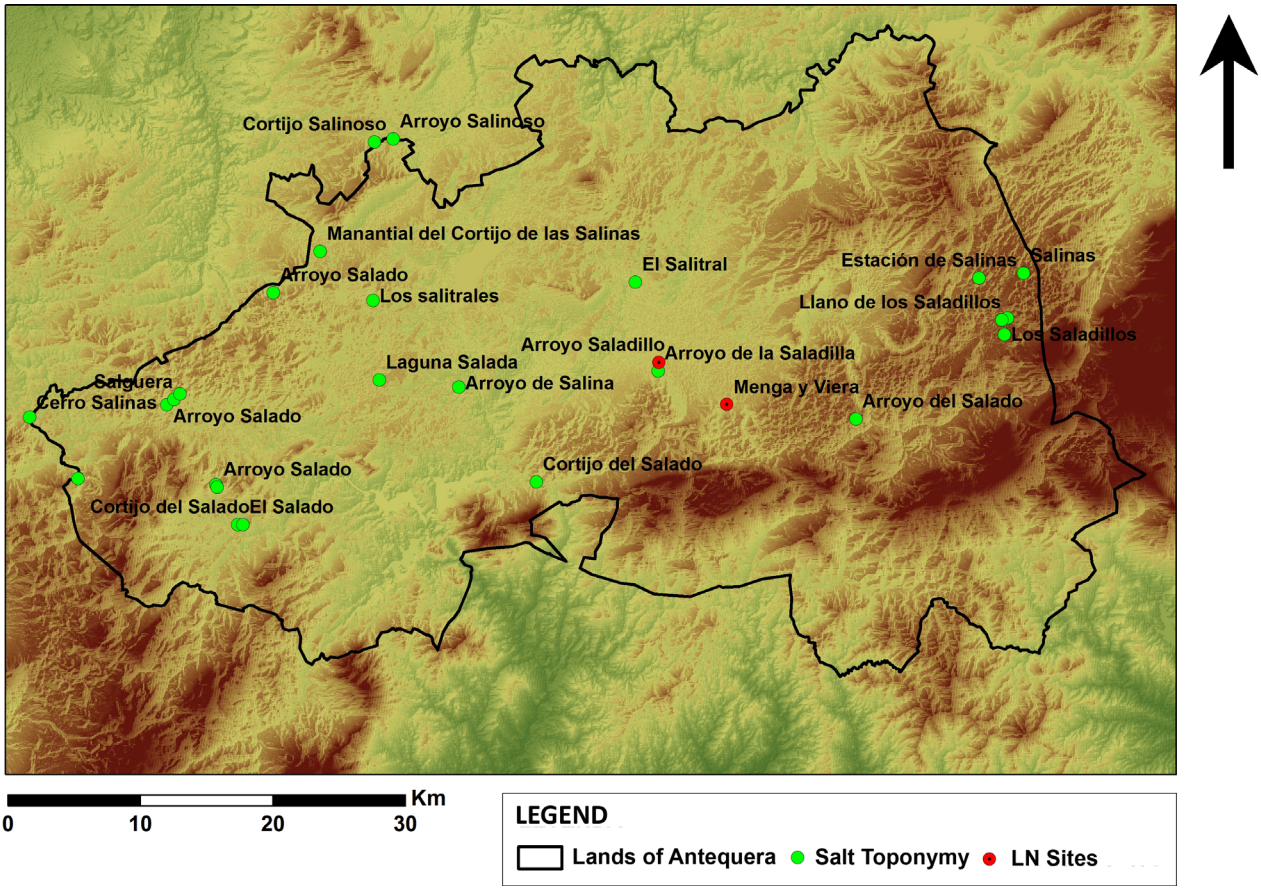

Fig. 10. Plan of Antequera showing brackish-water related toponymy (García Sanjuán et al. 2016).

materials are also susceptible to karstification, although they are less frequent than the carbonated ones of the Baetic mountain range (Durán Valsero et al. 1998). In some sectors, the Trías extends over major extensions such as Gobantes, Antequera, Salinas and Fuente Camacho (Pulido Bosch 1998) where water springs linked to gypsum are numerous and where some lakes also do appear. The springing waters present high calcium sulphate and sodium chloride content, that is to say, they are chemically 'poor' and not interesting in terms of human consumption (Durán Valsero et al. 1998). However, springs of salty water often form true salt lakes ('salmueras' in Spanish) as is the case of Fuente Camacho (Loja, Granada), 35km East of Antequera. In general, the whole of the Lands of Antequera region is dotted with brackish water places, as illustrated by toponymy itself (*fig. 10*). A conspicuous example of this is the Fuente de Piedra lake, located barely 20km northwest of Antequera and one of the most outstanding cases of endorheism known in Andalusia (Linares Girela/Rendón Martos 1998). Resulting from

Fig. 11. Pink flamingos at the Fuente de Piedra salty lake (García Sanjuán et al. 2016).

the dissolution and karstification of the salty gypsum materials of the Trías, with salty water with concentrations in calcium sulphate and sodium

Fig. 12. Sampling of Menga's well's water in May 2017 (Photograph: Javier Pérez González).

Fig. 13. Sampling of El Nacimiento's water in May 2017 (Photograph: Leonardo García Sanjuán).

chloride, this seasonal lake is, with 13km^2, one of the largest of its kind in Iberia[5] (*fig. 11*).

Lastly, the Antequera depression post-orogenic materials are composed by sedimentary materials of the Miocene and Quaternary periods. This area was 'depressed' after the collision between the internal and external zones in the Alpine folding of the Middle Miocene, and where later filled with marine sediments during the Tortonian (Carrión Méndez et al. 2006a; 2006b).

From a geological viewpoint, Menga sits on sedimentary materials of Upper Tortonian age, corresponding to a delta facies with abundant gravels, sands (with little or no cementation) and lutites wrapped in a clayish matrix. Although these rocks present small-sized pores, resulting in the area being a poor aquifer, they are interdigitating with marine beach facies constituted by calcarenites, which themselves present optimum pore sizes to host good quality free aquifers (Carrión Méndez et al. 2006a; 2006b). Piezometric data obtained some 200m east of Menga, at an altitude of 474m above sea level, shows the water table at three metres of depth. Further to the north, the water table is cut by the topography, which might suggest that in the past there may have been been a spring nearby (Carrión Méndez et al. 2006a; 2006b).

The chemical study of the water from the Menga well undertaken by us (Montero Artús 2018) is important in order to establish its properties and to contextualise it within the local hydrological background and the locally available water resources (Durán Valsero 2007). In May 2017 water samples were obtained and in situ measurements were made both in the well and El Nacimiento spring (*fig. 12, 13*). A portable impermeable multiparametric (IP67), HI9819x series HANNA Instruments recorder with a 20m probe, coupled with a measuring tape was used. The sample was analysed at the laboratories of the Sevilla-based 'Grupo Soil' following standardised methods. Table 2 shows the results for the Menga well water compared with standard values for water intended for human consumption according to Spanish law (Royal Decree 140/2003, by which health criteria for the quality of water intended for human consumption are established).[6]

The results obtained suggest that all these physical-chemical parameters comply with the

5 It also is the only place in the Iberian Peninsula where pink flamingos (Phoenicopterus ruber roseus) breed regularly. The lagoon and its surroundings are part of the Network of Natural Protected Areas of Andalusia (Natural Reserve). It has also been declared a wetland of international importance (Ramsar Convention, 1983) and Special Protection Area for Birds (SPA) (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, OJ L 20, 26.01.2010, 7–25, <http://data.europa.eu/eli/dir/2009/147/oj>).

6 From the Council Directive 98/83/EC (3rd November 1998) on the quality of water intended for human consumption (OJ L 330, 5.12.1998, 32, <https://eur-lex.europa.eu/eli/dir/1998/83/oj>). However, it is important to note that our analysis of the water from the Menga well is not intended to establish whether or not it is suitable for human consumption today, as that would involve a microbiological characterisation in order to establish health risks, as well as an assessment of other chemical parameters, including pesticides and numerous synthetic substances.

Parameters	Units	Well sample	EU Regulatory limits
Antimony	µg/l	<0.25	5
Arsenic	µg/l	1.67	10
Boron	mg/l	0.226	1
Cadmium	µg/l	<0.05	5
Chromium	µg/l	1.17	50
Copper	mg/l	<0.10	2
Fluoride	mg/l	1.33	1.5
Lead	µg/l	<0.5	10
Mercury	µg/l	<0.10	1
Nickel	µg/l	0.84	20
Nitrate	mg/l	229.6	50
Selenium	µg/l	1.52	10
Aluminium	µg/l	11.6	200
Ammonium	mg/l	<5.2	0.5
Chloride	mg/l	92.2	250
Conductivity	µS/cm	1798	2500
Iron	µg/l	18.4	200
Manganese	µg/l	0.77	50
pH		7.73	6.5–9.5
Sodium	mg/l	89.4	200
Sulphate	mg/l	496	250
Turbidity	NTU	12.12	1–5
Barium	µg/l	34	-
Bicarbonate	mg/l	143.3	-
Carbonate	mg/l	<10	-
COD	mg O2/l	<10	-
Calcium	mg/l	240.48	-
Magnesium	mg/l	9.72	-
Hardness	mg CaCO3/l	640.56	-
Phosphate	mg/l	<1.5	-
Potassium	mg/l	62	-
Silica	mg/l	46	-
Strontium	mg/l	1852	-
Suspended Solids	mg/l	30	-
Total Solids	mg/l	1520	-
Zinc	mg/l	<0.1	-

Tab. 2. Results of the chemical analysis of the Menga well water compared with standard values for water intended for human consumption according to Spanish law

current standards for water intended for human consumption, with only two exceptions: nitrates and sulphates. The presence of high levels of nitrates in the water is usually caused by anthropogenic factors largely connected with the use of fertilisers for agriculture. The Antequera plain is in fact recognised legally as 'vulnerable to pollution by nitrates' by the Andalusian regional government (Decree 36, February 5th 2008, by which zones vulnerable to pollution from nitrates used in agriculture are designated and measures against it are established) (Gonzalez 2008, 5). In turn, the presence of high levels of sulphates (twice the maximum levels set by legislation) is not only caused by anthropogenic factors, but also by the very nature of the geological substrate, given the presence of gypsum in the 'Trías de Antequera'. A recent study based on the analysis of both radioactive and stable sulphate isotopes in the region has established that its natural contribution to the underground water from evaporitic substrate oscillates between 70 and 85% of dissolved sulphate (Urresti Estala 2016).

The quality of the water from Menga's well must be compared with the three main aquifers of the surrounding region: Llanos de Antequera-Vega de Archidona (060.032), El Torcal (060.032) and Fuente de Piedra (060.034).[7] From a chemical viewpoint, this comparison is important in order to establish whether Menga's water is different or similar from other locally available resources, fundamentally in terms of their hydrogeological characteristics.[8]

In general, the chemistry of Menga's water matches well that of the Llanos de Antequera-Vega de Archidona aquifer, with higher mineralisation than El Torcal aquifer water, which has outstanding quality. The water from the Llanos de Antequera-Vega de Archidona aquifer also presents high levels of sulphates resulting from the underlying geological substrate, the gypsum-rich Trías de Antequera (*fig. 14*). In this sense, Menga's water is within the expected values. The water of the Fuente de Piedra aquifer has naturally-occurring calcium-sodium sulphate-chloride facies (chloride values are in excess of 1,000mg/l), although there is also anthropogenic salinisation caused by the return of irrigation waters which are by themselves quite salty and form *salmueras* (salt ponds) after evaporating.

The La Villa river, originating in the El Torcal aquifer, shows increased concentrations after passing near Antequera, which may be due to its flowing over the Trías before joining the Guadalhorce but also to the potential effects of diffuse and sporadic pollution caused by intensive farming across the Antequera plain. By comparison with Menga's well, the La Villa river water shows considerably lower levels in almost all parameters, which is linked with high contents of dissolved salts in the groundwater, except with magnesium, which shows similar values. Again, it is worth noting the high levels of nitrate (229.6mg/l), generally explained by the use of fertilisers in agriculture. The highest average values of parameters such as calcium, chloride, water hardness, sulphate and magnesium are found in the Guadalhorce river, and its surrounding plain, probably due to the influence of the underlying gypsum-rich substrate.

In order to understand the locational and functional background of the Menga well, it is important to consider the topography linked to the subterranean waters, that is to say, the depths at which they can be found throughout

7 Coding assigned to each of the three bodies of water identified in the immediate vicinity of Antequera as established in the Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, <https://eur-lex.europa.eu/eli/dir/2000/60/oj>) (last access 19.05.2021).

8 For each parameter basic and reference levels are used following the definition of the EFD (European Framework Directive). Reference levels represent the concentration of a substance within a mass of underground water with no or minimal anthropogenic alterations (32_R, 33_R and 34_R). These levels are generally established following the methodology in Report D18 ('Final Proposal for a methodology to set up groundwater threshold values in Europe') of the BRIDGE project (Background cRiteria for the iDentification of Groundwater thrEsholds). The temporal series is different for each parameter and each mass, although the first and last year recorded are 1977 and 2004 respectively. The basic values of each water mass (32_B, 33_B and 34_B) are average values recorded at least within the reference years (2012, 2013) on the basis of control programs applied in accordance with article 8 of Directive 2000/60/CE.

the Antequera region. To this end, the data on piezometric levels stored in the Spanish 'Red de Seguimiento del Estado e Información Hidrológica' ('Nation-Wide Monitoring and Hydrological Information Network'),[9] have been used. Piezometric data show a flow of underground water running from east to west, from La Peña de los Enamorados to the Guadalhorce dam. In the Antequera plain, underground water drains in the same direction as the Guadalhorce river. In this system, underground water can be found at depths ranging from a few centimetres to up to 25m. Low values are usually located on the northern edge, at between 5m and 13m, whereas near to Antequera depths range from 22m to 25m. When our sampling was carried out (May 2017) the water of the Menga well was at 15.06m from the dolmen's floor.

The variation of piezometric levels is closely connected with the porosity of the geological substrate. In the Antequera plain, the Quaternary alluvial deposits, with thicknesses ranging from 15m to 18m, are in hydrogeological continuity with Miocene calcarenites when the latter are arranged laterally or in-depth, as it occurs between the Guadalhorce river and the city of Antequera. In this sense, it is remarkable that inside Menga's well, the water table is reached at a depth of between 15m and 20m, when in nearby locations, it appears at between 5m and 10m, or even less.

In summary, the analysis of the water from Menga's well against its hydrogeological background reveals a number of important conclusions. Firstly, this water is within the range of what modern regulations impose for human consumption. Only nitrate and sulphate values are outside that range. While the former reflect the use of nitrogen-based fertilisers in modern agriculture (possibly less than the last 100 years), the latter occur naturally as a result of Triassic gypsum. However, to this date, no evidence has been found concerning possible negative effects of sulphates on human health. As a result, and subject to biological parameters (highly variable over time), we must conclude that the Menga

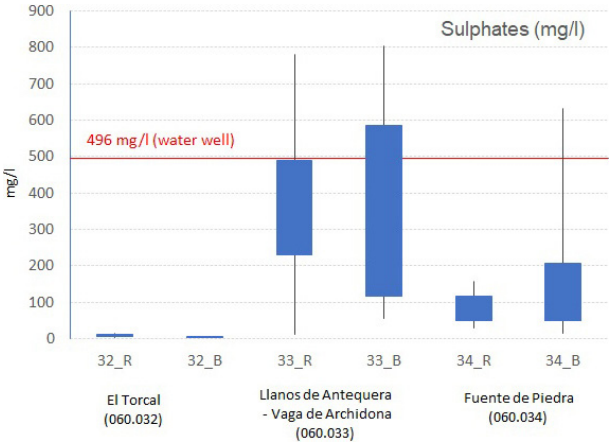

Fig. 14. Sulphate concentration in the well water vs. underground water in the surroundings of Antequera.

well water may have been used for the consumption of humans and animals. Secondly, we must note the similarity between the water of Menga's well and that of the Antequera plain. Given that, objectively, there is a multitude of points in Antequera's *vega* where water of the same quality and characteristics can be found, and that often this water is a lot closer to the surface, it seems clear that the action of making Menga's well where it was made did not respond to a simple cost-benefit economic rationale. Thirdly, La Villa's river water, streaming from El Nacimiento spring, presents a low-minerals quality that far surpasses that of the Antequera plain (and Menga's well). The massive aquifer underneath El Torcal provides a constant supply of high-quality water throughout the year, which would pretty much make it a strategic economic resource in any Mediterranean region, let alone in Antequera, where, in addition, much of the locally available water is brackish and unsuitable for human consumption.

Altogether, Antequera's hydrological configuration reveals a great diversity of water resources, some of which are located in the immediate vicinity of Menga in accordance with the exceptional diversity of the geological substrate in that location. Since early times, this fact may have played a key role, causing local communities to choose this particular location as especially suitable for stable occupation. As we will show in the next section, water resources have indeed played a crucial role in the history of the Antequera region.

9 <http://sig.mapama.es/redes-seguimiento/> (last access 19.05.2021).

3. A Past of Waterscapes

There is substantial evidence of the great social, and cultural significance water resources have had throughout the late Prehistory and History of Antequera. This significance derives from their use for human consumption and farming purposes (including irrigation and salt production), but also from their pervasiveness in the ideological sphere, especially in terms of their healing or medicinal qualities (real or imagined), as well as their sacredness.

The earliest known evidence of a likely 'cult of water' in Lands of Antequera is the Huelva-type bronze sword found near the town of Almargen, barely 400m from where a remarkable warrior stela was found in the 1980s (Díaz-Guardamino et al. 2020). The Huelva-type swords, usually interpreted as specifically Iberian in their style, although occasional examples have been found in Britain and France, are dated to the Willburton/Satin-Brieuc/Hío Late Bronze Age phase (ca. 1130 to 1050 BCE) (Rovira Llorens 2007; Brandherm 2007). This find is a classic occurrence of the 'water cult' found throughout western Europe in the Late Bronze Age, often materialised in the hoarding of objects (and special metal artefacts) in water places such as river crossings, fords, lakes, swamps, etc. (Levy 1982; Bradley 1990; etc.).

Almargen itself is a place of outstanding hydrological significance, as it is located at the watershed of the Mediterranean and Atlantic domains, acting as a true 'hinge' between the two main climatic and hydrological zones of Iberia. Its strategic location as a pass between the Mediterranean-bound Guadalhorce river (and Lands of Antequera) on the one hand, and the Guadalquivir river valley, of Atlantic configuration, on the other, also lends Almargen a strong cultural significance. It is worth noting that Antequera and the lower Guadalquivir valley (and particularly at Valencina) represent two of the most accomplished and spectacular cycles of monumentalisation in Late Neolithic and Copper Age Iberia. It is quite possible that Almargen played a significant role in connecting these two regions at that time (Díaz-Guardamino et al. 2020). In fact, barely 200m from where the warrior stela and the Huelva-type sword were found, a third unusual archaeological find underlines the potential significance of the place in the 4th and 3rd mill. BCE: the so-called Almargen idol. This anthropomorphic sculpture, 48cm high and 22.2kg in weight, made in marble, is one of the most remarkable pieces of plastic art made in Iberian late Prehistory and displays a complex, hybrid nature in terms of fertility and reproduction (for a full description, see García Pérez et al. 2020). It is important to note that while the sword represents a water deposit in itself, both the idol and the stela were found at the nearby edge of what used to be a wide meadow dotted by fresh water wells. In fact, the very name Almargen derives from Arabic *al-marj* ('swamp, meadow or pasture') (Vernet 1960), although Asín (1940, 67) uses a slightly different spelling (Almarjen), and translates the name as *maryain* ('the two meadows'). The two etymologies, however, suggest the importance of Almargen in terms of water resources, both at a local (pastures which, as the wells in the area show, must have been frequently flooded), and supra-local scale (liminal place, in terms of Atlantic/Mediterranean watershed).

Another significant case of 'water cult' can be found south of Antequera, near the town of Valle de Abdalajís (Martín Ruiz 2009, 182). Evidence uncovered at the Cerro Tozaire hill, just outside the town and near the Las Piedras brook, suggests the existence of a Late Iron Age sanctuary devoted to fertility and healing deities in connection with the local water and certain medicinal plants. Although the exact location of the sanctuary is not known, several votive figurines made of bronze and numerous coins suggest this cult place was in use until the Late Roman Empire (Martín Ruiz 2006, 148–154). Various anthropomorphic votive figurines portraying female personages have been interpreted as offerings to some of the many water springs located at the limestone massif of Sierra de Abdalajís. The use of these waters for healing purposes is further underlined by various altar stones with Latin inscriptions (Martín Ruiz 2006, 151 f.; Peréx Agorreta/Miró i Alaix 2017). In one of them, M. Cornelio Optatus recounts his healing experience, while another was dedicated by L. Postumio Castrensis to Asclepius and Apollo, gods linked with the healing power of the waters, and a third inscription by Lucio Postumio Satulio was dedicated to a divine spring. In both Pre-Roman and

Roman religions, the healing power of water was seen within the context of the beneficial action of a deity so that springs were sanctified (Martín Ruiz 2006, 155). At Valle de Abdalajís, water cult is so deeply rooted in the local culture that it is alive even today through folklore. In the summer solstice (Saint John's Night) celebrations are held around the theme of water, and not fire as it normally happens in the rest of Spain.

The sacralisation of water in the region extends well into modern times. Today, the patron saint of Antequera is the Holy Christ of Health and Waters (Santísimo Cristo de la Salud y de las Aguas), whose seat is the church of St. John the Baptist, located in one of the oldest neighbourhoods of the city, next to the La Villa river. The popular devotion to this Christ finds its roots in the draughts suffered by the region in the 17th century AD. According to the local tradition, in the last Sunday of April 1668 its image was paraded to the Vera-Cruz hill, which led to copious rains. The 'miracle' caused the sacred image to receive the name it is known for today (León Vegas 2006, 453).

Apart from these cases of 'water cult', salt seems to have played a major part in the pervasive influence of water resources quite early on. It is quite possible that the production of salt played a part in the cultural flourishing experienced by Lands of Antequera in the Late Neolithic. Some 35km to the East of Antequera, at Fuente Camacho, there is a spring of brackish water leading to high concentrations of sodium chloride that have been traditionally exploited by local communities (Terán Manrique/Morgado Rodríguez 2011). Eleven sites of Late Prehistoric chronology are found within a 2.5km radius around the spring, some showing activity dated to the 4th and 3rd mill. BCE and continued throughout late Prehistory (Terán Manrique/Morgado Rodríguez 2011).

Salt exploitation, particularly at the Fuente de Piedra lake, also played a major economic role in Antiquity, contributing to the thriving of the region within the Roman empire (Gozalbes Cravioto/Muñoz Hidalgo 1986). Roman Antikaria,[10] one of the most prosperous towns in the Baetica province, developed in the same location as earlier settlements dating back to the Neolithic, Copper Age, Bronze Age and Iron Age. This is also, of course, the almost exact same location chosen by the local Late Neolithic communities to build Menga and Viera: at the foot of the Baetica cordillera, on a gentle elevation commanding a good view of (and easy access to) the Guadalhorce alluvial soil and, above all, near La Villa river, which granted a year-round supply of high-quality fresh water. Defence does not seem to have been a major concern in Antiquity, as there is much higher ground (representing more easily defensible locations), less than a kilometre to the south, deeper into the cordillera. Therefore, the location of Roman Antequera is best explained by the same kind of rationality that explains the location of the Late Neolithic dolmens: a secure supply of fresh water and access to good arable land.

Medieval Antequera would also develop within the same location, although occupying slightly higher ground for defensive purposes. Throughout the Late Middle Ages, the region experienced frequent conflict as the Castilian kingdom of Seville, and the Nasri kingdom of Granada fought against each other (Cobos Rodríguez 2016, 52 f.). After the Castilian conquest of the city in 1410, and especially at the start of the 16th cent., the city expanded considerably, and arrangements had to be made to grant water supply for a larger urban population (Escalante Jiménez 2008). To this end, water from other nearby springs, such as La Magdalena or Las Arquillas, was channelled into the city by means of a series of galleries, aqueducts and wells, in order to complement the water supplied by La Villa river. This is basically the water supply system that was in place in the city until the mid-20th cent. A history of Antequera published early in the 19th cent. (Fernández 1842) underlines the importance of the Fuente de Piedra lake salt exploitation throughout the Middle Ages.

10 Antequera's modern Spanish name, derived from Antikaria ('Antiquarian' or 'City of Antiquities'), is quite revealing in terms of the awareness that, already in Antiquity, existed concerning its very old origins. Archaeological evidence conclusively shows that in Antiquity there was full awareness of all three megalithic monuments, all of which were used as burial ground and, possibly, cult places (Aranda Jiménez et al. 2015; García Sanjuán/Lozano Rodríguez 2016; García Sanjuán et al. 2018a).

The *ordenanzas* (regulations) issued by the city council in 1531 provide a full picture of the importance of the La Villa river for human consumption. Essentially, these regulations protected the river from potential pollution from the cattle being moved from the Guadalhorce plain to the higher grounds of El Nacimiento springs for fresh pastures. The *ordenanzas* established at which points animals were allowed to drink water, expressly excluding fountains used for human consumption. The opening of wells expanded considerably at this time, although the search for water was reportedly difficult and laborious, as wells often had to be dug quite deeply,[11] and the discovery of good quality water was never guaranteed (Cobos Rodríguez 2016, 621). Documents dating from the second half of the 16th cent., also reflect frequent conflicts among the city's inhabitants due to water access (Cobos Rodríguez 2016, 1164).

Water-carrying pots (such as *alcarrazas*) and coins found inside Menga and in its atrium suggest an inordinate amount of activity at (or inside) the megalithic monument throughout the 16th and 17th cent. CE (García Sanjuán et al. 2018a). In light of the evidence proving the need for an expanded supply of fresh water, the existence of disputes over access to water wells and competing interests for water use (herders, farmers, neighbours) at that time, it is, of course, quite tempting to assume that the water well inside the megalithic monument was being used at that time, and perhaps its water even sold.

In fact, there is strong evidence showing that water was a highly valued and widely commercialised commodity in Antequera in that period. In his book 'Las Antigüedades de las Ciudades de España' ('Antiquities of the Cities of Spain'), published in 1575, in which a survey of the resources and wealth of the kingdom was made, Cordoba-born Ambrosio de Morales, historian and chronicler in the court of Phillip II, claimed that 'the most noble of all fountains in Spain seems to be that of Antequera, given its great strength against the terrible disease of the [kidney] stone, which breeds inside our bodies' (Morales 1575). Although the water was generally referred to as coming from Antequera, he is clear that it sprung not at the city of Antequera itself, but at the village of Fuente de Piedra, located some 20km further west. According to De Morales, the famed Antequera underground waters were delivered throughout Spain at distances over 100 leagues (between 500km and 600km) and were even exported to the Spanish overseas colonies in America and to Naples, at the time part of Spain. The exportation business in place included a quality control system that granted the authenticity of the provenance of the water. Different certification systems were used depending on how far it was meant to travel. For water jars intended to travel short distances, garlands of freshly cut *saxifragia* grass (*Saxifraga granulata*) were used as this plant was believed to grow only in the vicinity of the spring. For water to be shipped overseas, a notary certified the person, day, month and year in which the water had been collected and then the water jars were sealed and stamped by a priest. De Morales claimed that, on account of the high demand for water, in the preceding 30 years, Antequera had filled with priests and notaries. He goes on to explain his own experience after going to the spring and drinking its waters: '[...] the goodness of the water and its benefits are, to my judgement, ever greater than is published.' He highlighted the quality of the water from the spring as opposed to others springing nearby and which were of far lower quality.

Between 1524 and 1526, Andrea Navagiero, ambassador of the Venetian Republic in the court of emperor Charles V reported, while travelling through Spain that '[...] two leagues before arriving to Antequera, on the right and outside the road, there is a fairly large and wonderful salt marsh [located] at a concave site which, by virtue of the form of the ground, fills with brackish water that, without any industry or engineering, freezes [sic], thus supplying large quantities of salt' (García Mercadal 1952, 853, cited in Gozalbes Cravioto/Gozalbes Busto 1996, 203). Given that the traveller claims to be moving from the west, it is possible that the salt marsh he saw was at the Fuente de Piedra lake, although he did not provide further details.

About eighty years later, in 1603, Agustín de Rojas Villandrando, published his book 'El

11 As mentioned above, in the *vega* (Guadalhorce plain) the water table is often between 25m and 30m deep.

Viaje Entretenido' ('The Fancy Voyage'), in which he provided another account of the wealth of water resources available in the Antequera region. Firstly, he mentioned a fountain from a rock ('una fuente de una peña'), located at a distance of one league from Antequera, and which he acknowledged as nothing less than the best water of Spain. According to him, the water streaming from that spring was used by more than twenty water-mills and was used to irrigate several olive-tree grooves and 'more than a hundred' orchards (Rojas Villandrando 1603). He is obviously referring to El Nacimiento and the La Villa river, where milling was a very important activity still well into the 20th cent. Fully in line with the account published by De Morales some 30 years earlier, De Rojas also described a major spring, four leagues, away from Antequera, whose water was sold in many places, because it was good against the kidney-stone disease. The national and international fame of the Fuente de Piedra/Antequera waters, it seems, still lived on in the early 17th cent. CE.

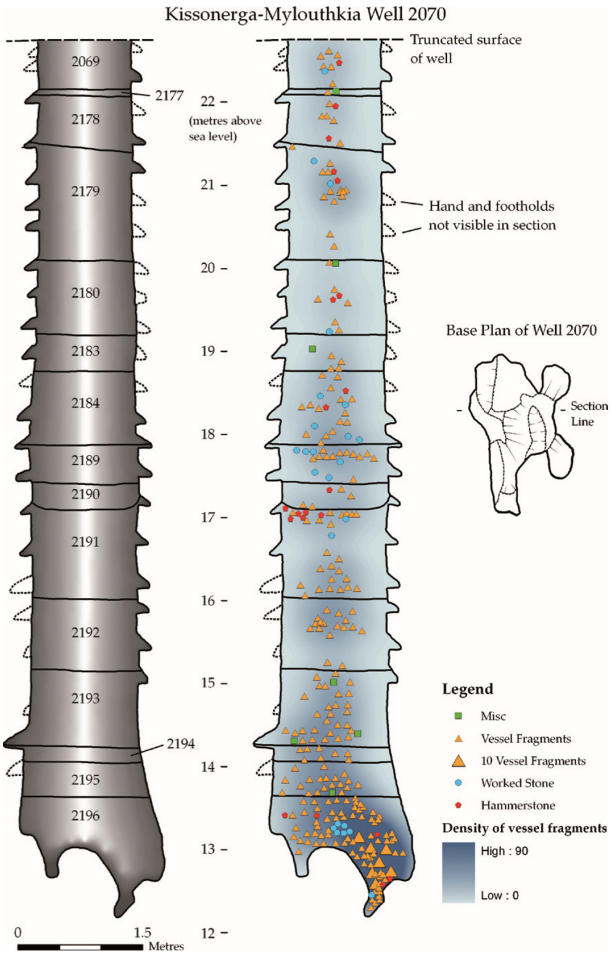

Fig. 15. Well #2070 at Kissonerga-Mylouthkia (Cyprus) (Peltenburg 2012, 74).

4. Discussion

The review made above reveals the important role water resources have played in the economic and social life of Lands of Antequera since the Neolithic. The year-round supply of good quality fresh water provided by the La Villa river was in itself of great importance in the social development of the region in the Late Neolithic period. Within a Mediterranean setting, such permanent and reliable access to fresh water must have been seen as nothing short of a special 'gift' of nature, especially in a region where there was (and is) a remarkable abundance of brackish waters. Therefore, it cannot be entirely surprising that Menga, the largest megalithic monument built in Neolithic Iberia, was erected exactly where the La Villa river met the fertile Guadalhorce plain, and the city of Antequera also started right there. Salt exploitation at Fuente Camacho and, perhaps, Fuente de Piedra lake would have provided local communities of the 4th mill. BCE with a strategic resource that, together with other factors already mentioned above, probably contributed to the accumulation of the wealth, technical know-how and social capital that led to the construction of such a magnificent monument. The basic pattern of human interaction with water resources in the region was already laid out in the Late Neolithic. In later periods, water would hold massive economic and social significance, whether in the form of economic practice (irrigation, salt production, water exportation) or as cult places (the Almargen water deposit in the Late Bronze Age, the Cerro Tozaire sanctuary in the Iron Age and Antiquity, the Fuente de Piedra healing water of the 16th and 17th cent. CE). Seen in this light, the presence of a unique hydraulic feature in Menga acquires a significance more in line with the geography and the social and cultural history of the region.

Like the history of Antequera itself, the biography of Menga cannot be understood without reference to the complex social and cultural connection of the whole region with water resources.

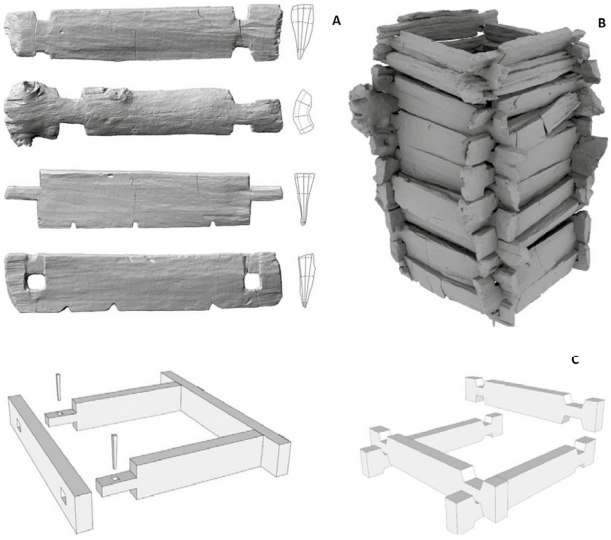

Fig. 16. 3D model of well A at Altscherbitz (Germany) (Tegel et al. 2012, 4).

Fig. 17. Early Neolithic flint mining shaft at Casa Montero (Vicálvaro, Madrid) (Photograph: Proyecto Casa Montero).

Fig. 18. Copper Age shaft at Cerro de la Cabeza sector in the Valencina mega-site (Sevilla) (Fernández Gómez/Oliva Alonso 1980).

Naturally, this observation brings to the fore the problem of when the Menga well was constructed: was it made during the Late Neolithic, as part of the grandiose megalithic project? Or was it opened later? If later, was it made during Late Prehistory – in the Copper Age, Bronze Age or Iron Age – or was it made more recently – in Antiquity, the Middle Ages, or even in the modern period? And was the well the reason why Menga's biography was so long? The currently available data are not conclusive: essentially, no direct evidence exists to tell when the well was made. There is, however, a substantial amount of indirect evidence that is worth discussing.

Firstly, there is solid evidence that Neolithic societies across the Old World had the know-how necessary to detect underground water, dig hydraulic wells (sometimes to great depths) and obtain a steady supply of fresh water. Several examples of this have been discovered during the last 30 years. They include the water wells found in Cyprus (Peltenburg et al. 2003; Thomas 2003; Peltenburg 2012; Koutrafouri 2008; 2013), cylindrical structures with diameters between 0.90m and 1.20m and depths up to 13m, dating to the Pre-Pottery Neolithic B, in the 9th mill. BCE – which makes them the oldest water wells known in the world (*fig. 15*). Other hydraulic wells dating to the Neolithic period are known in Israel (Galili et al. 1993; Garfinkel et al. 2006; Weinberger et al. 2008; Mithen 2010) and in Germany, where *Linearbandkeramik* communities of the 6th mill. BCE built remarkable wells lined with timber planks (Tegel et al. 2012) (*fig. 16*). Of course, specific hydrological situations and water management were a key issue for the development of social complexity in the Near and Middle East, as postulated by the classic 'hydraulic hypothesis' of the rise of the state (Wittfogel 1957; Butzer 1976). In Mediterranean and arid regions, water resources have often played a key role in the development of technical innovations and economic change (Müller-Neuhof 2014). In Iberia, there is also widespread evidence of the ability of Neolithic societies to dig complex underground structures. Such is the case of the shafts used for the mining of flint at Casa Montero (Vicálvaro, Madrid) (Consuegra Rodríguez et al. 2004) (*fig. 17*) or variscite at Can Tintorer (Gavá, Barcelona) (Blasco et al. 2000, 78), dated to the

late 6th and early 5th mill. BCE respectively. Deep shafts of unknown function have been found at sites dated to the 4th and 3rd mill. BCE in southern Iberia, like for example El Jadramil (Cádiz) (Lazarich González et al. 2003) or Valencina (Seville) (Fernández Gómez/Oliva Alonso 1980; Fernández Gómez 2012) (*fig. 18*). Although the El Jadramil and Valencina shafts were almost certainly not used for mining, there is no clear evidence to understand what they were used for, water supply being one possibility. Regardless of the specificities, it is beyond any doubt that when Menga was built, there was widespread knowledge among Old World societies about how to locate underground water and how to dig deep wells to extract it. The Neolithic communities of Antequera had the necessary technical expertise and sufficient economic motivation to open a well like Menga's.

Secondly, throughout the Mediterranean, as indeed across the Old World, there is a widespread tradition of sacred water wells, often integrated in temples and cult places. In the Iberian region of La Mancha, the so-called Motillas Culture of the Early Bronze Age (ca. 2200 to 1550 BCE) was characterised by a remarkable phenomenon of well-digging and water management that has been linked with the more arid conditions brought about by the 4.2 ky BP climatic event (Mejías Moreno et al. 2015; López Sáez et al. 2014). In Sardinia, the Bronze Age 'Nuragic Culture' was characterised by a similar pattern of well-digging, water control, and monumentalisation of water wells. Often monumentalised by means of large-scale megalithic architecture, some Nuragic 'sacred wells', experienced extremely long biographies, which in some cases extend to this day (Melis 2003; 2008; Moraveratti 2003; Rassu 2016; Spanedda 2006; Zucca 1988) (*fig. 19*). The use of water in connection with sacred places is well attested world-wide throughout the last 10,000 years. In this sense, the Menga water well fits easily within a more general pattern of cult places and cult buildings linked to water.

Thirdly, it is worth considering the spatial and morphological characteristics of Menga's well. There are four main aspects to take into account:

(i) From a purely spatial perspective, and within the context of the local hydrology described above, the location of Menga's well does not make sense if the purpose of those who made it was only practical – for example, to obtain drinking water for people and/or animals. To achieve that, it would have been far easier to open the well 200m further to the east, where the same underground water can be reached at between 2m and 3m of depth. The topographic and hydrogeological location of Menga's well suggests that those who undertook the serious job of cutting through 20m of calcarenite rock (not the hardest of rocks, but rock all the same) all the way down to the water table, did so because they wanted the well to be right there, and not anywhere else. This suggests the well was not made for a purely practical purpose but invested of some kind of significance, and was made where it was made precisely because of the dolmen.

(ii) From a micro-spatial point of view, the well is located right behind Menga's pillar 3, and perfectly centred with regards to the uprights on both sides and the backstone behind it (*fig. 5*). This suggests that those who made it wanted it to be in a prominent place of the monument (at the back of the chamber, the deepest recess inside the 'underground' space) and in harmony with the architecture surrounding it.

(iii) Last but not least, the morphology of the well presents characteristics that set it clearly apart from all other Neolithic or Chalcolithic wells or shafts known in Iberia. Compared with the coarsely finished shafts at Casa Montero, Can

Fig. 19. Bronze Age monumentalised sacred water well at Santa Vittoria (Sardinia). General perspective (Photograph: Leonardo García Sanjuán).

Tintorer, El Jadramil or Valencina, Menga's well presents carefully carved sides, a smooth finish, and almost perfect circularity, all of which are elements that please the eye and convey a sense of geometric perfection. Unlike other more 'practical' wells known in Iberian prehistory, Menga's well produces a pleasant aesthetic and artistic effect – in line with what one would expect had it been conceived as one with the dolmen itself. However, there is also evidence to suggest that the making of the well may not have been part of the megalithic project or was not built by the same people who built the dolmen. For instance, in a picture taken during the 2005 excavations inside Menga (Mora Molina et al. 2018, 42, fig. 22), the upper part of the well appears to have cut the socket of pillar 3, which is very important for the stability of the monument, as it supports capstones 4 and 5 (Mora Molina 2019, 1070). If the well had cut pillar 3's socket, that would obviously mean that the well was made some time after the dolmen. Unfortunately, there is no drawing of that particular section, and no specific description of the possible stratigraphic connection between those two elements was made. Therefore, only a future study will help determine the stratigraphic connection between those two elements. At the same time, it is important to note that in principle, the idea of a water well inside a dolmen mostly built on calcarenite rock is not very conducive to its long-term preservation: the sandstones and breccias used to make to uprights and capstones are three times less efficient when soaked in humidity (García Sanjuán et al. 2018b, 333 f.).

Fourthly, it is important to pay some attention to the data concerning the backfilling of the well in the first half of the 18th cent. CE. The available chronometric model shows that the infill was formed in a period lasting not much longer than 35 years (68% probability) (García Sanjuán et al. 2016). It is not entirely unreasonable to think that the well was filled in a gradual manner (deliberate, but gradual). The materials and animals used in the backfilling could have entered the well gradually over a period of three or four decades. However, it is also possible that the filling of the well was an action planned and executed within a shorter period of time. The presence in the infill of fully articulated skeletons of various animals suggests that they were dumped into the well in a deliberate manner, as it is highly unlikely that so many different animals would have fallen accidentally into the well within a relatively short period of time. Indeed, why so many animals? It is worth noting that a well-established way to corrupt sources of drinking water is to dump dead animals into them. The fact that the infill includes the same mixture of materials of heterogeneous chronology (prehistoric, ancient, modern) found in the sediments of the atrium and surroundings of the dolmen points into the same direction. If the hypothesis of the backfilling having been executed in a quick and planned manner is correct, the transportation and dumping of all the material involved must have implied a significant effort, demanding some funding and a minimum amount of technical and human coordination. What could explain the serious amount of work involved in backfilling the 35.36m^3 (35360l) of volume of the well, roughly equivalent to 51t of material? (García Sanjuán et al. 2016, 220). A possible explanation for this would be the desire to achieve an ideological and/or 'moral' destruction of the well (and perhaps the dolmen itself). In this sense, it is perhaps worth remembering that in his 1587 manuscript 'Discursos Históricos de Antequera', Agustín de Tejada Páez, prebendary at the Granada cathedral had described Menga as a 'nocturnal temple where the gentiles came at night to perform their sacrifices.' The same idea echoed across various other manuscripts written locally in the 16th and 17th cent., at a time when the Spanish Catholic church was very much at war with any form of heresy or religious dissension. Inevitably, this lends credibility to the hypothesis that by the second half of the 17th cent. Menga may have been seen as a place of 'pagan' connotations (or, worse, worship), and therefore entirely unacceptable, especially if the use of the well and the consumption of its water was propitiating a significant frequentation of the place (García Sanjuán et al. 2016, 221). Along this line of reasoning, it is important to note that between the 16th and 17th cent., a period of religious wars in Europe, church authorities (Catholic or Protestant)

imposed stricter limitations on the frequentation or use of 'folk' sanctuaries of 'pagan' origin. A well-known case is the destruction by fire and hammering of some of the menhirs at the Neolithic site of Avery (United Kingdom) in the early 18th cent. (Pollard/Reynolds 2002). Sometimes, church authorities made efforts to 'Christianise' prehistoric monuments, as is the case with some of the dolmens in the Alentejo region of Portugal, like São Dinis or São Brisos, which in the 17th cent. were physically transformed (but not destroyed) to resemble something more akin to a Christian chapel. Thus, the filling of Menga's well, including the dumping of several animals to make sure the water was rendered unusable, may well have been a case of religious condemnation of a place that Catholic authorities felt uneasy about (García Sanjuán et al. 2016, 221).

Whatever the specific reasons or circumstances, the filling of the well seems to have effectively killed off the frequentation of the dolmen. When a hundred years later, Mitjana y Ardison wrote his memoir, he would claim that 'This temple, called by the plebs Cueva de Mengal, was entirely forgotten and blocked by the accumulation of earth that filled it up almost completely' (Mitjana y Ardison 1847, 5). Is it possible that the filling of the well in the 18th cent. was accompanied by a filling of the whole megalithic chamber? That, of course, would have entailed a much bigger investment of labour, rendering even more plausible the hypothesis of a deliberate and planned filling of the well, executed within a short period of time. However, it is unlikely that we will ever know, as Mitjana y Ardison devoted several years to empty and excavate the 'druidic temple', and all traces of the infill he removed are now gone.

To recapitulate, as far as our present knowledge goes it is not possible to rule out any date for the cutting of Menga's well. It may have been carved before the construction of the dolmen, which likely took place between 3800 and 3600 BCE (García Sanjuán/Lozano Rodríguez 2016, 5; García Sanjuán et al. 2018c, 315 f.). There is solid evidence of activity at Menga's hill prior to the construction of the dolmen, particularly evidenced by the materials used to fill the dolmen's mound. But the specific nature of that activity remains unknown. It is also possible that the well was made as part of the megalithic project: its position inside the dolmen and its formal characteristics clearly invite to take this possibility into account (García Sanjuán et al. 2018b, 346). On the other hand, it is not possible to rule out that the well was made some time after the construction of the dolmen, at any time before the early 18th cent. CE. Recent studies show the presence in Menga of various elements of material culture linked with water management, including a Roman ceramic *tubulus* (pipe) as well as several jars which in the Late Middle Ages and Modern History were used to carry, sell and consume drinking water, as is particularly the case with *alcarrazas*, which were widely used by *aguadores* (water sellers) in the streets of Spanish cities during the 16th and 17th cent. CE (García Sanjuán et al. 2018b, 396). The very presence of coins dated to the 16th and 17th cent. in Menga, at a time when Antequera's water was famed both nationally and internationally because of its alleged healing properties, hints at the possibility of the dolmen being a focus of activity because of the well.

5. Conclusion

The evidence presented in this paper suggests that Menga cannot be understood without reference to the hydrology of the surrounding region and the complex patterns of use and ideological appropriation of water deployed by local populations throughout time. Menga is an exceptional megalithic monument that presents an equally exceptional relationship with water. The location of the dolmen within the local geography invites to consider the possibility that the original 'idea' of the monument was already associated with water. This would not be entirely surprising for two reasons:

(i) While the region is subject to a Mediterranean water regime, which entails annual fluctuations of surface water and multi-year cycles of dryness, and is dotted with brackish water that make fresh water a scarce and difficult-to-find resource, Menga is spatially connected to a permanent source of high-quality fresh water, El Nacimiento-La Villa, which has provided the basis for the very existence and development of Antequera as a city.

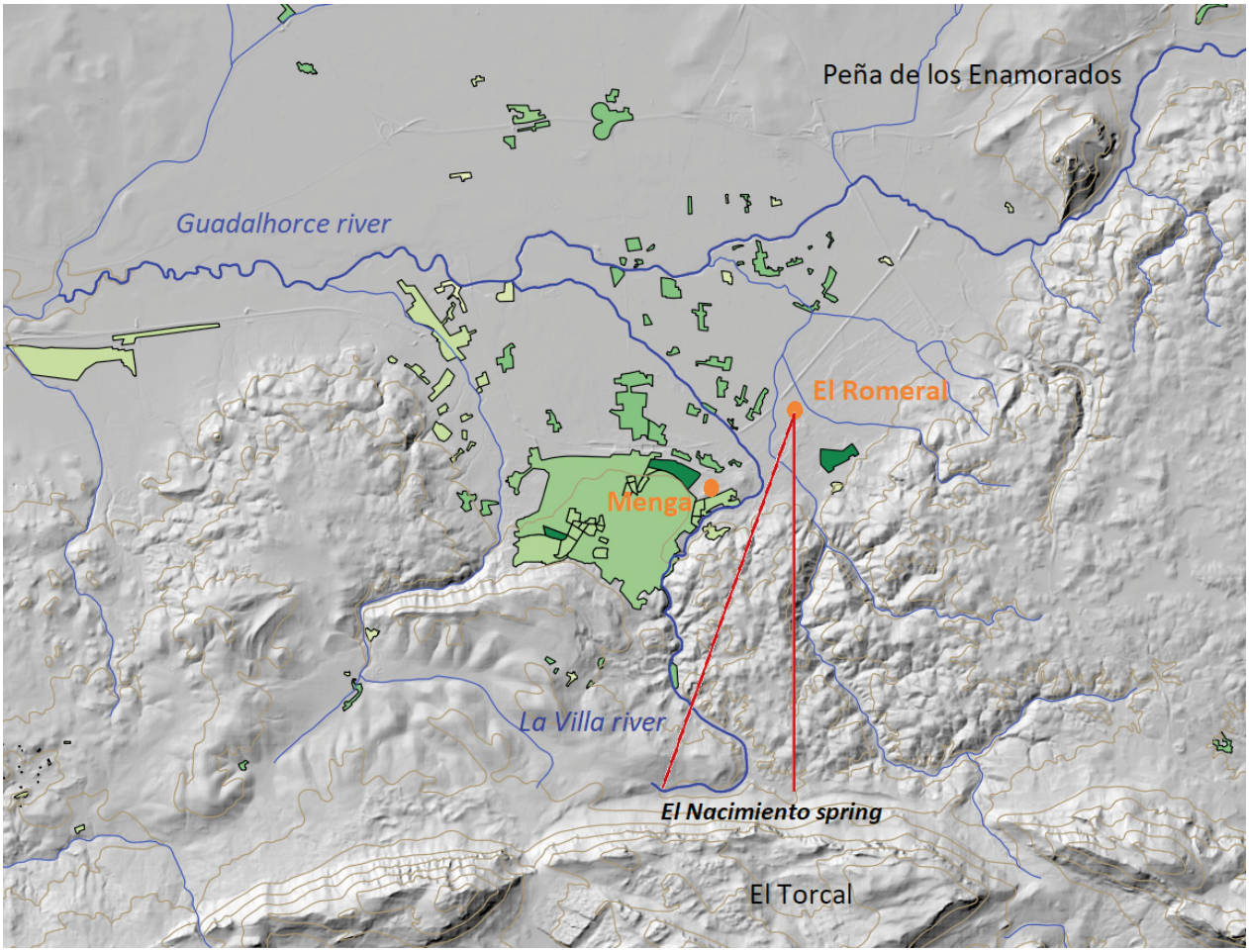

Fig. 20. Map showing the orientation of El Romeral with regards to El Nacimiento and El Torcal (Design: Raquel Montero Artús).

(ii) Both its spatial location and morphology open up the possibility that the well was meant to be integrated within ideas of sacredness embedded with the megalithic monument, regardless of whether it was made in the Neolithic, Antiquity or a later historical period.

(iii) Across the Mediterranean, water cult and especially healing waters, present impressive continuities that sometimes extend from the late Prehistory to modern times, and which often cut through modern religions, such as Christianity (Eliade 1974, 234), as is the case with the Sardinia sacred water-well sanctuaries.

Within the present state of our knowledge, two hypotheses regarding the making of Menga's well can be contemplated. Firstly, it is possible to consider that the well was part of the earliest megalithic project at Menga. This project would have been exceptional in terms of the extraordinary combination and intrinsic execution of both features. The transmission of humidity from the well onto the uprights and capstones, which is detrimental to the stability of the construction, seems to speak against that hypothesis. Secondly, it is possible to think of both features as constructed at different times. In this case, the possibility that the well was carved inside the megalithic chamber long after the construction of the dolmen would be equally remarkable. The location of the well with regards to the local piezometric levels and its morphology strongly suggests that regardless of which hypothesis we choose as more likely, the well was not made for purely practical reasons, as neither of those variables fit in a cost-benefit rationality.

Beyond the problem of the well's age, it is worth noting that our review of the waterscapes of the lands of Antequera suggests the special significance of water over time. The well intimately connects Menga with water just like the whole of

the Antequera region is closely connected with water throughout its past. Whether since the inception of Menga or since a later date, there is every reason to think that the well was a key element in its remarkable journey through time. It is even possible that Menga is not the only monument presenting a close relationship with water. In this respect, the UNESCO declaration emphasises the exceptionality in the conception of Antequera's megalithic landscape, which emanates from a profound relationship between 'built' and 'natural' places (or between architecture and nature), including some 'anomalous' orientations. In that sense, just like Menga is oriented towards an anthropomorphic mountain (La Peña de los Enamorados), El Romeral is oriented towards the southwest, facing El Torcal roughly at the point where El Nacimiento spring is located (*fig. 20*). If the intention of those who built El Romeral was to pay tribute to the most important water resource in the region, they would have 'closed' in a remarkably harmonious way the relationship between water and monumentality. Therefore, a question for future research could well sound like this: did the builders of El Romeral celebrate the material and symbolic importance of the limestone massif that had been inhabited by the ancestors in time immemorial and whose water sprung relentlessly to provide life to the communities of the region?

Leonardo García Sanjuán
University of Sevilla
Department of Prehistory and Archaeology
María de Padilla s/n, 41004
Sevilla, Spain
lgarcia@us.es

Raquel Montero Artús
University of Sevilla
Research Group ATLAS (HUM-694)
Department of Prehistory and Archaeology
María de Padilla s/n, 41004
Sevilla, Spain
raquelmontero@us.es

Coronada Mora Molina
University of Sevilla
Research Group ATLAS (HUM-694)
Department of Prehistory and Archaeology
María de Padilla s/n, 41004
Sevilla, Spain
coronada_mora@us.es

Bibliography

Aranda Jiménez et al. 2015: G. Aranda Jiménez/L. García Sanjuán/C. Mora Molina/M. C. Moreno Escobar/J. A. Riquelme Cantal/S. Robles Carrasco/J. Vázquez Paz, Evidencias de asentamiento y prácticas funerarias en los dólmenes de Menga y Viera en la Antigüedad. La Intervención de 1988. Menga. Revista de Prehistoria de Andalucía 06, 2015, 253–289.

Asín 1940: M. Asín, Contribución a la Toponimia Árabe de España (Madrid 1940).

Blasco et al. 2000: M. Blasco/M. Borrell/J. Bosch Argilagos, Las minas prehistóricas de Gavá (Barcelona). Un ejemplo de estudio, conservación y presentación pública de un yacimiento arqueológico. Trabajos de Prehistoria 57.2, 2000, 77–87.

Bradley 1990: R. Bradley, The Passage of Arms. Archaeological Analysis of Prehistoric Hoards and Votive Deposits (Oxford 1990).

Bradley/García Sanjuán 2017: R. Bradley/L. García Sanjuán, Sudden Time? Natural Disasters as a Stimulus to Monument Building. From Silbury Hill (Great Britain) to Antequera (Spain). In: P. Bickle/V. Cummings/D. Hofmann/J. Pollard (eds.), Neolithic Europe. Essays in Honour of Professor Alasdair Whittle (Oxford 2017) 181–201.

Brandherm 2007: D. Brandherm, Las Espadas del Bronce Final en la Península Ibérica y Baleares. Prähistorische Bronzefunde 4.16 (Stuttgart 2007).

Butzer 1976: K. W. Butzer, Early Hydraulic Civilization in Egypt. A Study in Cultural Ecology (Chicago 1976).

Carrión Méndez et al. 2006a: F. Carrión Méndez/J. A. Lozano Rodríguez/D. García González/T. Muñiz López/P. Félix/C. F. López Rodríguez/J. A. Esquivel Guerrero/I. Mellado García, Estudio Geoarqueológico de los Sepulcros Megalíticos de Cueva de Menga, Viera y Romeral (Antequera, Málaga) (Granada 2006) Unpublished.

Carrión Méndez et al. 2006b: F. Carrión Méndez/T. Muñiz López/D. García González/J. A. Lozano Rodríguez/P. Félix/C. F. López Rodríguez, Intervención Arqueológica en el Conjunto Megalítico de Menga y Viera (Antequera, Málaga) (Granada 2006). Unpublished.

Carrión Méndez et al. 2009: F. Carrión Méndez/J. A. Lozano Rodríguez/D. García González/T. Muñiz López/P. Félix/C. F. López Rodríguez/J. A. Esquivel Guerrero/I. Mellado García, Estudio geoarqueológico de los dólmenes de Antequera. In: B. Ruiz González (ed.), Dólmenes de Antequera. Tutela y Valorización Hoy (Sevilla 2009) 144–163.

Carrión Méndez et al. 2010: F. Carrión Méndez/J. A. Lozano Rodríguez/D. García González/T. Muñiz López/P. Félix/C. F. López Rodríguez/J. A. Esquivel Guerrero/I. Mellado García, Estudio geoarqueológico del conjunto de los dólmenes de Antequera (Málaga, España). In: D. Calado/M. Baldia/M. Boulanger (eds.), Monumental Questions. Prehistoric Megaliths, Mounds, and Enclosures. Proceedings of the XV World Congress (Lisbon, 4–9 September 2006). BAR International Series 2122 (Oxford 2010) 57–69.

Cobos Rodríguez 2016: J. J. Cobos Rodríguez, De la Antaqira Nazarí a la Antequera Castellana a finales de la Edad Media (PhD-Thesis Universidad de Granada 2016).

Consuegra Rodríguez et al. 2004: S. Consuegra Rodríguez/M. M. Gallego García/N. Castañeda Clemente, Minería neolítica del sílex de Casa Montero (Vicálvaro, Madrid). Trabajos de Prehistoria 61.2, 2004, 127–140.

De Rojas y Rojas 1861: T. De Rojas y Rojas, La Cueva de Menga. El Museo Universal 37, 1861, 295–296.

De Rojas y Rojas 1874: T. De Rojas y Rojas, La Cueva de Menga, El Genil. Semanario de Literatura 15, 1874, 57–58.

De Rojas y Rojas 1879: T. De Rojas y Rojas, Historia de Antequera. Tomo I. Imp. De M. Pérez de la Manga (Antequera 1879).

Díaz-Guardamino et al. 2020: M. Díaz-Guardamino/L. García-Sanjuán/D. Wheatley/J. A. Lozano-Rodríguez/M. A. Rogerio-Candelera/M. Casado-Ariza, Late Prehistoric Stelae, Persistent Places and Connected Worlds. A Multi-Disciplinary Review of the Evidence at Almargen (Lands of Antequera, Spain). Cambridge Archaeological Journal 30, 2020, 69–96.

Durán Valsero et al. 1998: J. J. Durán Valsero/J. López Martínez/M. Vallejo, Distribución, caracterización y síntesis evolutiva del karst en Andalucía. In: J. J. Durán Valsero/J. López Martínez (eds.), Karst en Andalucía (Madrid 1998) 13–19.

Durán Valsero 2007: J. J. Durán Valsero, Atlas Hidrogeológico de la Provincia de Málaga. Volumen 2 (Madrid 2007).

Eliade 1974: M. Eliade, Tratado de Historia de las Religiones (Madrid 1974).

Escalante Jiménez 2008: J. Escalante Jiménez, El Abastecimiento de Agua en Antequera. El Memorial de Yllanes Sancho de Toledo (1544) (Antequera 2008).

Fernández 1842: C. Fernández, Historia de Antequera desde su Fundación hasta el Año de 1800 (Málaga 1842).

Fernández Gómez 2012: G. Fernández Gómez, Las excavaciones de 1975 del Museo Arqueológico de Sevilla en Valencina de la Concepción (Sevilla). Sectores de La Perrera y Cerro de la Cabeza. In: L. García Sanjuán/J. M. Vargas Jiménez/V. Hurtado Pérez/T. Ruiz Moreno/R. Cruz-Auñón Briones (eds.), El Asentamiento Prehistórico de Valencina de la Concepción (Sevilla). Investigación y Tutela en el 150 Aniversario del Descubrimiento de La Pastora (Sevilla 2012) 131–150.

Fernández Gómez/Oliva Alonso 1980: F. Fernández Gómez/D. Oliva Alonso, Los ídolos calcolíticos del Cerro de La Cabeza (Valencina de la Concepción. Sevilla). Madrider Mitteilungen 21, 1980, 20–44.

Galili et al. 1993: E. Galili/M. Weinstein-Evron/I. Hershkovitz/A. Gopher/M. Kislev/O. Lernau/L. Kolska-Horwitz/H. Lernau, Atlit-Yam. A Prehistoric Site on the Sea Floor off the Israeli Coast. Journal of Field Archaeology 20.2, 1993, 133–157.

García Mercadal 1952: J. García Mercadal, Viajes de Extranjeros por España y Portugal, Tomo II, Madrid, 1952, 853.

García Pérez et al. 2020: S. García Pérez/V. Hurtado Pérez/L. García Sanjuán/M. Cintas-Peña, The Many Forms of the Sacred. Portable Imagery from Late Neolithic and Copper Age Southern Spain. In: P. Bueno Ramírez/J. Soler Díez (eds.), Los Ídolos del Neolítico y Calcolítico de la Península Ibérica (Alicante 2020) 245–264.

García Sanjuán/Wheatley 2009: L. García Sanjuán/D. Wheatley, El marco territorial de los dólmenes de Antequera. Valoración preliminar de las primeras investigaciones. In: B. Ruiz González (ed.), Dólmenes de Antequera. Tutela y Valorización Hoy (Sevilla 2009) 128–143.

García Sanjuán/Wheatley 2010: L. García Sanjuán/D. Wheatley, Natural Substances, Landscape Forms, Symbols and Funerary Monuments. Elements of Cultural Memory among the Neolithic and Copper Age Societies of Southern Spain. In: K. Lillios/V. Tsamis (eds.), Material Mnemonics. Everyday Memory in Prehistoric Europe (Oxford 2010) 10–39.

García Sanjuán/Lozano Rodríguez 2016: L. García Sanjuán/J. A. Lozano Rodríguez, Menga (Andalusia, Spain). Biography of an Exceptional Megalithic Monument. In: L. Laporte/C. Scarre (eds.), The Megalithic Architectures of Europe (Oxford 2016) 3–16.

García Sanjuán et al. 2015: L. García Sanjuán/D. W. Wheatley/M. Díaz-Guardamino Uribe/C. Mora Molina/O. Sánchez Liranzo/K. Strutt, Evidence of Neolithic Activity at La Peña de los Enamorados (Antequera, Málaga). Intensive Surface Survey, Geophysics and Geoarchaeology at the Site of Piedras Blancas I. Menga. Revista de Prehistoria de Andalucía 6, 2015, 211–252.

García Sanjuán/Mora Molina 2018: L. García Sanjuán/C. Mora Molina (eds.), La Intervención de 2005 en el Dolmen de Menga. Temporalidad, Biografía y Cultura Material en un Monumento del Patrimonio Mundial (Sevilla 2018).

García Sanjuán et al. 2016: L. García Sanjuán/G. Aranda Jiménez/F. Carrión Méndez/C. Mora Molina/A. Lozano Medina/D. García González, El relleno del pozo de Menga. Estratigrafía y radiocarbono. Menga. Revista de Prehistoria de Andalucía 07, 2016, 199–223.

García Sanjuán et al. 2018a: L. García Sanjuán/C. Mora Molina/J. A. Lozano Rodríguez, Valoración y conclusiones. Cultura material, tiempo y persistencia en la biografía del dolmen de Menga. In: L. García Sanjuán/C. Mora Molina (eds.), La Intervención de 2005 en el Dolmen de Menga. Temporalidad, Biografía y Cultura Material en un Monumento del Patrimonio Mundial (Sevilla 2018) 355–410.

García Sanjuán et al. 2018b: L. García Sanjuán/C. Mora Molina/R. Montero Artús, El pozo de Menga. Una estructura hidráulica excepcional. In: L. García Sanjuán/C. Mora Molina (eds.), La Intervención de 2005 en el Dolmen de Menga. Temporalidad, Biografía y Cultura Material en un Monumento del Patrimonio Mundial (Sevilla 2018) 325–353.

García Sanjuán et al. 2018c: L. García Sanjuán/C. Mora Molina/A. Lozano Medina/G. Aranda Jiménez, La cronología radiocarbónica del dolmen de Menga. In: L. García Sanjuán/C. Mora Molina (eds.), La

Intervención de 2005 en el Dolmen de Menga. Temporalidad, Biografía y Cultura Material en un Monumento del Patrimonio Mundial (Sevilla 2018) 307–322.

Garfinkel et al. 2006: Y. Garfinkel/A. Vered/O. Bar-Yosef, The Domestication of Water. The Neolithic Well at Sha'ar Hagolan, Jordan Valley, Israel. Antiquity 80, 2006, 686–696.

Gonzalez 2008: Disposiciones generales. Boletín Oficial de la Junta de Andalucía 36, 2008, 5–15. Last updated: 20.02.2008, <https://www.juntadeandalucia.es/boja/2008/36/d1.pdf> (last access 22.03.2021).

Gozalbes Cravioto/Muñoz Hidalgo 1986: C. Gozalbes Cravioto/F. Muñoz Hidalgo, Fuente de Piedra. La vía romana de la sal. Jábega 53, 1986, 20–23.

Gozalbes Cravioto/Gozalbes Busto 1996: C. Gozalbes Cravioto/G. Gozalbes Busto, Antequera y su comarca, según un viajero alemán del siglo XVI (1599). Revista de Estudios Antequeranos 7/8, 1996, 199–213.

Koutrafouri 2008: V. G. Koutrafouri, Ritual in Prehistory. Definition and Identification. Religious Insights in Early Prehistoric Cyprus (PhD-Thesis University of Edinburgh 2008).

Koutrafouri 2013: V. G. Koutrafouri, From Wells to Pillars, and from Pillars to…? Ritual Systems Transformation and Collapse in the Early Prehistory of Cyprus. In: V. G. Koutrafouri/J. Sanders (eds.), Ritual Failure, Archaeological Perspectives (Leiden 2013) 85–108.

Lazarich González et al. 2003: M. Lazarich González/M. J. Richarte García/L. Aguilera Rodríguez, Análisis de las estructuras prehistóricas. In: M. Lazarich González (ed.), El Jadramil (Arcos de la Frontera). Estudio arqueológico de un asentamiento agrícola en la campiña gaditana (Arcos de la Frontera 2003) 115–137.

León Vegas 2006: M. León Vegas, Un enclave sacralizado en la urbe antequerana. La ermita, beaterio y hospital de la Vera-Cruz (siglos XVI–XVIII), Baetica. Estudios de Arte, Geografía e Historia, 28, 2006, 433–456.

Levy 1982: J. E. Levy, Social and Religious Organization in Bronze Age Denmark. An Analysis of Ritual Hoard Finds. BAR International Series 142 (Oxford 1982).

Linares Girela/Rendón Martos 1998: L. Linares Girela/M. Rendón Martos, La laguna de Fuente de Piedra (Málaga), un área endorreica de interés ecológico ligada al karst yesífero-salino. In: J. J. Durán Valsero/J. López Martínez (eds.), Karst en Andalucía (Madrid 1998) 165–172.

López-Geta et al. 2010: J. A. López-Geta/M. Fernández-Palacios Carmona/M. Martín Machuca/J. C. Rubio Campos (eds.), El agua subterránea en el Parque Natural Sierra de Grazalema (Cádiz y Málaga) (Madrid 2010).

López Sáez et al. 2014: J. A. López Sáez/F. Alba Sánchez/T. Nájera Colino/F. Molina González/S. Pérez Díaz/S. Sabariego Ruiz, Paleoambiente y sociedad en la Edad del Bronce de la Mancha. La Motilla del Azuer, Cuadernos de Prehistoria y Arqueología de la Universidad de Granada 24, 2014, 391–422.

Lozano Rodríguez et al. 2014: J. A. Lozano Rodríguez/G. Ruiz-Puertas/M. Hódar-Correa/F. Pérez-Valera/A. Morgado, Prehistoric Engineering and Astronomy of the Great Menga Dolmen (Málaga, Spain). A Geometric and Geoarchaeological Analysis. Journal of Archaeological Science 41, 2014, 759–771.

Martín Ruiz 2006: J. A. Martín Ruiz, Sobre un posible santuario ibérico en el Valle de Abdalajís (Málaga). Habis 37, 2006, 145–157.

Martín Ruiz 2009: J. A. Martín Ruiz, Nescania (el Valle de Abdalajís), un municipio romano en la provincia de Málaga. Sagvntvm 41, 2009, 175–186.

Mejías Moreno et al. 2015: M. Mejías Moreno/L. Benítez De Lugo Enrich/J. A. López Sáez/C. Esteban López (eds.), Arqueología, Hidrogeología y Medio Ambiente en la Edad del Bronce de La Mancha. La cultura de las Motillas (Madrid 2015).

Melis 2003: P. Melis, La Civilisation nuragique (Sassari 2003).

Melis 2008: M. G. Melis, Osservazioni sul ruolo dell'acqua nei rituali della Sardegna preistorica. Rivista di Scienze Preistoriche 58, 2008, 111–124.

Mithen 2010: S. Mithen, The Domestication of Water. Water Management in the Ancient World and its Prehistoric Origins in the Jordan Valley. Philosophical Transactions of the Royal Society 368, 2010, 5249–5274.

Mitjana y Ardison 1847: R. Mitjana y Ardison, Memoria sobre el templo druida hallado en las cercanías de la ciudad de Antequera (Málaga 1847).

Montero Artús 2018: R. Montero Artús, El Pozo del Dolmen de Menga (Antequera, Málaga). Análisis Hidrogeológico, Arqueológico e Histórico (Masters Dissertation University of Sevilla 2018).

Mora Molina 2019: C. Mora Molina, Los Monumentos Megalíticos de Antequera (Málaga). Una Aproximación Biográfica (PhD-Thesis University of Sevilla 2019).

Mora Molina et al. 2018: C. Mora Molina/L. García Sanjuán/V. Navarrete Pendón/L. E. Fernández Rodríguez, La intervención de 2005 en el dolmen de Menga. Pplanteamiento, estructuras y estratigrafía. In: L. García Sanjuán/C. Mora Molina (eds.), La Intervención de 2005 en el Dolmen de Menga. Temporalidad, Biografía y Cultura Material en un Monumento del Patrimonio Mundial (Sevilla 2018) 28–85.

Morales 1575: A. Morales, Las Antigüedades de las Ciudades de España (Alcalá de Henares 1575).

Moraveratti 2003: A. Moraveratti, Il Santuario Nuragico di Santa Cristina (Sassari 2003).

Moya Morales 2004: J. Moya Morales, Manuel Gómez-Moreno González. Obra Dispersa e Inédita (Granada 2004).

Müller-Neuhof 2014: B. Müller-Neuhof, Desert Irrigation Agriculture. Evidences for Early Bronze Age Rainwater-Harvesting Irrigation Agriculture at Jawa (NE-Jordan). Studia Chaburensia 4, 2014, 187–197.

Peltenburg 2012: E. Peltenburg, East Mediterranean Water Wells of the 9th–7th Millennium BC. In: F. Klimscha/R. Eichmann/C. Schuler/H. Fahlbusch (eds.), Wasserwirtschaftliche Innovationen im archäologischen Kontext (Rahden/Westf. 2012) 69–82.

Peltenburg et al. 2003: E. Peltenburg/D. Bolger/S. Colledge/P. Croft/S. C. Fox/E. Goring/A. Jackson/D. A. Lunt/C. McCartney/M. A. Murray/J. Ridout-Sharpe/G. Thomas/M. E. Watt (eds.), The Colonisation and Settlement of Cyprus. Investigations at Kissonerga-Mylouthkia, 1976–1996. Studies in Mediterranean Archaeology 70.4 (Sävedalen 2003).

Peréx Agorreta/Miró I Alaix 2017: M. J. Peréx Agorreta/C. Miró I Alaix, VBI AQVAE IBI SALVS Aguas Mineromedicinales, Termas Curativas y Culto a las Aguas en la Península Ibérica (Desde la Protohistoria a la Tardo-Antigüedad) (Madrid 2017).

Pollard/Reynolds 2002: J. Pollard/A. Reynolds, Avebury. The Biography of a Landscape (Charleston 2002).

Pulido Bosch 1998: A. Pulido Bosch, Principales rasgos hidrogeológicos de los macizos kársticos andaluces. In: J. J. Durán Valsero/J. López Martínez (eds.), Karst en Andalucía (Madrid 1998) 49–53.

Rassu 2016: M. Rassu, Pozzi Sacri. Architetture Preistoriche per il Culto Delle Acque in Sardegna, Condaghes (Cagliari 2016).

Rogerio-Candelera et al. 2018: M. A. Rogerio-Candelera/P. Bueno Ramírez/R. De Balbín Behrmann/M. I. Dias/L. García Sanjuán/M. L. Coutinho/J. A. Lozano Rodríguez/A. Z. Miller/A. W. Pike/C. D. Standish/M. I. Prudêncio/A. L. Rodrigues/J. M. De la Rosa Arranz/D. Gaspar, Landmark of the Past in the Antequera Megalithic Landscape. A Multi-Disciplinary Approach to the Matacabras Rock Art Shelter. Journal of Archaeological Science 95, 2018, 76–93.

Rojas Villandrando 1603: A. Rojas Villandrando, El Viaje Entretenido (Madrid 1603).

Rovira Llorens 2007: S. Rovira Llorens, Apéndice E: Las Espadas del Bronce Final de la Península Ibérica. Estudio Arqueometalúrgico. In: D. Brandherm, Las Espadas del Bronce Final en la Península Ibérica y Baleares. Prähistorische Bronzefunde 4.16 (Stuttgart 2007) 155–175.

Spanedda 2006: L. Spanedda, La Edad del Bronce en el Golfo de Orosei (Cerdeña, Italia) (PhD-Thesis Universidad de Granada 2006).

Tegel et al. 2012: W. Tegel/R. Elburg/D. Hakelberg/H. Stäuble/U. Büntgen, Early Neolithic Water Wells Reveal the World's Oldest Wood Architecture. PLoS ONE 7.12, 2012, <https://doi.org/10.1371/journal.pone.0051374>.

Tenison 1853: L. Tenison, Castile and Andalucia (London 1853).

Terán Manrique/Morgado Rodríguez 2011: J. Terán Manrique/A. Morgado Rodríguez, El aprovechamiento prehistórico de sal en la alta Andalucía. El caso de Fuente Camacho (Loja, Granada), Cuadernos de Prehistoria y Arqueología de la Universidad de Granada 21, 2011, 221–249.

Thomas 2003: D. Thomas, Wells as Signatures of Social Change. Assemblage 7, 2003, 86–116.

Urresti Estala 2016: B. Urresti Estala, Implementación de la Directiva de Aguas Subterráneas (2006/118/CE) en la Cuenca Hidrográfica del Río Guadalhorce. Aplicación de Técnicas Estadísticas e Isotópicas (PhD-Thesis University of Málaga 2016).

Vernet 1960: J. Vernet, Toponimia arábiga. In: M. Alvar/A. Badía/R. De Balbín/L. F. Lindley Cintra (eds.), Enciclopedia Lingüística Hispánica I (Madrid 1960) 561–578.

Weinberger et al. 2008: R. Weinberger/A. Sneh/E. Shalev, Hydrogeological Insights in Antiquity as Indicated by Canaanite and Israelite Water Systems. Journal of Archaeological Science 35, 2008, 3035–3042.

Wittfogel 1957: K. A. Wittfogel, Oriental Despotism. A Comparative Study of Total Power (Yale 1957).

Zucca 1988: R. Zucca, Il Santuario Nuragico di S. Vittoria Di Serri. Sardegna Archeologica, Guide e Itinerari 7 (Sassari 1988).

Roberto Filloramo, Valeska Becker, and Antonio Curci

Landscapes of Control and Connection

Reconstructing Mobility among Apulian Late Prehistoric Communities, Italy

Keywords: Apulian prehistory, Neolithic, Copper Age, visibility analysis, least-cost path analysis, mobility, landscape archaeology

Summary

The region of Apulia, southern Italy, is especially interesting during early prehistory. Due to its fertile soils and its abundance of valuable raw materials, especially high-quality flint and obsidian sources off the coast, the density of settlements is very high from the earliest Neolithic onwards. In a selected area in this region, an ongoing project situated at the universities of Münster, Germany, and Bologna, Italy, and the Soprintendenza Archeologia, Belle Arti e Paesaggio per le province di Barletta-Andria-Trani e Foggia, Italy, is currently dealing with the comprehension of how prehistoric communities moved in their territory and how they exploited the landscape during the Neolithic and the Early Bronze Age.

The region was chosen because it played an important role as a bridge between the eastern Mediterranean Sea and the inner peninsular areas during pre- and protohistoric times, thus permitting a mutual exchange of ideas, artefacts, and people. Since the landscape and human presence are linked via site distribution, the investigations comprise visibility analysis and least-cost path analysis in order to understand the networks of ties and relationships between sites. This will be fundamental to comprehend how the ancient communities exploited the landscape, and to determine the reasons for choices of settlement, also in relation to local and foreign influences that began to emerge from the Late Neolithic onward. Hence, the research aims to introduce new ways to analyse the landscape in relation to human frequentation and ways of communication, both terrestrial and aquatic. The landscape is viewed as a repository for natural resources, and its analysis can be tied to questions regarding the exchange of cultural resources like ideas, practices and techniques.

1. Introduction

The network of archaeological cultures in Italian early prehistory is complex and difficult to disentangle, especially when we rely merely on a conventional study of features and finds, such as an analysis of pottery, stone tools, or distributions of settlements. Instead, we may get closer to drawing a picture of historical realities by focusing on the interactions between communities during different time slices and their use of resources, meaning natural resources which abound in Italy, especially in the south, as well as cultural resources like knowledge, practices, and methods.

In order to achieve this goal, tools employed in landscape archaeology and social network analysis prove of help. With them, mobility and communication patterns, the layout of networks and the roles of players within them and their development and change in the course of time can be charted and interpreted, thus offering deeper insights into the life of prehistoric communities.

Some of these questions will be addressed in the project R.P.C.M. Apulia (Reconstructing

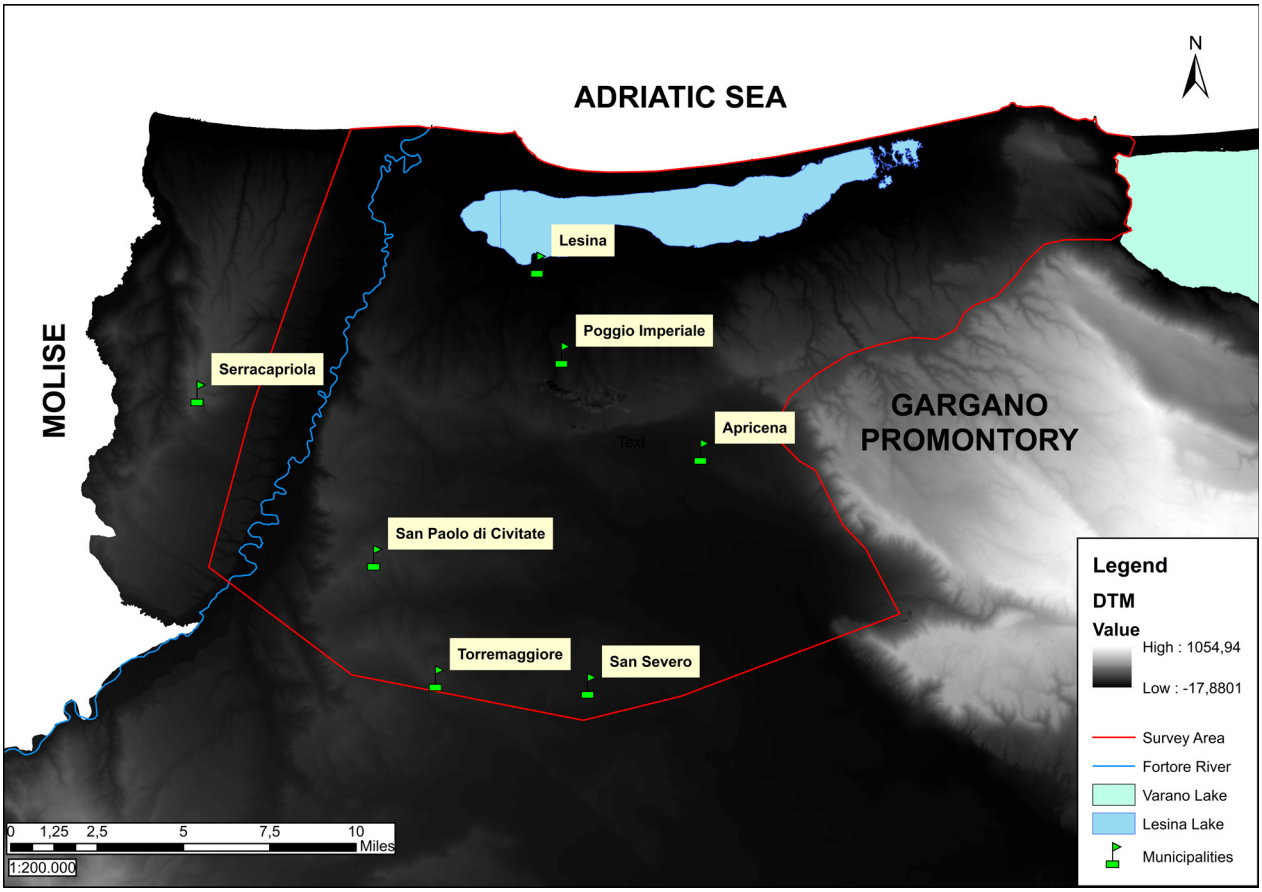

Fig. 1a. Northern Apulia. In red the project area; in blue the Fortore River; green triangles are modern cities (image by the authors).

Prehistoric Communities' Mobility in Apulia) currently underway in a cooperation of Münster University, Germany, Bologna University, Italy, as well as the Soprintendenza Archeologia, Belle Arti e Paesaggio per le province di Barletta-Andria-Trani e Foggia, Italy.

The investigations are focused on an area in northern Apulia between the Fortore River valley and the north of the Gargano promontory, including the Lesina and Varano lakes (*fig. 1a*). Research in the last decades has underlined the important role of this region and an increasing human frequentation during pre- and protohistory (*fig. 1b*). This phenomenon was encouraged by positive environmental and climatic conditions, which facilitated settling and changing the landscape according to the ideas and needs of the communities (Gravina 1999; Boenzi et al. 2001).

It will be one of the tasks of the ongoing research to identify, by investigating the landscape, how the territory was influenced by human presence and vice versa, and moreover, to comprehend how groups (and therefore also the ideas and practices they brought with them) moved in the landscape while keeping in touch each other. This type of circulation does not only regard local communities but also people coming from other regions.

1.1. Environmental Conditions

Apulia is of special importance for the Neolithic (6000–4100 calBC) and the Copper Age (4100–2350 calBC). The Gargano peninsula as well as the Tavoliere plain and the Altopiano delle Murge, a plateau in central Apulia, with their fertile soils and the limestone substratum, in combination with a very mild climate, set the stage for the oldest Neolithic settlements in all of Italy (e.g. Foggia, Villa Comunale, dating around 6850 calBP; Passo di Corvo, darting ca. 6140 calBP; Coppola

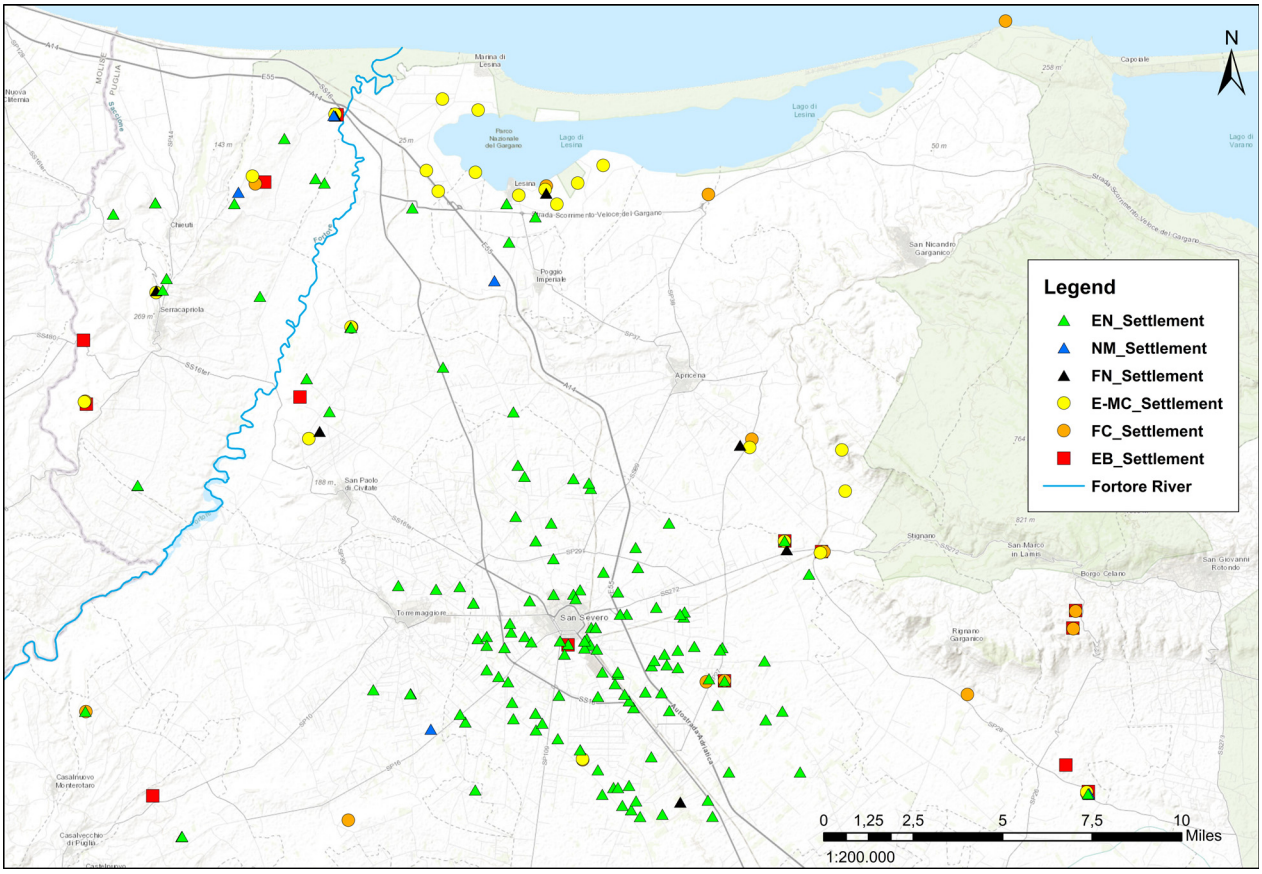

Fig. 1b. Diachronic distribution chart of known sites. Triangles: Early Neolithic (EN), Middle Neolithic (MN), Final Neolithic (FN); circles: Early-Medium Copper Age (E-MC), Final Copper Age (FC); squares: Early Bronze Age (EB) (image by the authors in ArcGIS).

et al. 2017). Especially the red Mediterranean soils of the limestone strata are of great importance, among them particularly *terra rossa*. The red colour originates from iron enclosures or else from the accumulation of red mineral dust from the Sahara and Sahel regions (Muhs et al. 2010). The *terrae rossae*, but also the clayey eutric cambisols in Apulia are very well-suited for agriculture, and maybe such soils were specially chosen by Early Neolithic settlers.

Apulian geology is characterised by limestone plateaus, as mentioned above, which tend to karstify; thus, it is no wonder that the region, especially the Altopiano delle Murge, the Gargano and the alto and basso Salento are riddled with caves (cf. the Catasto nazionale delle Grotte d'Italia, http://www.speleo.it/catastogrotte/mappa), some of which were in use for various purposes during the Neolithic and the Copper Age, and even since Palaeolithic times (cf. Palma di Cesnola 2005). The Gargano peninsula features limestone

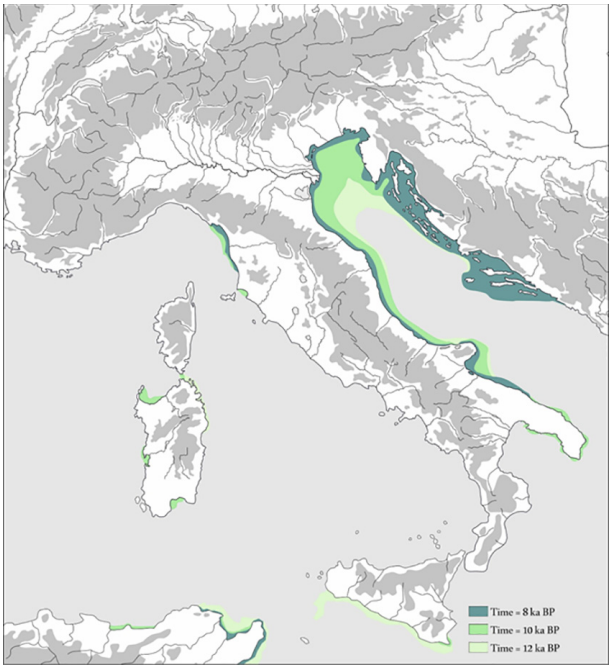

Fig. 1c. Palaeographic reconstruction of sea-level changes between 12,000 and 8,000 BP with corresponding land loss (altered after Lambeck et al. 2004).

flint-bearing formations related to those of the southern Alps (Monti Lessini), with mining activities going back to Early Neolithic times (Galiberti 2005).

Finally, we have to mention the coastline, which is subject to permanent change (*fig. 1c*). Sea-level changes were caused by climate changes but also heavings and depressions of the country itself, which can be ascribed to plate tectonics and the dislocation of rock in the subsoil.

1.2. Historical Background

Studies show that during the Neolithic period, the impact on the territory intensified with Neolithic communities conducting agriculture, livestock breeding, hunting, and fishing which peaked in the following periods (i.e. the Copper and the Bronze Ages). The close interaction with the territory is also underlined by the types of settlements that started to take open space into consideration, creating large villages equipped with ditches whose function is debated until today: some suppose that they were used to distinguish the untamed wilderness from the settled area (Skeates 2000); others see them as a way to define a specific portion of the land dedicated to agriculture, as it was presumed in the course of the excavations of the village of Passo di Corvo (Tinè 1983). During this time, natural caves emerged as places for rituals, such as Grotta Scaloria (Tinè/Isetti 1981; Elster et al. 2016).

In terms of cultural history, an approximate succession of pottery decorated with simple impressions (*ceramica impressa arcaica*) to a more developed *impresso* decoration (*ceramica impressa evoluta*) and to pottery with painted and incised decoration (*ceramica dipinta/stile Lagnano da Piede*/*stile Passo di Corvo* and *Ceramica graffita*) is not doubted anymore, although it has become apparent, also with the help of larger series of absolute dates, that these developments occurred during different points in time microregionally and that there are large overlaps between these stylistic phases (Tiné 2002). In terms of absolute chronology, these phases can be set between 6000 and 5200 calBC.

With the end of the Neolithic (4100 BC), human impact started to become more intricate: intensified relationships with other groups and the birth of a new type of economy pushed communities to modify their approach to the territory. Settlements arose progressively in points of control of commercial and transhumance routes, sites that previously did not show signs of fortification now begin to establish new control, especially during the Bronze Age (2000–1000 BC; Cazzella 2010).

These changes are also reflected in the material culture in which the influence of other cultural phenomena coming from neighbouring regions becomes manifest. Particular signs of this new cultural exchange network can be perceived during the beginning of the Copper Age. The so-called *facies* Macchia a Mare (ca. 4100–3700 calBC) now becomes important, being characterised by a specific lithic production and pottery decorated with slightly engraved zigzag motives. It can be found along the northern coast of the Gargano; however, recent investigations brought to light other sites such as Coppa Nevigata, Mezzana della Quercia and Brancia 10km south of the promontory with this type of material remains (Palma di Cesnola 1981; Gravina 2009). Moreover, further research has traced a comparable material production between the site of Paterno (located in the neighbouring Italian region Abruzzo), Zinzulusa cave (located in Calabria in the south) and the *facies* Macchia a Mare (Gravina 2009; Ingravallo 1998). Therefore, we may conclude that the material culture is not evidence of an isolated group's production but rather an overall set of ideas distributed not only in the region but also in neighbouring areas.

In the course of the Copper Age, we can observe how contacts between communities start to exceed their former distribution areas. This is the moment when the spread of a new type of motives in pottery production becomes manifest. Found initially at the Sicilian site of Lipari, the *facies* Piano Conte (3700–3300 calBC) characterised by pottery with linear engraved motives seems to have also been absorbed in the southern peninsular areas, opening a long-standing debate about its circulation. Today research is more prone to consider this aspect not as a direct influence from Sicily

but rather as an aspect of material culture which spread into the south of Italy and was adapted by the communities according to their own perspective. Hence this is evidence of the presence of a network linking the southern areas of the peninsula (Del Fattore et al. 2017).

A similar cultural link appears in the final moments of the Copper Age with the *facies* Laterza, characterised by a pottery decoration comprising slightly engraved motives on the outer vessel wall and vertical engraved lines on the inner part of the rim, the rim itself being raised above the vessel wall. The distribution area of this culture is very blurred and difficult to contextualise because it seems to change in accordance with the different groups that absorbed it; in particular, it becomes manifest in funerary rituals with great variations that are so significant that some scholars tend to consider the rituals not part of the reflection of the identity of the likewise groups themselves (Tunzi Sisto/Monaco 2010).

However, there is no doubt at this point that within the cultural background of the *facies* Laterza (2900–2350 calBC), closer ties began to modify deeply the interactions between the communities. This becomes especially clear in the Bronze Age, where the contact with eastern groups of the Mediterranean became more constant.

New types of economy arose, with communities placing more and more emphasis on the possession of land. The first signs of this change become obvious already in the final moments of the Eneolithic: the control of economic and transhumance routes began to become crucial. For this reason, sites were set up on the top of hills, close to inland watercourses, near the coast or at other places from where it was possible to dominate passages.

Thus, it becomes obvious that the area taken into consideration played an important role as a hub, being a sort of intermediary between the eastern parts of the Mediterranean and the inner regions. This became possible also thanks to raw materials, such as the Gargano flint, which triggered increasingly dense economic relations with the areas mentioned above. Another clear example is the early appearance of copper artefacts in sites more or less close to Apulia, such as Santa Maria in Selva (Macerata, Marche), Fossacesia (Chieti, Abruzzo), Chieti (Abruzzo) and the Lipari Acropolis (Eolian Islands, Sicily).

2. Methodology

2.1. General Considerations

Whereas there is no doubt concerning the important role played by Apulia in Italian prehistory in general – there is well-documented evidence for many parts of the region –, there are problems concerning the exact frame for the archaeological, cultural phenomena which is quite blurred for some periods; thus, a clear chronological sequence does not exist. This problem originates especially in anthropic action inflicted on the territory, for continuous agricultural activities have changed it deeply since prehistoric times.

In order to try to clarify the situation, published information was gathered to create a distribution map of the above-mentioned periods. The data was organised and re-evaluated systematically and finally inserted into a GIS database in accordance with the formal database of the Superintendence of Foggia, including information such as GPS positions, vicinity to sites and prehistoric routes (i.e. inland watercourses, coastal and valley passages), single finds, possible figures and bibliographic information. This formed the basis for the following analysis of the landscape to evaluate the important role it played in the life of the communities and possible migratory processes in the territory. The examination and definition of chorological processes with all their implications is crucial to gain insights into settlement choices. Furthermore, road networks need to be investigated that may have connected the sites; several routes have been used for a very long time since they served for transhumance. A good example of these could be paths along valleys which may have been used since prehistoric times due to their ecological characteristics. The analysis of these networks helps to comprehend how groups moved in the territory and what could have driven them to choose a specific way instead of another one. Predictive modelling has in the past proved

to be an efficient method to answer such questions (Doneus 2013, 301–310) and is used in this paper to investigate the ancient lifescape according to the landscape's visibility and surface.

2.2. Methods and Course of Action

Analysis was conducted using ArcGIS (v.10.1). A digital terrain model (DTM) could be acquired from the official website of the region of Apulia (http://www.sit.puglia.it/) with a resolution of 8m, which forms the basis for mapping the site positions previously checked and stored in the database. A distinction was made between verified sites (i.e. settlements) and areas of frequentation (i.e. walking areas from which stray finds have been gathered).

The DTM has been adapted in order to get a smoother surface avoiding incurring modern changes in the landscape to or gain at least a more weighted raster. To achieve this, the focal statistics tool was applied that estimates a statistical mean of the values for each cell within a specified neighbourhood around it (setting a rectangular moving window with a size of 3 x 3 cell units; see Esri's Focal Statistics).[1]

2.2.1. Visibility

Visibility is considered in archaeology as a defining factor for the structure of the social and cultural landscape (Doneus 2013, 303). It is connected with a desire for protection, status, religious aspects or communication and promotes the exchange of people, ideas and materials. In this paper, the Fortore River, with its many sites dating from the Early Neolithic to the Early Bronze Age, constitutes our sample region. The sites were chosen according to their proximity to the watercourse applying a radius of 3km (i.e. ca. one hour walking distance at a constant speed of 4km/h) (Fischer-Kowalski et al. 2013), an easily walkable distance without a significant energetic or time cost. The presence of the watercourse motivated some speculation about its usage as a potential communication way or else a barrier. To verify this, fuzzy viewshed analysis was conducted in order to yield a more detailed insight into the visibility spectrum on the surface. The method uses E. D. Ogburn's procedure developed based on Fisher's theory (Fisher 1992; 1994), showing that an observer could have a different visual perception degree of an object's clarity under various (or same) conditions (e.g. weather, distance, sight acuity related to age/physical state). This perception scale is solved by applying the fuzzy set theory: a viewshed is created showing not the usual binary result (i.e. 1 = visible and 0 = not visible), but a scale of visibility degrees, incorporating the value coming from the fuzzy membership to the common viewshed analysis. The result is a model with shaded zones underlining the dropping-off in clarity from the observer to infinity (Ogburn 2006).

Further parameters were introduced into the procedure to apply it to our sample region: a value of 1km was set as a range within which there was no drop in visibility (as suggested by Fisher 1994 and Ogburn 2006). The observer's height was set at 1.65m, likewise the height of the theoretical target (another human being) and a maximum radius of visibility of 15km (i.e. ideal weather conditions, as suggested by D. Wheatley and M. Gillings [2002]).

2.2.2. Buffer Zones

Moreover, buffer zones were created to establish a better comprehension of the vicinity of places. A maximum radius of 3km was set, indicating almost one hour on foot, assuming that the walking speed average free of load was 4km/h. This could be useful for getting an idea about the mobility of people and artefacts between sites close to the watercourse and those not so far away from it.

2.2.3. Least-Cost Path Analysis

Least-cost path analysis (LCPA) can be used to establish the minimal accumulative travel cost from a source to each cell location on a raster (Doneus

1 Esri's Focal Statistics: ESRI – ArcGIS 10.3 Help: Focal Statistics, <http://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-analyst-toolbox/focal-statistics.htm> (last access 29.03.2021).

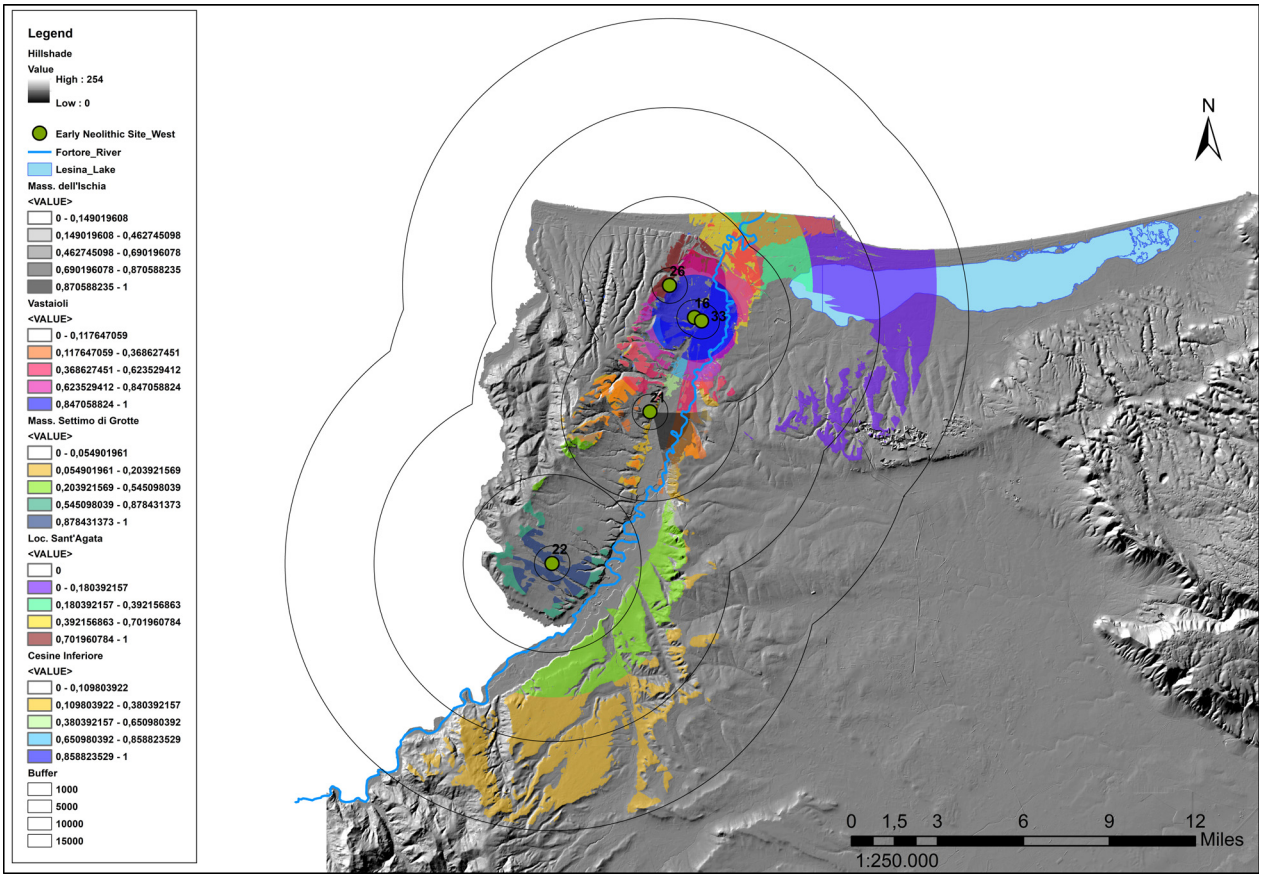

Fig. 2a. Fuzzy viewshed analysis applied on the Early Neolithic sites on the western shore of the Fortore river: 16) Vastaioli; 21) Mass. dell'Ischia; 22) Mass. Settimo di Grotte; 26) Loc. Sant'Agata; 33) Cesine Inferiori. The colour shades indicate the grades of visibility. The buffer lines (1000, 5000, 10,000 and 15,000) determine the distance from the observer point to the maximum visible radius (image by the authors in ArcGIS).

2013, 332–335); in our case, from one site to all others. Factors like the slope, but also visibility and other aspects more difficult to determine, like social borders, cultural or religious issues, may determine what paths were chosen by prehistoric people to get from one place to another. Whereas slope and visibility can be modelled accordingly, these latter aspects are disproportionately more difficult to encompass.

The DTM (8m resolution) was again adjusted with the focal statistics tool, and afterwards, the sloping trend was estimated in degrees as a preparatory base of the accumulative surface. In order to get a raster in which the cost is determined in terms of time, Tobler's hiking function was introduced (Tobler 1993).

The result is the friction surface, which is an accumulative cost surface that constitutes an anisotropic raster that encodes the direction to the closest cells with the lowest cost. On this basis, the suitable path is generated.

In addition, first attempts were made to introduce the river network as an alternative to the pedestrian path because maybe both systems – terrestrian and aquatic – may have been used. However, this proves rather difficult since many parameters have to be taken into consideration, such as the flow direction, the speed of the water, and others to gain reliable results.

The data collected will be used as a starting point for fieldwork[2] in order to validate possible paths and to make cross-checks with Roman and transhumance routes tracing down a possible continuity in use.

2 Four sample areas have been selected in northern Apulia, each representing a different kind of landscape (i.e. lake, river, mountain slope and plain) to contrast the use of land and resources and to gain a more complete picture of Apulian prehistory.

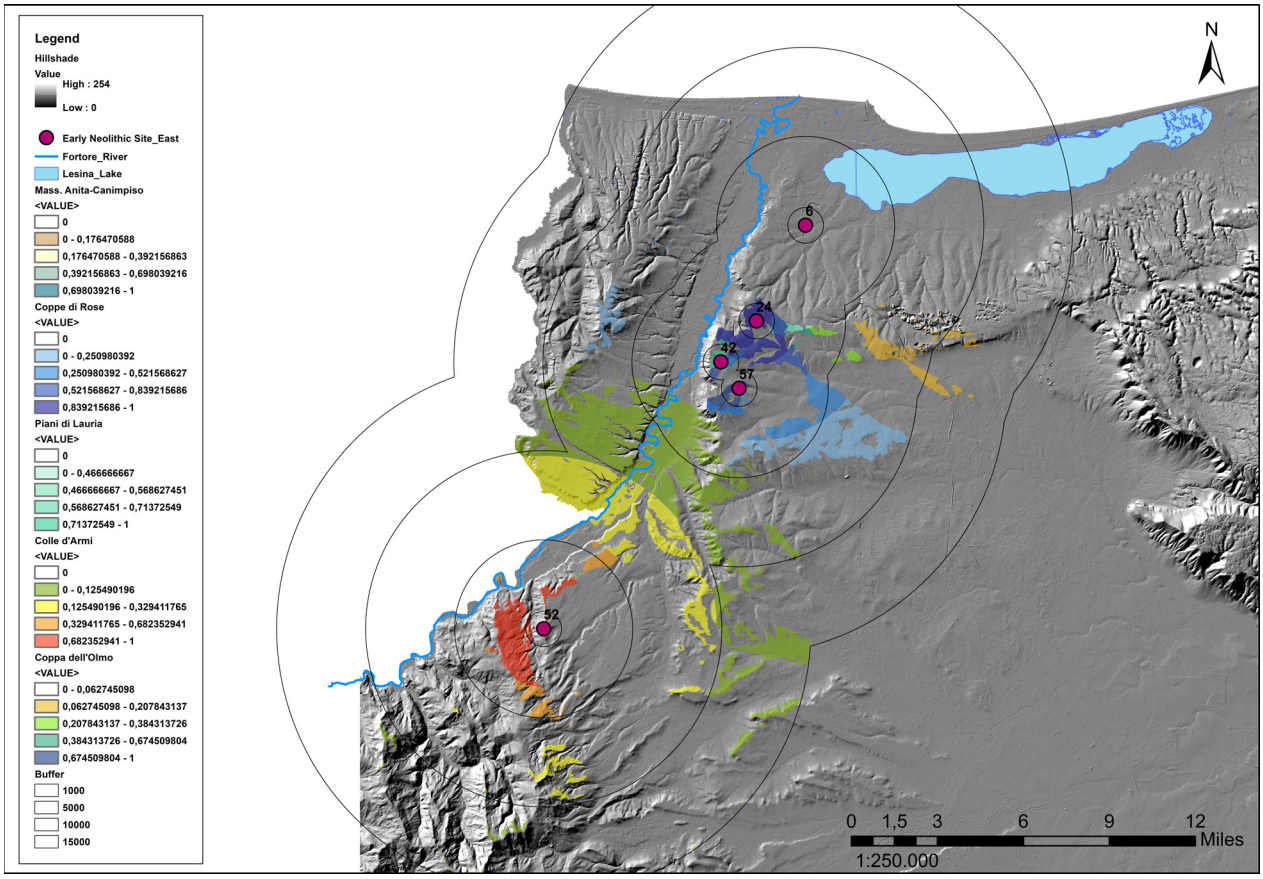

Fig. 2b. Fuzzy viewshed analysis applied on the Early Neolithic sites on the eastern shore of the Fortore river: 6) Mass. Anita-Canimpiso; 24) Coppe di Rose; 42) Piani di Lauria; 52) Colle d'Armi; 57) Coppa dell'Olmo. The colour shades indicate the grades of visibility. The buffer lines (1000, 5000, 10,000 and 15,000) determine the distance from the observer point to the maximum visible radius (image by the authors in ArcGIS).

2.2.4. Social Network Analysis

An aspect not covered in the scope of this paper will be to use the data gained from the analysis detailed above to create technical-stylistic comparisons to classify the evidence and refine the chronological designations. These results will then be subject to social network analysis (SNA) to analyse the relationships between sites and systematically carve out networks (Hanneman/Riddle 2005), thus creating different relationship structures according to the data and the scope of the research.

In particular, the aim is to establish a model for a network that will be able to put sites in relation with similar techniques and styles to generate a clear frame of the potential links between the communities. Moreover, in order to comprehend how people and ideas moved into the territory, we will establish a model for a network regarding the distance of sites to possible routes in order to analyse those places with an easy connection and hence greater possibilities of movement to reach other communities or raw materials.

To underline the circulation of elements of the material culture, it is useful to undertake chemical analyses on the finds. In this way, it can be possible to trace the provenance of raw materials and, therefore, potential points of extraction. In conclusion, it will be interesting to compare networks regarding raw materials with those connected to technical-stylistic elements to comprehend whether there is a correspondence between variations of style, technique and raw material provenance.

3. Results

The expected results concern, *in primis*, a systematic arrangement of site distribution in the territory based on GIS results and on a newly-established

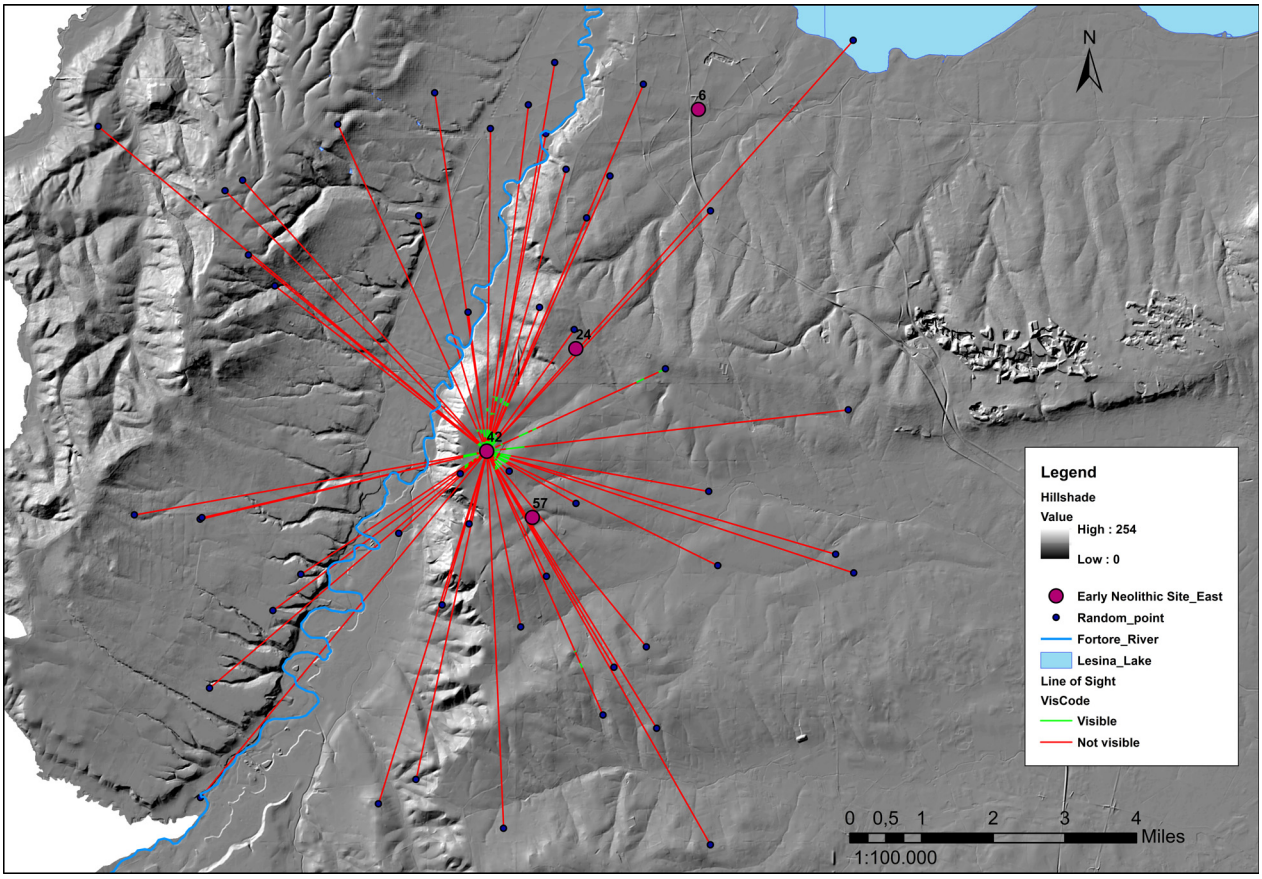

Fig. 3a. Line of sight applied to site n. 42 (Piani di Lauria). The discontinuous green line shows the presence of obstacles like the ridges of the hill (image by the authors in ArcGIS).

clear chronological framework. The data acquired allows to study in-depth the relationships between site positions and the landscape and how the latter could have influenced human activities or vice versa.

3.1. Visibility Analysis

Regarding visibility analysis, the data revealed a diverse settlement location system between the two river shores. We conducted this analysis on sites located on both Fortore river shores for all the periods considered (i.e. Neolithic, Copper and Early Bronze Ages).

3.1.1. Neolithic

Concerning the Neolithic, it becomes evident that the major number of the sites could be dated to the earliest Neolithic. From a point of view of the visibility, not much change occurred in the course of the Neolithic since most sites displayed continuity throughout the whole Neolithic. Exceptions are the sites of Chiarappa and Piani di Lauria. Chiarappa arose during the Middle Neolithic and is characterised by a good view of the northern part of the river and the surroundings on both shores. Piani di Lauria ranges from the Neolithic to the Bronze Age but is located closer to the river valley, thus displaying a different type of visibility spectrum.

3.1.1.1. Early Neolithic

Visibility analysis confirms that the sites on the western shore had a better view of the river and the opposite side than those on the eastern shore. Especially in the northern area, there was an overlay in the visibility spectrum producing

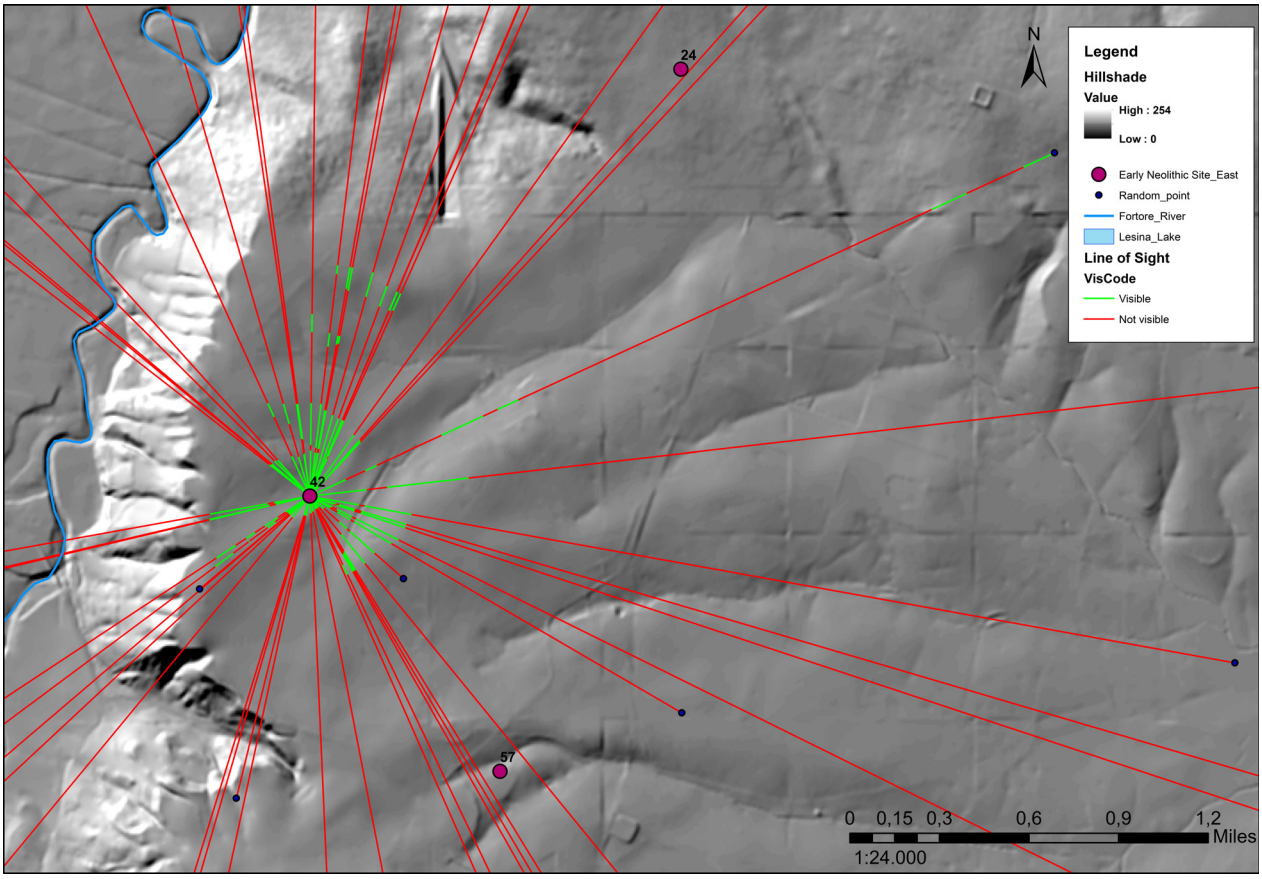

Fig. 3b Line of sight close-up (image by the authors in ArcGIS).

almost whole coverage of the area on both shores (*fig. 2a, b*). The eastern side revealed diverse results: only the site of Colle d'Armi had a direct view of the river (from 6.4km to 15km), but still, visibility was poor regarding its close surroundings. In contrast, Coppe di Rose and Masseria Anita-Canimpiso had only the possibility to look at the opposite hills at a distance of 8.6km respectively 11.6km, which meant a range in which we could consider the target between 'sometimes visible' and 'visible under favourable conditions'. In any case, the sites had good visibility regarding their surroundings, with only small areas lacking (*fig. 2b*).

Regarding visibility more generally and perhaps even control, the sites placed on both sides of the river seemed to look individually at more or less the same small percentage of territory. However, when viewshed results were joined, they display quite a good coverage of the area, with only few lacks. The surface trend (such as the ridge of the hills, as also suggested by the line of sight[3]) influenced the placement of sites on the eastern shore since it did not permit a good visibility towards the other side (*fig. 3a, b*). Although the river was easy to cross, we have to consider it as a limit or barrier.

3.1.1.2. Middle Neolithic

Three sites can be attributed to the Middle Neolithic: Chiarappa, Piani di Lauria and Masseria Settimo di Grotte. The western side of the river presents a wide lack of visibility in the central zone. It was seen only by Chiarappa (in the north), whereas Masseria Settimo di Grotte reached the boarder of the river in the medium part of the

3 In order to generate the line of sight at different distances we produced 50 random points to test the visibility.

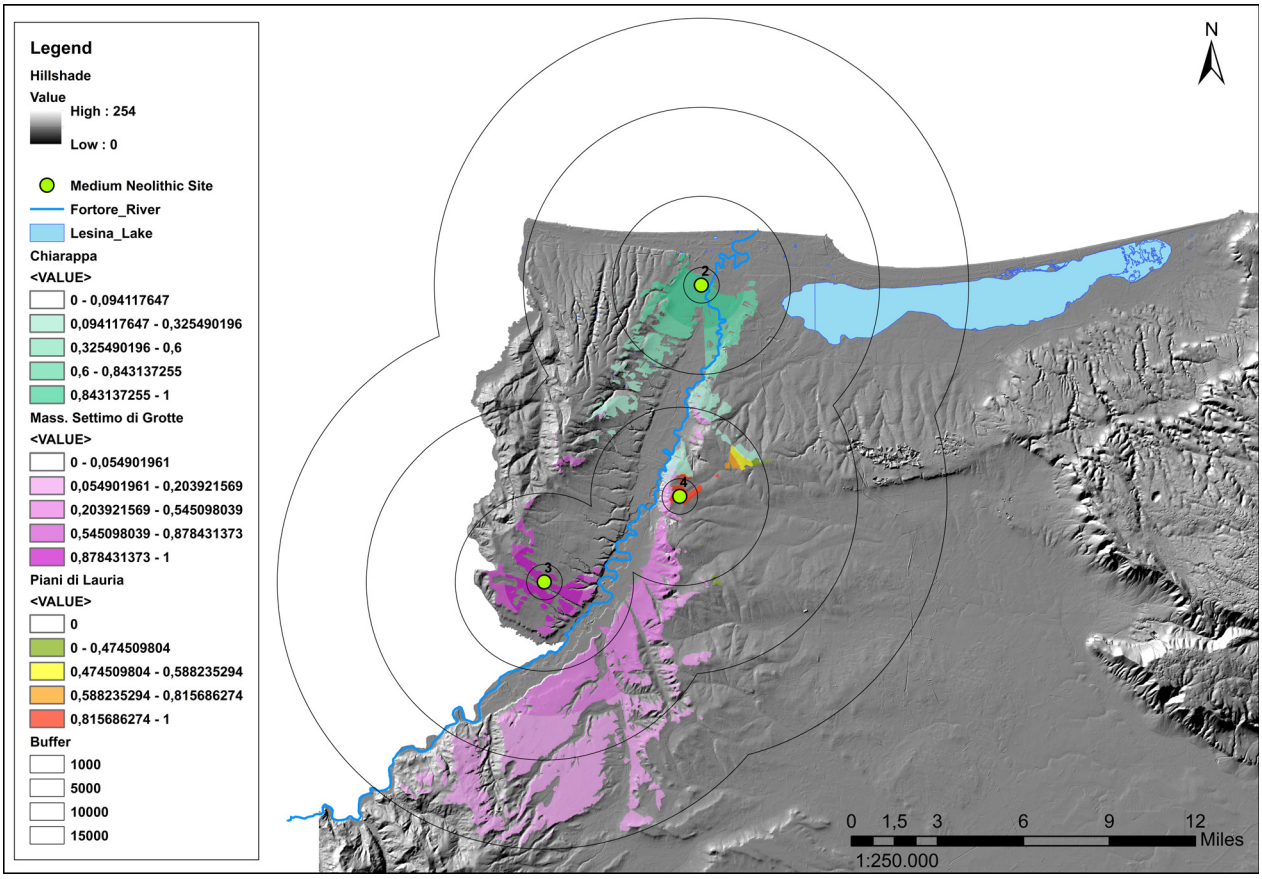

Fig. 4a. Fuzzy viewshed analysis applied on Middle Neolithic sites: 2) Chiarappa; 3) Mass. Settimo di Grotte; 4) Piani di Lauria. The colour shades indicate the grades of visibility. The buffer lines (1000, 5000, 10,000 and 15,000) determine the distance from the observer point to the maximum visible radius (image by the authors in ArcGIS).

watercourse. Both settlements had a range of visibility on the eastern shore between 'visible' and 'visible under favourable conditions', overlaying their view on the medium area (*fig. 4a*).

Remarkably, Chiarappa is one of the best-preserved sites where artefacts belonging to the *facies* Serra d'Alto[4] were found. In addition, the site could have had some links with the neighbouring site of San Marco Chiantinelle, likewise featuring Serra d'Alto artefacts. The presence of Serra d'Alto pottery allows us to speculate that these sites were connected by routes on which new cultural ideas travelled, such as pottery production or the abandonment of constructing ditches around settlements which was common during the Early Neolithic (Gravina 1985, 35).

As far as Piani di Lauria is concerned (i.e. the only site located on the eastern shore), it has a much-reduced view on its side. We have to consider that Piani di Lauria is one of the few sites displaying continuity also in other time periods. During the Middle Neolithic, the area in consideration was probably affected by a shrinkage of population due to the climate becoming drier, but Piani di Lauria continued to be populated, perhaps because of the presence of the river, reflecting also the settlement organisation of the villages located in the Tavoliere plain.

3.1.1.3. Final Neolithic

The settlements related to this period are three: Chiarappa (western side), Coppe di Rose and Piani di Lauria (eastern side). Remarkably, in this period, the largest number of finds from Chiarappa can be compared well with the material culture

4 This Middle Neolithic *facies* is rather rare in northern Apulia, in contrast to southern Apulia and other South Italian regions.

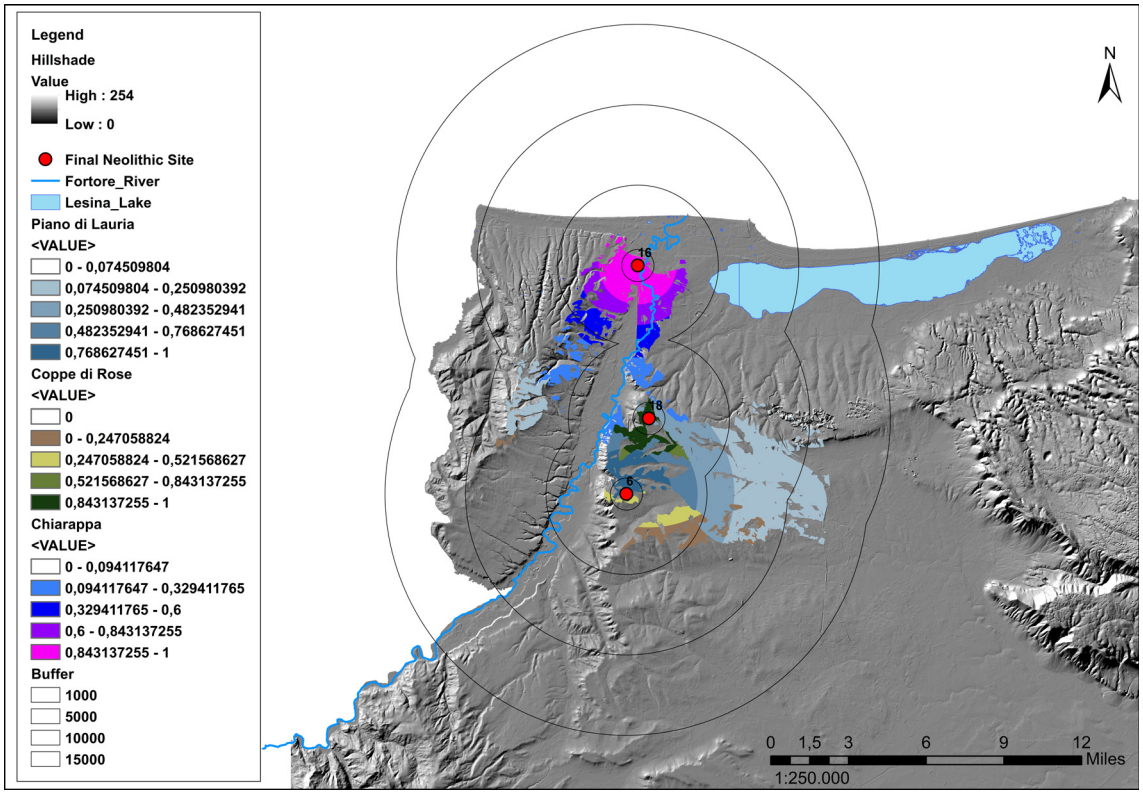

Fig. 4b. Fuzzy viewshed analysis applied on the Final Neolithic sites: 6) Piani di Lauria; 16) Chiarappa; 18) Coppe di Rose. The colour shades indicate the grades of visibility. The buffer lines (1000, 5000, 10,000 and 15,000) determine the distance from the observer point to the maximum visible radius (image by the authors in ArcGIS).

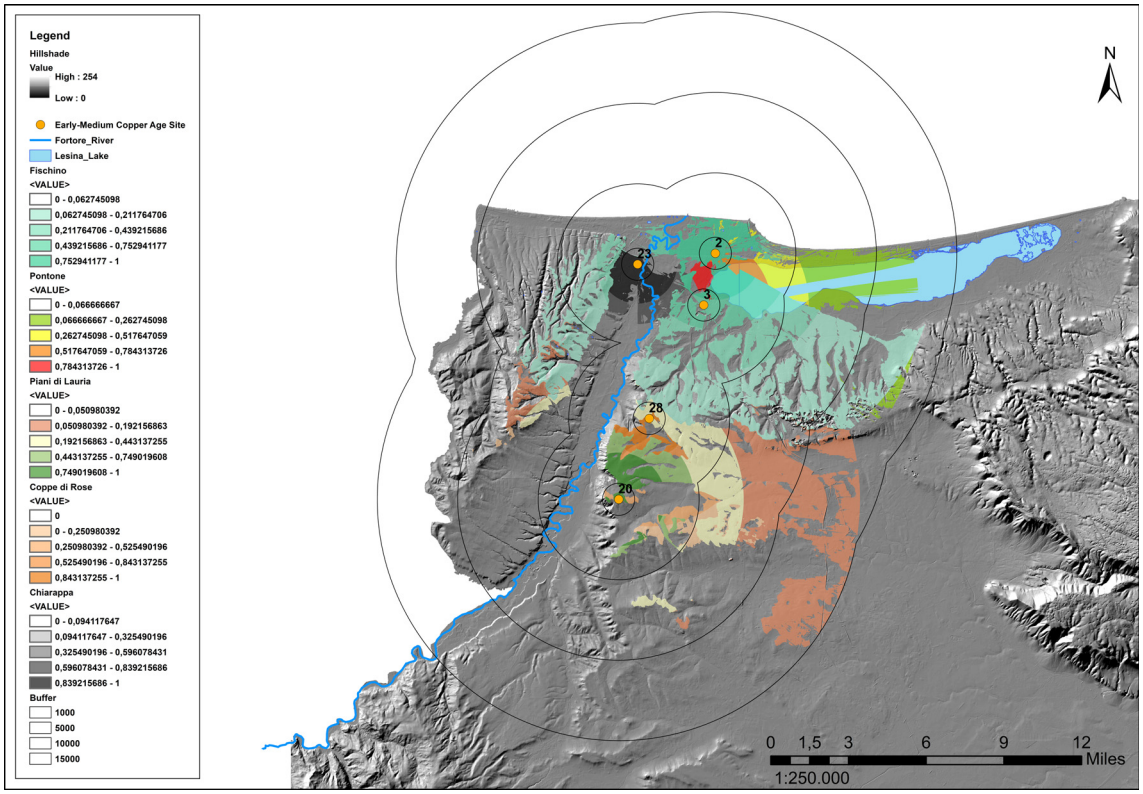

Fig. 5a. Fuzzy viewshed analysis applied on the Early-Middle Copper Age sites: 2) Fischino; 3) Pontone; 20) Piani di Lauria; 23) Chiarappa; 28) Coppe di Rose. The colour shades indicate the grades of visibility. The buffer lines (1000, 5000, 10,000 and 15,000) determine the distance from the observer point to the maximum visible radius (image by the authors in ArcGIS).

from Grotta n. 3 of Latronico (region of Basilicata) and Grotta La Punta (region of Abruzzo; Gravina 1985, 34).

Except for Coppe di Rose, the settlements present a good visibility on the river and its valley, allowing to assume the possibility of an increasing control of the river valley (*fig. 4b*). It is necessary to point out that Piani di Lauria has a visibility of the opposite hills instead of the river bed. The reduced number of settlements was likely due to a socio-economic shift in which the dynamics of resource exploitation changed. From this moment on, communities seem to have intensified trading and livestock breeding, thus choosing places from which they could easily control the surrounding landscape (i.e. valleys, watercourses and crossing points). That was the case for Chiarappa and Piani di Lauria. The connections began to be denser, as becomes obvious by evidence for the trade of 'exotic' goods such as obsidian. This new way to relate to the landscape intensified in the following periods (i.e. Copper and Bronze Age; Gravina 1999, 87 f.).

3.1.2. Copper Age

Regarding the Copper Age, most of the sites are concentrated in the middle and northern river valley, and, except for two (Pontone and Fischino), the sites display chronological continuity (Chiarappa, Coppe di Rose, Piani di Lauria and Colle d'Armi).

However, there is a discrepancy between the Early/Middle and the Final Copper Age from the visibility point of view. During the first phase, a higher number of observer points is orientated directly towards the watercourse and the hills on the other side. The choice to remain in the same area, thus continuing settlement traditions from earlier periods, can be interpreted as evidence for the relationship between the site placement and the new economic system introduced properly during the Final Neolithic/Early Copper Age. The control of valleys, passages and watercourse routes had to play an important role for the trade and transhumance networks established both in the area and between it and inner Italy, for which the Fortore and its hills and valleys had to be such a crossing point. This aspect can be traced for some sites, such as Piani di Lauria, which is located on a hilly plain above the Fortore with a view of the valleys around it (Gravina 1980, 91).

3.1.2.1. Early/Middle Copper Age

During this time, the settlements within the proximity parameter were located on the middle and northern river valley, with one site at the western and four on the eastern side. The first one, Chiarappa, continuing from Neolithic times, showed a good visibility on both sides and on the river. We suggest that this site was potentially connected to the sites placed on the hill ridges towards the south and hence also to the inner Italian regions. The same role can be ascribed to Piani di Lauria and, likely, Fischino because of their geographical position and their possibility to control the river passages and the territory on both sides of the valley. Coppe di Rose maintained visibility on the opposite hills and on the inner eastern part of the valley and may have had the role of a central point. The same may be true for Pontone, whose visibility was completely directed towards the eastern side of the landscape (especially towards Lesina Lake; *fig. 5a*).

Remarkably, the beginning of this period coincides at some sites with the presence of the *facies* Piano Conte. From this we conclude that the area under study was part of a complex trading network since that *facies* was spread along the more southern parts of Italy. Sites featuring traces of this *facies* can be found along the Fortore river valley, such as Coppe di Rose, or not far away to the watercourse (Colle Arsano or Piano Navuccio).

This new cultural phenomenon did not cause an abrupt change or hiatus; rather, assimilation processes between the Final Neolithic communities and those dating to the early Copper Age seem to have taken place since the sites display the same settlement patterns (Gravina 1999, 91).

3.1.2.2. Final Copper Age

During the Final Copper Age marked by the *facies* Laterza, three sites placed all on the eastern shore of the Fortore river had a very good grade of visibility on their side and an almost as good one on

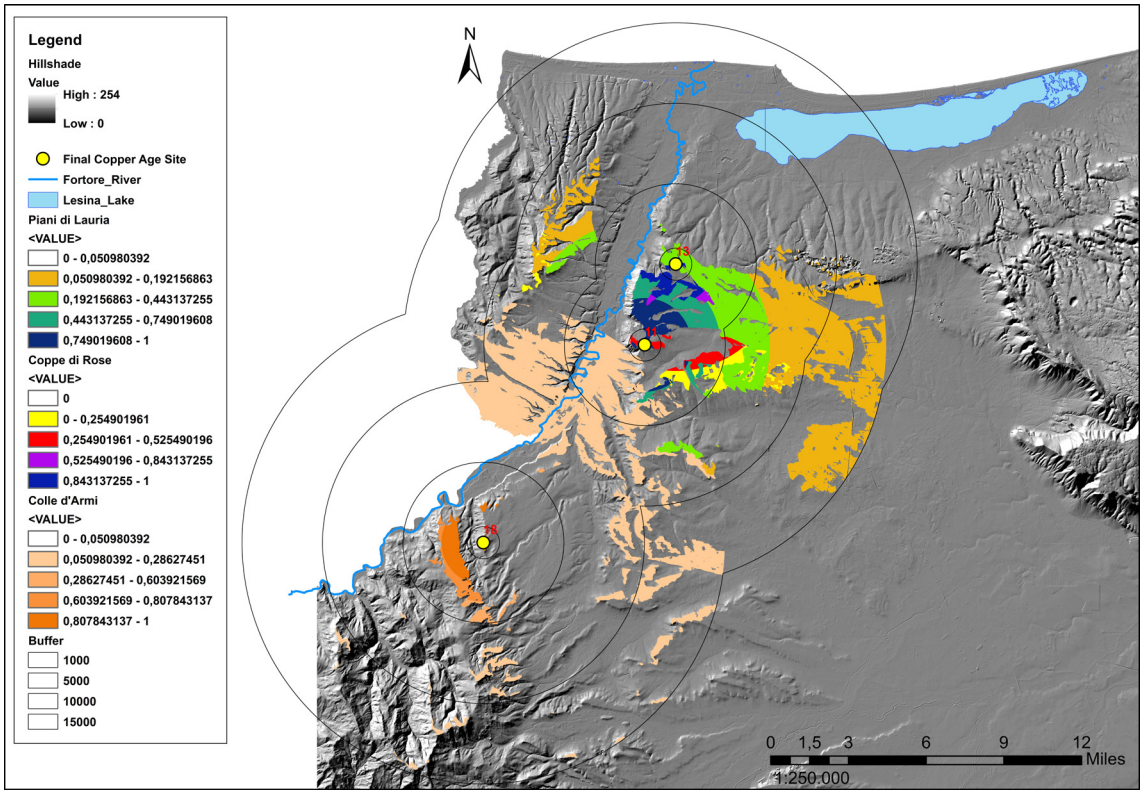

Fig. 5b. Fuzzy viewshed analysis applied on the Final Copper Age sites: 11) Piani di Lauria; 13) Coppe di Rose; 18) Colle d'Armi. The colour shades indicate the grades of visibility. The buffer lines (1000, 5000, 10,000 and 15,000) determine the distance from the observer point to the maximum visible radius (image by the authors in ArcGIS).

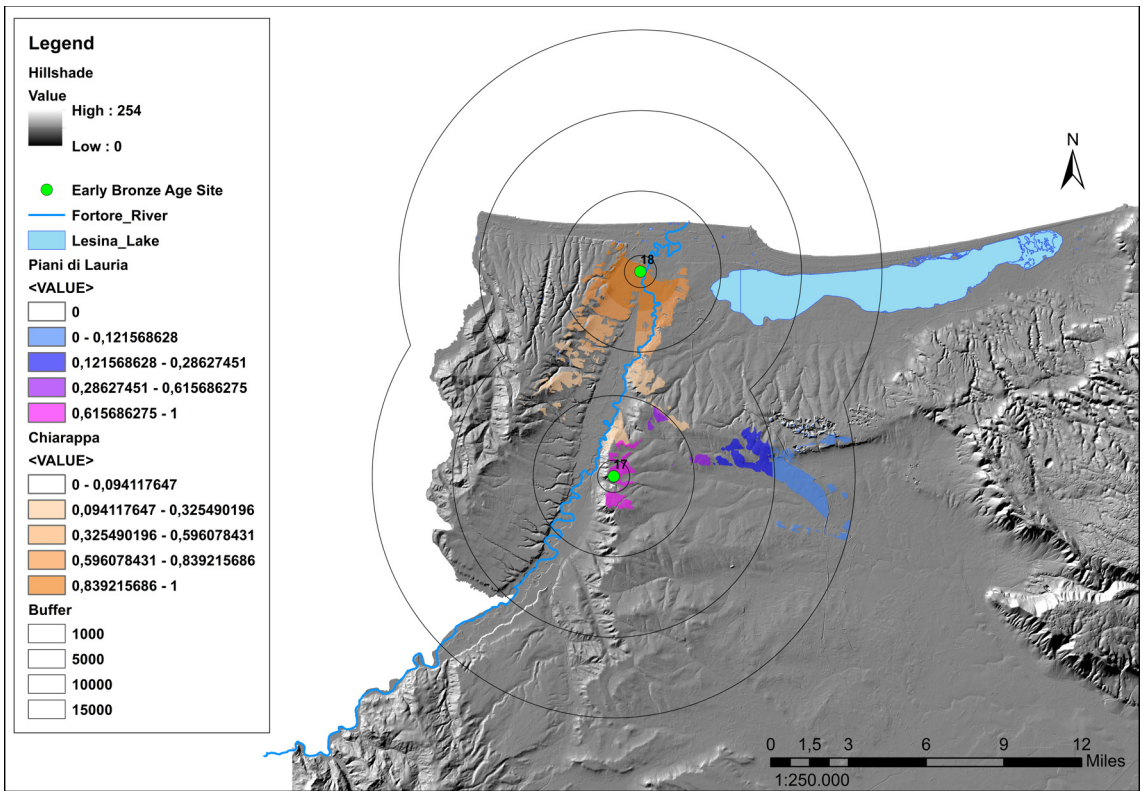

Fig. 6. Fuzzy viewshed analysis applied on the Early Bronze Age sites: 17) Piani di Lauria; 18) Chiarappa. The colour shades indicate the grades of visibility. The buffer lines (1000, 5000, 10,000 and 15,000) determine the distance from the observer point to the maximum visible radius (image by the authors in ArcGIS).

the opposite side of the valley. The only site having a direct sight on the river was Colle d'Armi, while the rest were orientated towards the opposite hills and parts of the valley, for example Piani di Lauria (*fig. 5b*).

It is necessary to notice that no significant changes occurred in settlement patterns in comparison to the Early and Middle Copper Age. The Piano Conte sites were in continuity with the *facies* Laterza, as is underlined for Coppe di Rose or Colle Arsano. The number of the villages increased a little, with many of them located close to springs, watercourses and hills. Examples can be found at Piani di Lauria or Colle Creta-San Matteo Chiantinelle.

3.1.3. Bronze Age

The settlements related to this period and to the chosen distance radius were just two, both continuing from the previous period. The first is Chiarappa, settled since the Middle Neolithic, and the second is Piani di Lauria, settled from the Early Neolithic on, though not in the exact same position but in the area. Chiarappa showed a direct view of the river, while Piani di Lauria only had a view on the eastern side (*fig. 6*).

Again, the careful selection of site placement that started during the Final Neolithic was set to gain control of crossing points in order to supervise the trading and transhumance routes. Piani di Lauria, for instance, was exploited for this purpose also during the following periods (i.e. the Recent and Final Bronze Age and historical periods). The network character of the place is also visible when regarding artefacts since they continue to show influences by cultural phenomena from other parts of Apulia or inner Italian regions (Gravina 1995, 17 f.).

In nuce, the visibility analysis demonstrated the differences between the sites placed on both river shores. The relationships between the geographical position and their role played in the course of time changes according to the arising of new economic reasons. We have to point out how those sites placed very close to the river during the Final Neolithic revealed special attention to the choice of the location, aiming to control communication ways for economic and maybe also political purposes. This speculation could also be validated by the persistence of this socio-economical scope in the following periods with the rise of the *villaggi gemini* (i.e. 'twin villages') during the Middle Bronze Age, for example, in Piani di Lauria. They consist of two symmetrical villages placed on the valley edges in order to have maximum control of the surroundings (Gravina 1999).

3.2. Buffer Analysis

The analysis demonstrates which sites could be easily reached; as a starting point a settlement close to the Fortore River was selected (i.e. the centre of the 3km radius mentioned above).

Some sites, although being located outside the 3km radius, may have been part of a relational network built up towards the hills or the inner regions of Apulia (i.e. the landscape between Lesina Lake and the village of San Severo). If traces and stray finds are added to the model as 'presence', we can interpret them as passage points from and towards the sites, but it will be necessary to conduct further investigations to clarify this aspect (*fig. 7*).

Not all periods presented a high number of settlements along the river or in its surroundings. The most populated periods were the Early Neolithic and Early/Middle Copper Age, but then again, the exact chronological setting of some sites needs to be considered as well as gradual transitions to new time periods so that brief coexistence cannot always be excluded (for example for Piani di Lauria).

3.3. Least-Cost Path Analysis

Least-cost path analysis was aimed at investigating the possibility to exploit the landscape to reach sites easily from a specific starting point. The idea was also to comprehend whether it would be more sustainable to reach a place on foot or on water, thus involving also the exploitation of watercourses as communication ways although we have to mention again that it is especially difficult

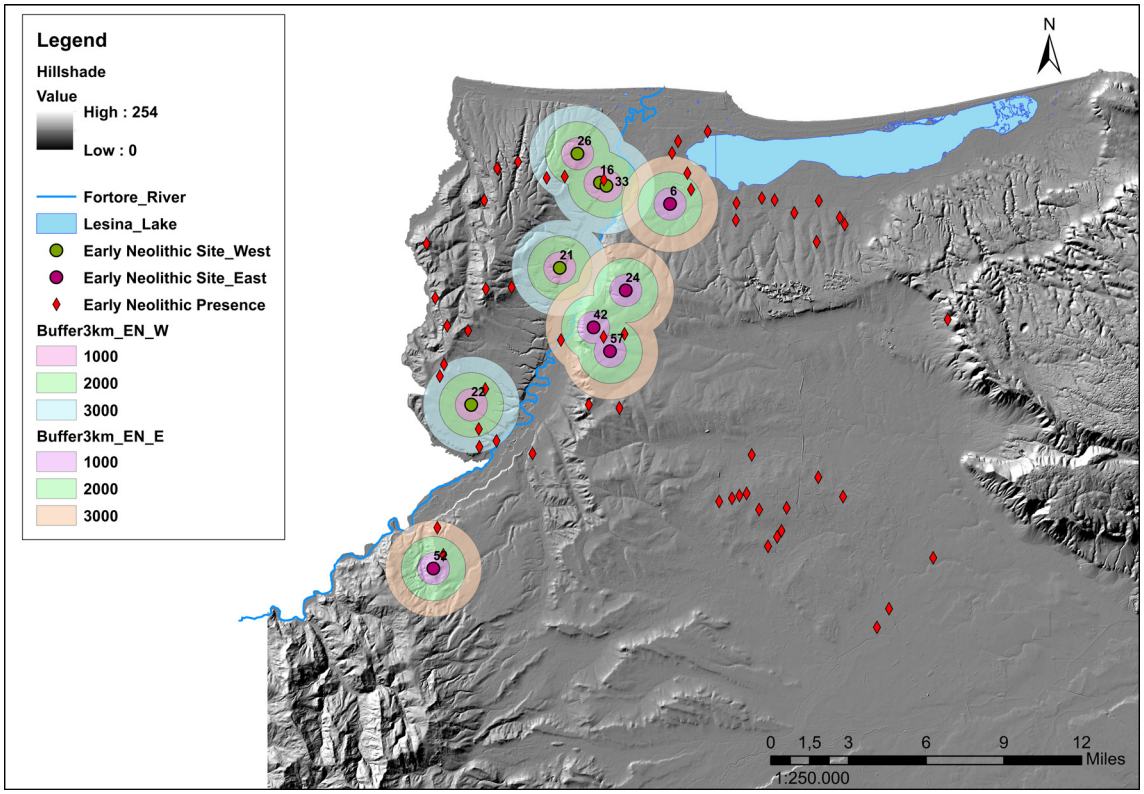

Fig. 7. Buffer zones applied to Early Neolithic sites (1000km, 2000km, 3000km). In red evidence of 'presence', that is the area where only traces of human occupation have been found, such as pottery sherds (image by the authors in ArcGIS).

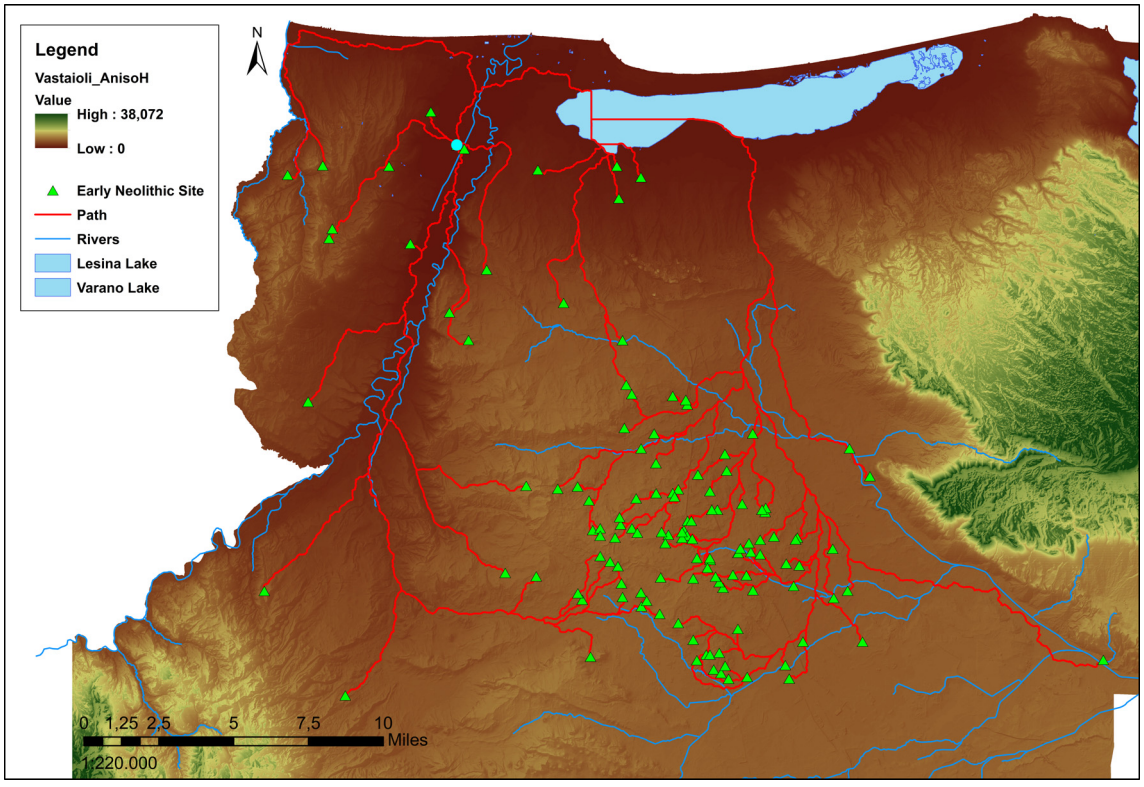

Fig. 8a. Least-cost path analysis applied to the Early Neolithic settlements. In light blue, the starting point from which the path network is generated (Vastaioli); in green, all the other sites. The surface ('Vastaioli_AnisoH') presents the accumulative value in time (hours) (image by the authors in ArcGIS).

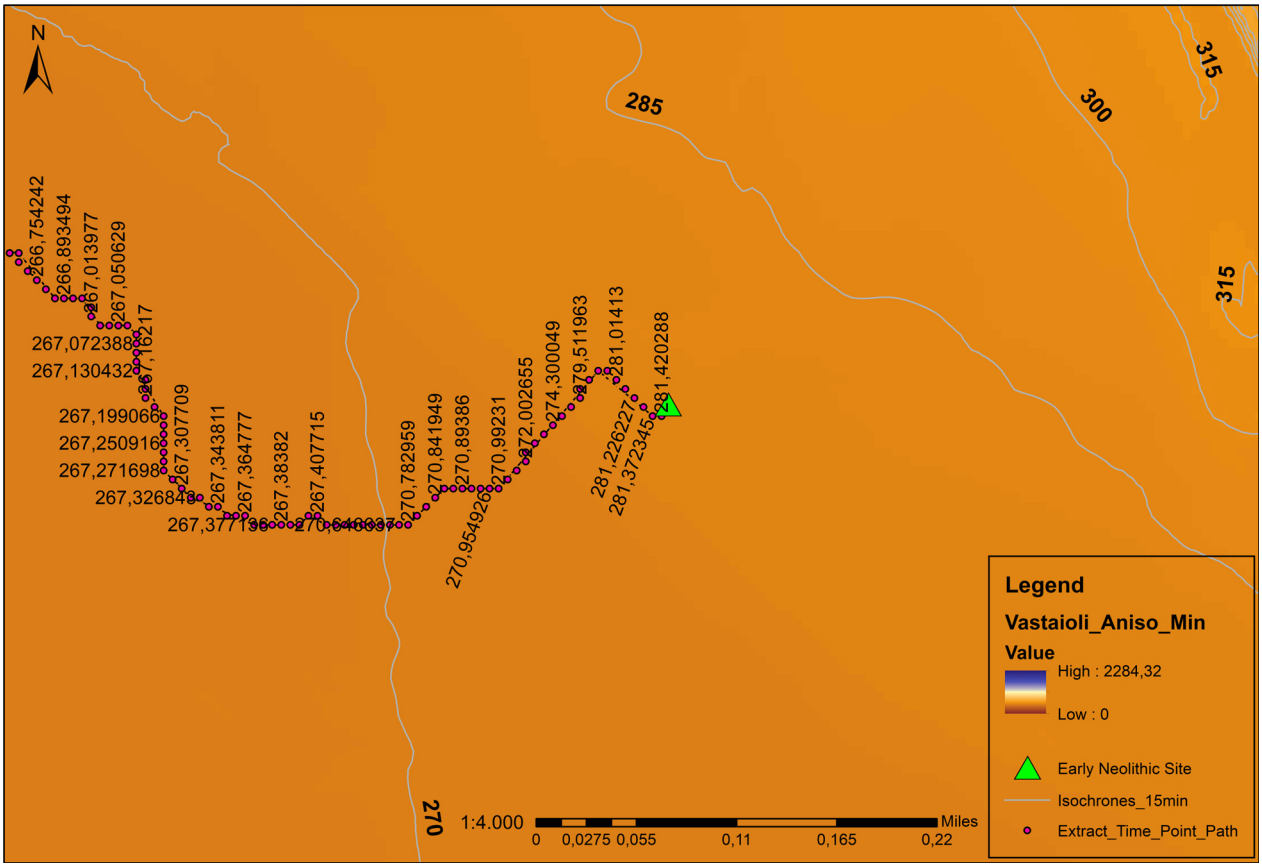

Fig. 8b. Detail of accumulative surface (Vastaioli_AnisoMin): in light grey, the isochrones at a distance of 15min each, from the source up to cover the whole surface; in violet, the extracted value from the path network expressing the time needed from the source to the specific arrival point (in this case the green triangle). All values are in minutes (image by the authors in ArcGIS).

to conduct such analyses for travel on water, for parameters such as the speed of the current, the shape of the riverbed and others have to be taken into account. The following may therefore be seen as a preliminary suggestion.

Our sample site is the Early Neolithic settlement of Vastaioli because it is placed near the mouth of the Fortore river in the north of the study area. The generated predictive model (without use of the river) shows the most suitable network path in terms of time to create a connection between all other Early Neolithic sites. While the rivers were not used as ways of traveling, they were crossed at specific points (*fig. 8a*).

Converting the accumulative surface from hours to minutes, instead, makes it possible to increase the model with isochrones at a distance of 15 minutes each in order to get a visual idea about the path network and the time estimated to reach different areas. The result displays the maximum distance reachable in more or less five hours, determining thus a fast connection. The same result can be achieved by the extraction of the time value from the points creating the cost path after its conversion from raster to point (*fig. 8b*).

If, however, we consider the use of the river as a network, the communication between the settlements appears to be more direct since the majority of the villages were located near a watercourse. A caveat here is that this evaluation uses the current hydrological surface data. However, it is important to remember that it is just a first attempt, and the outcome may be different if more parameters and information about the prehistoric watercourses are included.

In the model, the main watercourses (i.e. rivers and streams) were considered since they were formed during the Quaternary period (*fig. 8c*). Further pedological analysis is, however, needed to verify the ancient courses of the riverbeds.

Still, the use of rivers as a means of communication must be considered and could open new

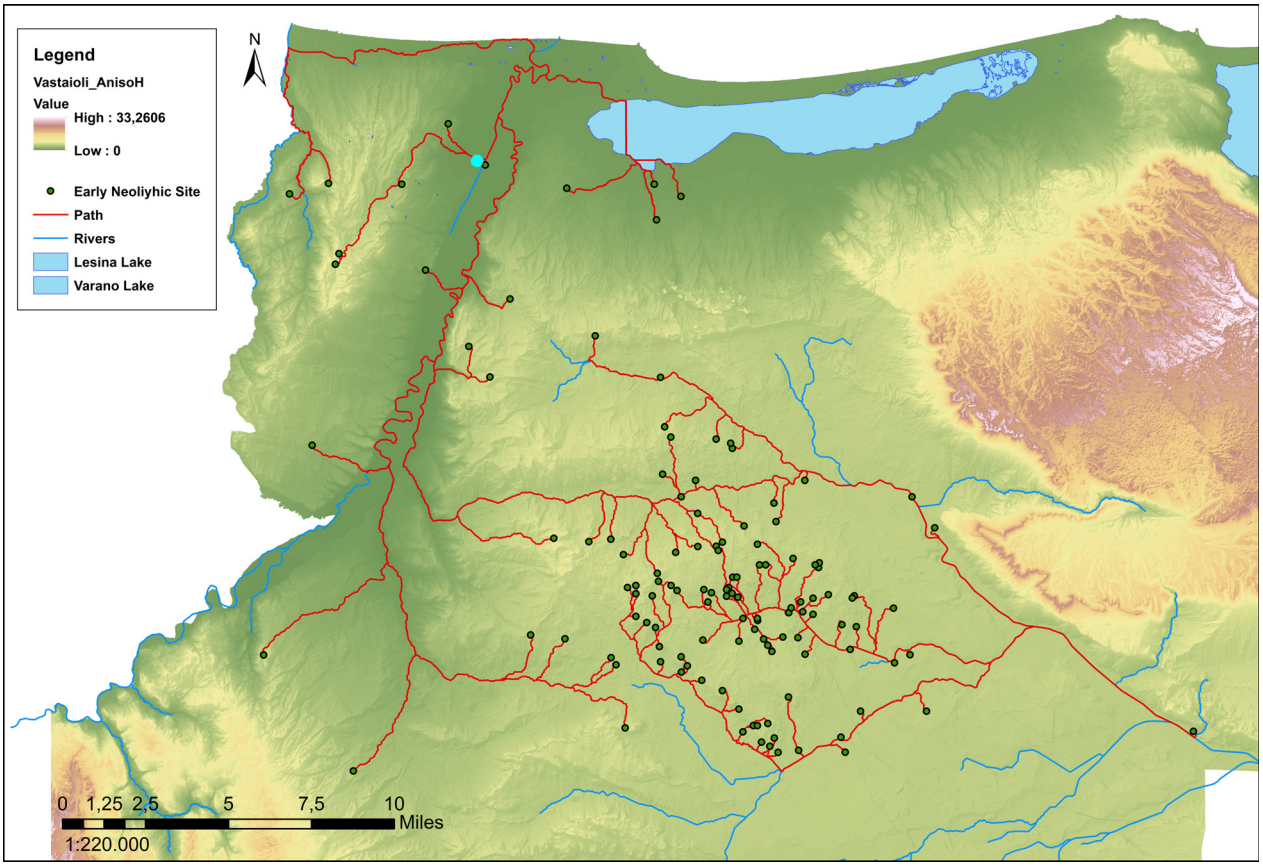

Fig. 8c. Least-cost path analysis applied to the Early Neolithic settlements with the introduction of the river network. In light blue, the starting point, in green all the other sites. The paths overlap the rivers exploiting them as communication ways (image by the authors in ArcGIS).

perspectives regarding mobility patterns of prehistoric communities. This adds to our ideas of what the landscape offered for people besides being a source for food and raw materials. The mere evaluation of the exploitation of raw materials and resources is an oversimplification; rather, we need to trace down the reasons that permitted the inhabitants to live and flourish in the landscape.

Further analysis will involve all sites synchronously and diachronically, in order to achieve more detailed results about the mobility of human beings and artefacts. Finally, when the data is complete, it will serve as a basis for SNA. In generating networks of relations between the sites according to criteria such as the proximity to a communication route, it will be possible to understand what and how many sites played a distinct role (having direct contacts with main routes or sites) or had a marginal position (not being involved into the network), or worked as *traits d'union* (acting as hubs between sites). The results could yield suggestions about the life of sites, their growth, the exploitation of the territory by a community and the influence they could have had on other sites or that they were subject to.

Thus, such investigations – in addition to technical-stylistic and chemical analysis of artefacts like pottery, copper, flint and stone – could reveal the dialogues existing between the northern Apulian communities and those from the eastern Mediterranean Sea or from the neighbouring regions of the Italian peninsula.

4. Conclusion

The connection between an analysis of finds and features with an analysis of the landscape – places of good visibility, possibilities of connection and communication such as valleys, ridges and rivers – offers new insights into the relations between natural and cultural resources and allows us to draw a clearer picture of the

life of prehistoric communities. Although only preliminary, the results of the project already outline different strategies of communities concerning settling in the course of time: a growing wish to gain control over a territory and its routes and watercourses, going along with the placement of settlements in spots of ever-increasing visibility, close to paths connecting them to other regions of Apulia and the rest of the Italian peninsula. First results of pottery analysis, with the emergence of evidence for Piano Conte pottery, highlight links to the southernmost parts of Italy. Northern Apulia thus functions as a bridge between the inner regions of the Italian peninsula and the eastern Mediterranean.

Further analysis will incorporate other sample areas such as the lakeside settlements of Lake Lesina, the farmsteads located on the fertile soils of the northern Tavoliere south of the city of San Severo, and the smaller, less densely spaced places of occupation along the outskirts of the Gargano which may be connected to pastoralism and thus display short-term use only. To define their role and placement in an ever-changing network of key players and less significant sites, of places of control versus settlements excluded from exchange and access to resources, will be the scope of work in the near future.

Roberto Fillloramo
Westfälische Wilhelms-Universität Münster
Abteilung Ur- und Frühgeschichtliche Archäologie
Università di Bologna
Dipartimento di Storia Culture Civiltà
Dammeweg 16
48145 Münster, Germany
roberto.filloramo@uni-muenster.de

Valeska Becker
Westfälische Wilhelms-Universität Münster
Abteilung Ur- und Frühgeschichtliche Archäologie
Domplatz 20-22
48143 Münster, Germany
valeska.becker@uni-muenster.de

Antonio Curci
Università di Bologna
Dipartimento di Storia Culture Civiltà
Piazza S. Giovanni in Monte 2
40126 Bologna, Italy
antonio.curci@unibo.it

Bibliography

Boenzi et al. 2001: F. Boenzi/M. Caldara/L. Pennetta, L'influenza delle variazioni climatiche e dei processi storico-sociali sull'evoluzione delle forme del rilievo del Mezzogiorno. Atti del Conveno "Territorio e Società nelle Aree Meridionali", Bari–Matera, 24–27 Ottobre 1996 (Bari 2001) 7–34.

Cazzella 2010: A. Cazzella, Introduzione. In: F. Radina/G. Recchia (eds.), Ambra di Agamennone. Indigeni e Micenei tra Adriatico, Ionio ed Egeo (Bari 2010) 31.

Coppola et al. 2017: D. Coppola/I. M. Muntoni/A. Manfredini/F. Radina, Il Neolitico della Puglia. In: Preistoria e Protostoria della Puglia. Atti della XLVII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria, Ostuni, 9–13 ottobre 2012 (Firenze 2017) 193–212.

Del Fattore et al. 2017: F. R. Del Fattore/R. Filloramo/F. Genchi/A. Curci, Elementi in comune ed aspetti locali. Ceramiche a solcature nel quadro delle evidenze dell'Italia centro-meridionale. In: Preistoria e Protostoria della Puglia. Atti della XLVII Riunione Scientifica dell'Istituto Italiano di Preistoria e Protostoria, Ostuni, 9–13 ottobre 2012 (Firenze 2017) 409–416.

Doneus 2013: M. Doneus, Die hinterlassene Landschaft – Prospektion und Interpretation in der Landschaftsarchäologie. Mitteilungen der Prähistorischen Kommission Wien 78 (Wien 2013).

Elster et al. 2016: E. S. Elster/E. Isetti/J. Robb/A. Traverso (eds.), The Archaeology of Grotta Scaloria. Ritual in Neolithic Southeast Italy. Monumenta Archaeologica 38 (Los Angeles 2016).

Fisher 1992: P. F. Fisher, First Experiments in Viewshed Uncertainty. Simulating the Fuzzy Viewshed. Photogrammetric Engineering and Remote Sensing 58, 1992, 345–352.

Fisher 1994: P. F. Fisher, Probable and Fuzzy Models of the Viewshed Operation. In: M. F. Warboys (ed.), Innovations in GIS 1. Selected Papers from the First National Conference on GIS Research UK (London 1994) 161–175.

Fischer-Kowalski et al. 2013: M. Fischer-Kowalski/F. Krausmann/B. Smetschka, Modelling Transport as a Key Constraint to Urbanisation in Pre-industrial Societies. In: S. Jit Singh/H. Haberl/M. Chertow/M. Mirtl/M. Schmid (eds.), Long Term Socio-Ecological Research. Studies in Society-Nature Interactions Across Spatial and Temporal Scales (New York 2013) 77–102.

Galiberti 2005: A. Galiberti (ed.), Defensola. Una miniera di selce di 7000 anni fa (Siena 2005).

Gravina 1980: A. Gravina, Preistoria e Protostoria sulle rive del basso Fortore. In: Atti del Convegno sulla Preistoria – Protostoria – Storia della Daunia, San Severo 23–24–25 novembre 1979 (San Severo 1980) 73–102.

Gravina 1985: A. Gravina, Considerazioni su C. Chiarappa, un insediamento Neolitico sul basso Fortore (riva sinistra). Attualità Archeologiche 2, 1985, 29–35.

Gravina 1995: A. Gravina, Il territorio di Tiati sul Fortore fra Preistoria e Protostoria. In: G. Piccaluga (ed.), Atti del 15° Convegno nazionale sulla Preistoria – Protostoria – Storia della Daunia, 27–28 novembre 1993. Tavola rotonda: "Titati-Teanum Apulum Civitate ed il suo territorio" (San Severo 1995) 11–34.

Gravina 1999: A. Gravina, La Daunia centro-occidentale. Frequentazione, ambiente e territorio fra neolitico finale, eneolitico ed età del Bronzo. In: A. Gravina (ed.), Atti 19° Convegno sulla Preistoria, Protostoria e Storia della Daunia, San Severo, 27–29 novembre 1998 (San Severo 1999) 83–144.

Gravina 2009: A. Gravina, La frequentazione eneolitica in un comprensorio alle pendici del Gargano meridionale. In: A. Manfredini (ed.), Origini. Preistoria e Protostoria delle civiltà antiche 31 (Roma 2009) 103–128.

Hanneman/Riddle 2005: R. A. Hanneman/M. Riddle, Introduction to Social Network Methods. University of California (Riverside 2005).

Ingravallo 1998: E. Ingravallo, *Facies* de Macchia a Mare – Zinzulusa. In: J. Guilaine (ed.), Atlas du Néolithique europeen. Volume 2A (Liège 1998) 53–54.

Lambeck et al. 2004: K. Lambeck/F. Antonioli/A. Purcell/S. Silenzi, Sea-Level Change along the Italian Coast for the Past 10,000 yr. Quaternary Science Reviews 23, 2004, 1567–1598.

Muhs et al. 2010: D. R. Muhs/J. Budahn/A. Avila/G. Skipp/J. Freeman/D. Patterson, The Role of African Dust in the Formation of Quaternary Soils on Mallorca, Spain and Implications for the Genesis of Red Mediterranean Soils. Quaternary Science Reviews 29, 2010, 2518–2543.

Ogburn 2006: E. D. Ogburn, Assessing the Level of Visibility of Cultural Objects in Past Landscapes. Journal of Archaeological Science 33, 2006, 405–416.

Palma di Cesnola 2005: A. Palma di Cesnola (ed.), Paglicci. L'Aurignaziano e il Gravettiano antico (Foggia 2005).

Palma di Cesnola 1981: A. Palma di Cesnola, Nuovi contributi del Neolitico-eneolitico del Gargano. A: Ricerche e studi effettuati durante il 1981. In: A. Gravina (ed.), Atti del 3° Convegno sulla Preistoria, Protostoria e Storia della Daunia, San Severo, 27–29 november 1981 (San Severo 1981) 21–40.

Skeates 2000: R. Skeates, The Social Dynamics of Enclosure in the Neolithic of the Tavoliere, South-East Italy. Journal of Mediterranean Archaeology 13.2, 2000, 155–188.

Tinè 1983: S. Tinè, Passo di Corvo e la civiltà neolitica del Tavoliere (Genova 1983).

Tinè/Isetti 1981: S. Tinè/E. Isetti, Culto neolitico delle acque e recenti scavi nella Grotta Scaloria. Bullettino di paletnologia italiana N. S. 24.82, 1975–1980 (1981), 31–70.

Tiné 2002: V. Tiné, Le *facies* a ceramica impressa dell'Italia meridionale e della Sicilia. In: M. A. Fugazzola Delpino/A. Pessina/V. Tiné (eds.), Le ceramiche impresse nel Neolitico antico. Italia e Mediterraneo. Studi di Paletnologia I (Roma 2002) 131–165.

Tobler 1993: W. Tobler, Three Presentations on Geographical Analysis and Modeling. Non-Isotropic Geographic Modeling; Speculations on the Geometry of Geography; and Global Spatial Analysis (93-1). UC Santa Barbara: National Center for Geographic Information and Analysis, <https://escholarship.org/uc/item/05r820mz> (last access 28.05.2021).

Tunzi Sisto/Monaco 2010: A. M. Tunzi Sisto/A. Monaco, Vaccarella – Masseria Fragella (Lucera – FG). Sepolture eneolitiche di *facies* Laterza. In: A. Gravina (ed.), Atti del 30° Convegno sulla Preistoria, Protostoria e Storia della Daunia, San Severo, 21–22 november 2009 (San Severo 2010) 128–136.

Wheatley/Gillings 2002: D. Wheatley/M. Gillings, Spatial Technology and Archaeology. The Archaeological Applications of GIS (London 2002).

Martin Bartelheim, Döbereiner Chala-Aldana, and Marta Díaz-Zorita Bonilla

The Known Unknowns

Full Bronze Age Settlement and Landscape Use in the Lower and Middle Guadalquivir Valley

Keywords: landscape, Copper Age, Bronze Age, Guadalquivir valley, resources

Abstract

The Guadalquivir valley in southern Spain with its perennial water supply belongs to one of the most fertile regions on the Iberian Peninsula, well connected above all via the river estuary. Consequently, it has been settled and cultivated intensively from the Neolithic until today. However, in the lower course of the river, the Bronze Age occupation is poorly understood, although several finds indicate the existence of a rich material culture similar to that of the neighbouring El Argar culture in the upper Guadalquivir valley, which has been intensively studied for almost 150 years. In this paper, we analyse the present state of knowledge about the settlement structure and the use of resources in the lower and middle Guadalquivir valley and the adjacent mountain regions. We discuss patterns of specific landscape use and formation as well as their connection with social dynamics, and compare them with those of the Argaric region and the preceding Chalcolithic period. The debate will examine tangible elements like remains of subsistence strategies as well as the exploitation of mineral or aquatic resources and also cover further questions like that of the recognition of itineraries or places with transcendental meanings. The objective is an approximation to how prehistoric landscapes were shaped to meet the needs of the societies living in them.

1. Resource Use

The Guadalquivir valley in southern Spain, and especially its lower part, is one of the most fertile regions of the Iberian Peninsula. The Guadalquivir belongs to the water-rich rivers of the peninsula and irrigates for the most part of its course a landscape characterised by alluvial tertiary and quaternary soils, which allow for several harvests per year due to their climatically favourable conditions. The river itself offered a rich supply of fluvial fauna and flora, which could act as a source of food (Granado Lorenzo/Sánchez Royo 1985; Martínez Sánchez 2013, 40 f.) in times when it was not yet strongly regulated and contaminated by sewage. It also played an important role as a transport route and in energy production (Peral López 2018; Féaux de la Croix/Bartelheim 2020). Via its mouth into the Gulf of Cádiz, the Guadalquivir offers the fertile settlement regions in its lower course direct access to the Atlantic and the Mediterranean with its transport links and maritime assets. For prehistoric times, the existence of a coastal lagoon is also postulated (Arteaga Matute/Roos 1995; Borja Barrera 2013; Arteaga Matute et al. 2016), which has been successively sedimented, but as a brackish water zone over long periods allowed the existence of a specific flora and fauna and the extraction of salt (Escacena

Carrasco et al. 1996; Escacena Carrasco 2010). To the north and northwest, the Guadalquivir valley is flanked over long stretches by the Sierra Morena, one of the richest ore mining regions in the Old World (Domergue 1987; Gómez Ramos 1999; Contreras Cortés 2000; Hunt Ortíz 2003; Arboledas Martínez 2010; 2014; Bartelheim 2007, 32–37). Transport routes open up the mountain region and enable the transport of goods as well as communication with neighbouring landscapes for humans and animals (Gómez Pantoja 2001; Berrocal Rangel 2004; Murrieta Flores 2012).

All these features of the landscape of the Guadalquivir valley were available to the Bronze Age population. The use of many of them has already been documented for earlier periods in the context of the formation of a rich settlement landscape, the character of which has become increasingly visible in recent decades (Escudero Carrillo et al. 2017; García Sanjuán 2017; Garcia Sanjuán et al. 2017). Some of these landscape features were resources (Escudero Carrillo et al. 2017) that formed part of the basis of the development and existence of society. Resources are defined here as elements with material, spiritual, or intellectual value for the functioning of societies (Scholz et al. 2017). Therefore, they are primarily culturally connoted and to be regarded as social constructs, as the analysis of the use of resources in historical periods and modernity shows (Hardenberg et al. 2017).

The definition, use and social valorisation of resources do not happen in isolation, but occur within the framework of ResourceComplexes. These can be understood within concrete spaces and at concrete times as networks of things, persons, knowledge and practices in the form of an interplay of various material and immaterial components (Teuber/Schweizer 2020). However, these complexes and the socio-cultural dynamics that are associated with them, are constantly subject to changes that are the product of contingent historical developments and their relationships to one another. In order to comprehend this from a diachronic perspective, the relationships between resources, their ways of treatment, social units or identities, as well as changes these phenomena may have undergone, are regarded here as ResourceAssemblages. Landscapes form such a structure of animate and inanimate elements with which the agents interact and – in this process – change both the environment and their own perceptions and practices. In landscapes, various resources are available whose cultural value is reflected in human actions (e.g. domestication, agriculture, construction of sanctuaries, creation of protected areas).

The question of a resource-oriented design, organisation and control of landscapes as resource assemblages during the Full Bronze Age (ca. 2200–1550 calBC) in the southern Iberian Peninsula is accompanied in the following by an analysis of the associated processes of territorialisation and hierarchisation of landscapes and the inherent potential conflicts. This allows a deeper understanding of the interaction of the use of landscapes, their cultural perception and social dynamics.

2. Archaeological Base of the Bronze Age in the Guadalquivir Valley

The lower and middle Guadalquivir valley (located in the current Andalusian provinces of Sevilla and Córdoba), which is the focus of this paper, was a good place to inhabit during the Chalcolithic, which, in southern Iberia, is dated to the end of the 4th and most part of the 3th mill. BC (Chapman 2008; Bartelheim et al. 2017; García Sanjuán et al. 2018). The region was densely populated, and many sites flourished during the 3rd mill. BC, owing to the abundance of highly valued raw materials and good agricultural conditions (Escudero Carrillo et al. 2017; Díaz-Zorita Bonilla 2017). Among them were some of the largest southern Iberian mega-sites (Márquez Romero/Jiménez Jáimez 2010) such as Valencina-Castilleja, near present-day Seville (García Sanjuán et al. 2018), or further east, Marroquíes Bajos near present-day Jaén (Zafra de la Torre et al. 1999; 2003; Sánchez Vizcaíno et al. 2005).

Our knowledge about the Bronze Age, however, is fragmentary. In contrast to the well-studied eastern Andalusian El Argar culture (roughly covering the provinces of Murcia, Almería, Granada and partly Jaén) (Aranda Jiménez et al. 2015), the Bronze Age in the lower and middle Guadalquivir valley is scarcely known because of deficient

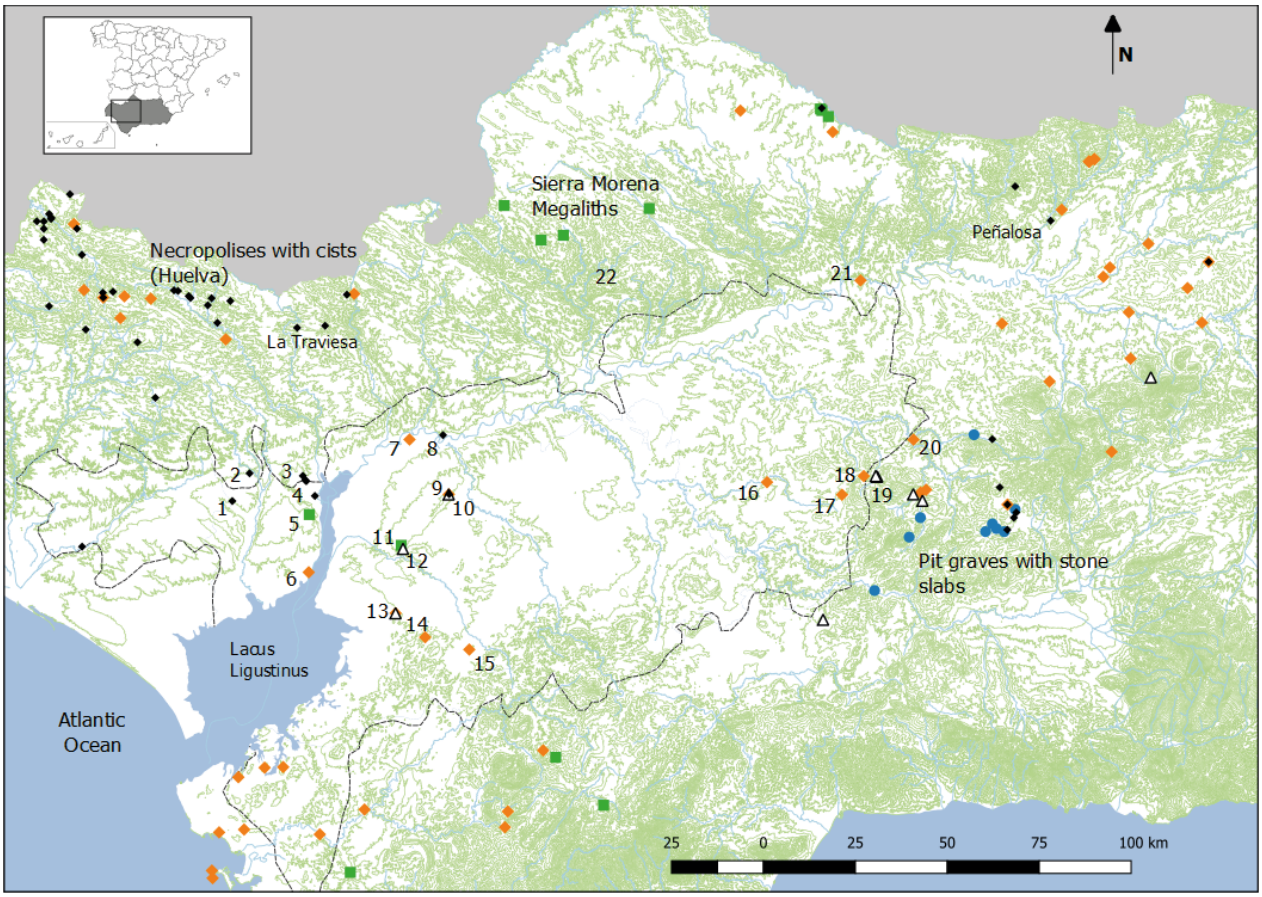

Fig. 1. Bronze Age burial finds in the lower and middle Guadalquivir valley. The dotted line delimits the middle and lower Guadalquivir valley according to REDIAM (Red de Información Ambiental de Andalucía) geographic database (for references and location of the sites see table 1).
♦ Cists: 1. Chichina; 2. Aznalcollar; 3. Salteras, SE-B and SE-K; 4. Jardín de Alá; 8. Canama; 9. Carmona.
◊ Pit burials: 6. Puebla del Río; 7. Cortijo María Luisa; 10. Carmona; 13. El Olivar Alto; 14. Salpensa; 15. La Nava Grande; 16. Castillo de Poley; 17. La Beleña; 18. El Laderón; 20. Cerro Cambrón; 21. Llanete de los Moros.
□ Reutilised dolmens: 5. La Pastora; 11. Tholos de las Canteras (Dolmens with Bronze Age materials, but no evidence of burials of that period).
Δ Artificial caves: 12. Cueva del Vaquero; 19. Cuevas de Las Laderas, Bermeja, La Detrita y Huerta Anguita.

evidence and insufficient research. Until recently, little had changed in the treatment of artefactual finds since the late eighties when the last comprehensive reviews were published by A. Caro Bellido and J. C. Martín de la Cruz (Caro Bellido 1989; Martín de la Cruz 1989). Most of the Bronze Age finds have been identified as such mainly based on typological comparisons with collections from eastern Andalusia or southern Portugal due to the lack of stratigraphic contexts that separate Bronze Age find material from the preceding Chalcolithic and from the posterior Late/Final Bronze Age (ca. 1500–800 BC) and Early Iron Age (ca. 800–600 BC) materials. Similarly, it is still not possible to identify an Early and Middle Bronze Age as two separate chronological units (Serna et al. 1984; García Rivero/Escacena Carrasco 2015, 32), as is the case in the El Argar culture (Arteaga Matute/Schubart 1980; Schubart et al. 2000) or in southern Portugal (Schubart 1975; Mataloto et al. 2013; Soares/Tavares da Silva 2016). Therefore, the term 'Bronce Pleno' (Full Bronze Age) instead of 'Bronce Antiguo' (Early Bronze Age) and/or 'Bronce Medio' (Middle Bronze Age) is commonly used, with which one avoids the difficulties of differentiation due to the generally low find stock.

2.1. Funerary Remains

As described above, the transition from the Chalcolithic to the Bronze Age in the Guadalquivir valley is still difficult to understand. It can be best grasped by changes in the burial system. In

southwestern Spain, graves identified as Chalcolithic are quite variable but mainly consist of three types such as megaliths or non-megalithic structures (amongst others pits, artificial caves or hypogea and natural caves). They usually contain collective burials and often have elaborate constructions as for example megaliths (Leisner/Leisner 1943; Bubner 1981; Cámara Serrano/Molina González 2004; Aguayo de Hoyos/García Sanjuán 2006; Fernández Flores et al. 2016). Furthermore, at Chalcolithic settlement contexts, as in Valencina (García Sanjuán et al. 2013), numerous depositions of human bodies in pits are known without identifiable grave goods (García Sanjuán/Díaz-Zorita Bonilla 2013).

In contrast to that, Bronze Age graves in the lower and middle Guadalquivir valley consist mainly of individual burials. We know a large variety of grave types from the Full Bronze Age, among them are stone cists or pits grouped into small necropolises (*fig. 1*). Stone cists are mainly found on the right side of the river in Gerena (Jardín de Alá), Salteras (SE-B, SE-K), Aznalcollár, Chichina, Setefilla, Carmona[1] and Canama (Sierra Alfonso 1991; Hunt Ortiz 2012; Martín de la Cruz/Garrido Anguita 2015). They also appear in a number of necropolises in the mountain region of the Sierra Morena north of the Guadalquivir valley (Pérez Macías/Frías 1989; Pérez Macías 1997; García Sanjuán 1998; 1999; Hurtado Pérez et al. 2011) and in the Subbetic Mountains (slab stone burials) (De la Torre Peña/Aguayo de Hoyos 1979). Other examples of burial types in the Guadalquivir valley are inhumations in small artificial or natural caves, like in Pirulejo, Cueva de la Detrita, Huerta Anguita, El Gandul (Martín de la Cruz/Garrido Anguita 2015, 189). Apart from these predominant burial customs, the reutilisation of Chalcolithic graves was also practised during the Full Bronze Age (Martín de la Cruz/Garrido Anguita 2015, 190) at sites such as Tholos de las Canteras, La Cueva del Vaquero and Dolmen de la Pastora (Hurtado Pérez/Amores Carredano 1984), Marroquíes Bajos (Sánchez Vizcaíno et al. 2005; Zafra et al. 1999; 2003), colección Siret (Lorrio Alvarado/Montero Ruiz 2004), El Barranquete (Aranda Jiménez et al. 2017) as it is also known from the El Argar region in southeastern Spain (Aranda Jiménez 2013; 2015; Lozano Medina/Aranda Jiménez 2018). The lowest concentration of burial sites is within the section of the Guadalquivir valley in the current province of Córdoba, most likely due to low research activity into prehistoric archaeology in this area. Despite the general increase in recorded Bronze Age burial sites, many identify burials as their sole component, so their relationship to settlements is often not clear.

Significant differences in grave goods between Chalcolithic and Bronze Age burials exist. While the burials of the Chalcolithic often contain a wide range of elaborate objects, some of which were made of exotic materials (such as ivory, amber, green stones or eggshell), the inventories of Bronze Age graves in the lower and middle Guadalquivir valley are mostly characterised by a few undecorated ceramic vessels and some metal objects (mostly ring ornaments and bronze weapons) (Bartelheim 2007, 101–104; Hunt Ortiz 2012; Martín de la Cruz/Garrido Anguita 2015, 182–191). As these graves usually form closed find contexts, the objects they contained can serve for the secure identification of significant diagnostic forms to differentiate Chalcolithic and Bronze Age graves.

2.2. Settlements

Regarding the settlement patterns in the lower and middle Guadalquivir valley, there is a clear change during the transition from the Copper to the Bronze Age. While large numbers of settlements ascribed to the Chalcolithic by characteristic find materials can be found on flat terraces as well as on low hills (Costa Caramé 2011, 278–280; García Sanjuán et al. 2013; 2017; Escudero Carrillo et al. 2017), Bronze Age materials hardly occur there. Targeted field surveys in 2018 in the valley areas between Villanueva del Río, Peñaflor and Carmona, province of Seville (Díaz-Zorita Bonilla et al. in print) and also specifically at Peñaflor (Ferrer Albelda et al. 2002), have confirmed this feature recognisable already on earlier find maps (e.g. Caro Bellido 1989). Settlements which are securely dated to the Full Bronze Age so far have only been identified in a few places in the lower

1 J. Vázquez Paz, personal communication.

and middle Guadalquivir valley and always in locations of obvious strategic defence importance, mostly hilltops. Up to now, Bronze Age settlement structures have not been investigated in extension, but only in narrow sondages at sites with large layer packages and complex stratigraphy. Within these, Full Bronze Age finds have been published from the lower layers of the following sites: Mesa de Setefilla (Aubet Semmler 1989), Cerro de San Juán in Coria del Río (García Rivero/Escacena Carrasco 2015; Escacena Carrasco et al. 2018) and Carmona (Cardenete et al. 1990; Pellicer Catalán 2006)[2] in the lower Guadalquvir valley and at Monturque (López Palomo 1993) and Llanete de los Moros (Martín de la Cruz 1987) in the middle Guadalquivir valley. Accordingly, there is little information on the structure of the Bronze Age settlement in the region. In Carmona as well as in Cerro de San Juán, a Chalcolithic layer with Bell Beaker materials was stratigraphically separated from one with Bronze Age finds, and in both cases, the Chalcolithic features lay directly on the rock. At Mesa Redonda (Villaverde del Río), ceramics of the Full Bronze Age and the Final Bronze Age were identified during excavations in 1978 and 1979, but also during surveys in 2019. There are also unpublished materials (pottery and metals) from Mesa Redonda in the Marsal Collection in the Seville Museum (FARMM 2014), which can be dated to the Full Bronze Age. In Peñaflor, different sites were identified by surveys showing Bronze Age ceramics and also materials from later periods, such as in Mesa Cordobesa I and II, Celti and Dehesa del Caballo III and some other starting during the Late Bronze Age with later occupations such as Cerro Pino I and II and La Torrecilla (Ferrer Albelda et al. 2002). At a distance of approximately 40km northwest of the Guadalquivir valley, in the northern part of the province of Huelva, two other Bronze Age settlements, El Trastejón and La Papúa (Hurtado Pérez et al. 2011), were excavated. They were presumably likely periodic temporary settlements located mostly in defensive positions on the landscape. Apart from a Full and a Final Bronze Age phase on each of them, they do not show any further occupation. Even though the sites have not been extensively excavated, Bronze Age finds could be recovered in stratigraphically well closed units, and thus a secure definition of the material could be made.

An element of particular interest are the hiatuses found in different sites during the Bronze Age. Several sites such as Calle Alcazaba (Lebrija) (Caro Bellido et al. 1986), Calle Galindos (Carmona) (Anglada Curado/Rodríguez Rodríguez 2000), Castillo de Alcalá de Guadaíra (Pozo/Tabales 1991), Cueva de la Murcielaguina (Priego de Córdoba) (Vaquerizo Gil 1986), Torreparedones (López-Sáez et al. 2015) have evidence of millennia of occupation, however the Bronze Age levels (or part of them) are not present. Hiatuses could be commonly considered as indicators of abandonment of the site during specific periods. However, the Bronze Age sites in the region, hint to other processes involved, such as regional migrations and different use of landscape. Excavated sites demonstrate that the lack of Full Bronze Age settlements in the Guadalquivir region may be caused, because they are deeply buried under younger strata. At the transition from the Chalcolithic to the Bronze Age, there have apparently been changes in the choice of settlement sites. From that time onwards, it seems that people deliberately moved to places whose characteristics were considered so favourable that they continued to be settled for a long time, often until the end of the 1st mill. BC or even longer.

Some clear evidence of this continuous occupation of the middle Guadalquivir valley after the first half of the 2nd mill. can be found in the abundance of Late Bronze Age sites along the whole valley as well as in the Sierra Morena. The sequences of Setefilla, Cerro San Juan, Monturque, Llanete de los Moros, Carmona, Peñaflor or Lebrija, present both Full and Late Bronze Age materials and chronologies that complement the list of those identified as initial Late Bronze Age sites along the whole valley (among others: El Carambolo, Cerro Macareno, Cuesta del Negro, Montemolín, Calle Costanilla de Torre del Oro in Carmona) (Torres Ortiz 2002; Jiménez Hernández 2004, 508–511;

2 In Valencina from the known Chalcolithic materials in Valencina and are dated to the Bronze Age in analogy to those in the southwest Iberian stone cist graves (T. Schuhmacher, personal communication), however, recently pottery was found close to the present surface in excavations at the sites Nueva Biblioteca and Valencina Nord (excavation DAI), which differs typologically significantly.

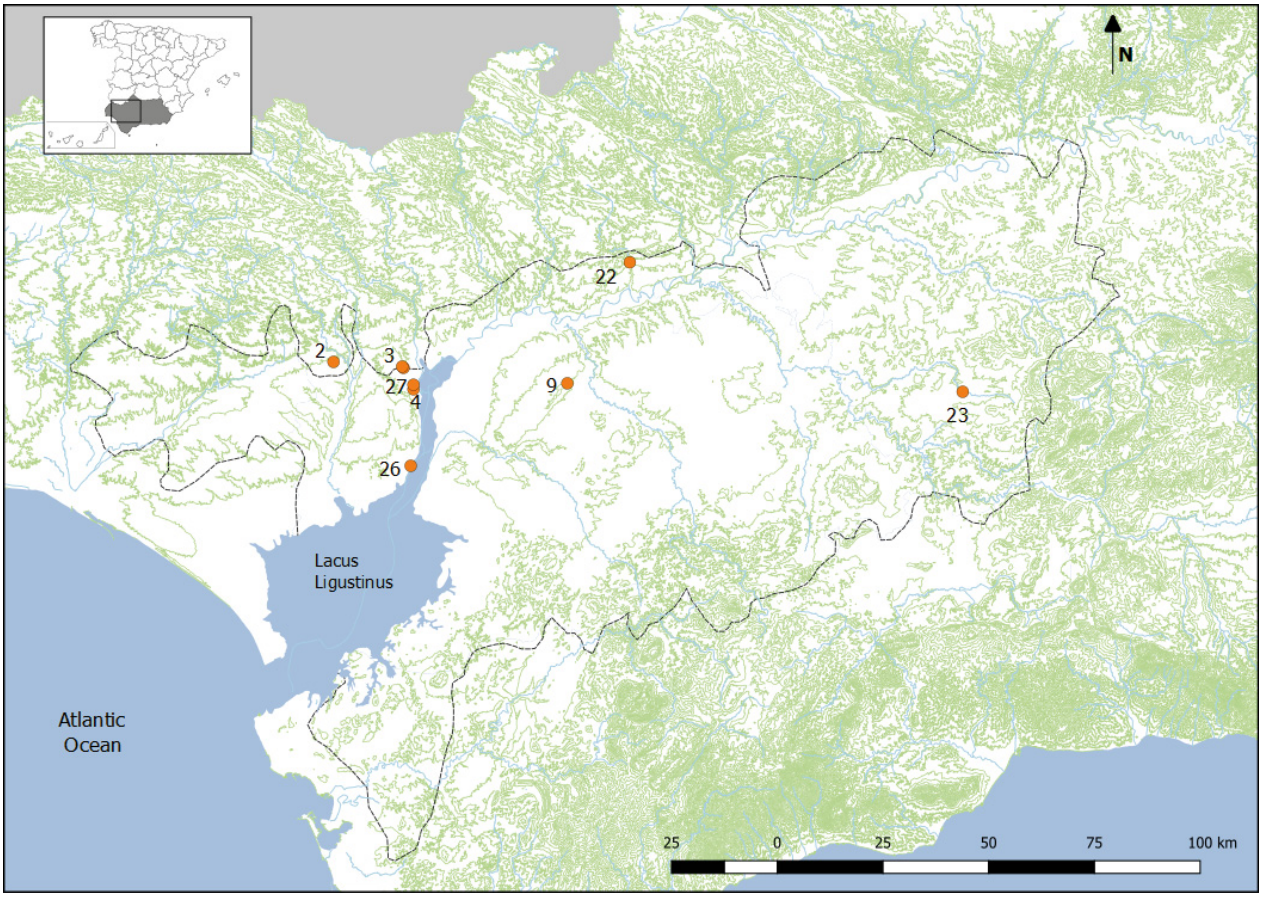

Fig. 2. Full Bronze Age sites of the lower and middle Guadalquivir Basin with ^{14}C data: 2. Aznalcollar (unpublished data) 3. SE-B, SE-K; 4. Jardín de Alá (Hunt Ortiz et al. 2008); 9. Carmona (unpublished data); 22. Setefilla (Aubet Semmler et al. 1983); 26. Cerro de San Juan (García Rivero/Escacena Carrasco 2015); 27. Valencina de la Concepción-Cerro de la Cabeza (Castro Martínez et al. 1996; Nocete Calvo et al. 2011; García Sanjuán et al. 2018). For further references and location of the sites see table 1.

Cruz Berrocal et al. 2013). The advent of exchanges between the Full and the Late Bronze Age is recognisable in the presence of foreign elements as Mycenaean, LBA Southwestern and Cogotas I ceramics – the latter coming from the Meseta in central Iberia (Martín de la Cruz 1988; Martín de la Cruz/Barrios Neira 2012; Torres Ortiz 2002; Jiménez Hernández 2004, 533 f., 580) – as well as new technologies as the refined bronze and the exchange networks from the Guadalquivir valley to the Mediterranean Sea (Barceló 1992). Despite these changes, the continuity in construction methods (stone wall structures), techniques (burnished and polished ceramics combined with new decorative styles) is also remarkable as well as the continuity of husbandry and agriculture strategies that were passed on from the Copper Age.

The reasons why these changes in the settlement pattern occurred around the end of the 3rd mill. are unclear. Bell Beaker materials have been found at some of these sites, which, where the situation could be clearly documented, appeared stratigraphically below those of the Full Bronze Age (e.g. Cerro de San Juán; Carmona). Therefore, it can be assumed that settlement was concentrated in some places that had partly been used before, as they met the new requirements and the extensive settlement of the landscape was abandoned. Some topographic positions, such as Mesa de Setefilla, however, were apparently occupied for the first time. In the present perception of the landscape, there are no indications as to why the settlement of the lowland areas near the favourable arable zones and grazing grounds in the Guadalquivir valley was abandoned.

Evidence for this could be provided by palaeoclimatological data, which have been collected for southwestern Europe on a large scale during the last years. In a recent study, Bellin et al. (2013) identify an aridisation phase in the south of the

Iberian Peninsula as part of a regional expression of the 4.2ky event between about 3200 and 1400 BC, following an evaluation of different climatic proxies, including pollen cores, marine sediments, lake sediments and fluvial archives from the Iberian south and southeast. Lillios et al. (2016) postulate a phase of drought in the Iberian Southwest around 2200 BC, also based on a multiproxy analysis, with emphasis on radiocarbon dates and tree pollen. Schirrmacher et al. (2019; 2020; see also Hinz et al. 2019) reconstruct an aridisation phase only between about 2400 and 2300 BC and a following somewhat wetter phase up to about 1800 BC on the basis of the analysis of two deep-sea drill cores off the South Iberian coast, speleothem density data, and pollen data. Even though the number of investigations is still quite small and supra-regional representations have to be based on points far apart from each other, they all share the observation of a phase of drought in the last third of the 3rd mill. BC.

Despite the paucity of evidence, it is conceivable that this climate change could have introduced stress situations, which lead to economic and political changes. In the course of this, conflicts may have arisen, which would have made it advisable to build settlements in protective positions. The distances of a few kilometres between the settlements that have been identified so far could then indicate delimited territories that were connected to the dwellings. It is possible that once the settlement system was established, the advantages gained from it were not abandoned, and many places in the Guadalquivir valley continued to be inhabited for a long time. In this respect, it would be a culturally determined shaping of the landscape as a settlement area and as a space for the use of resources.

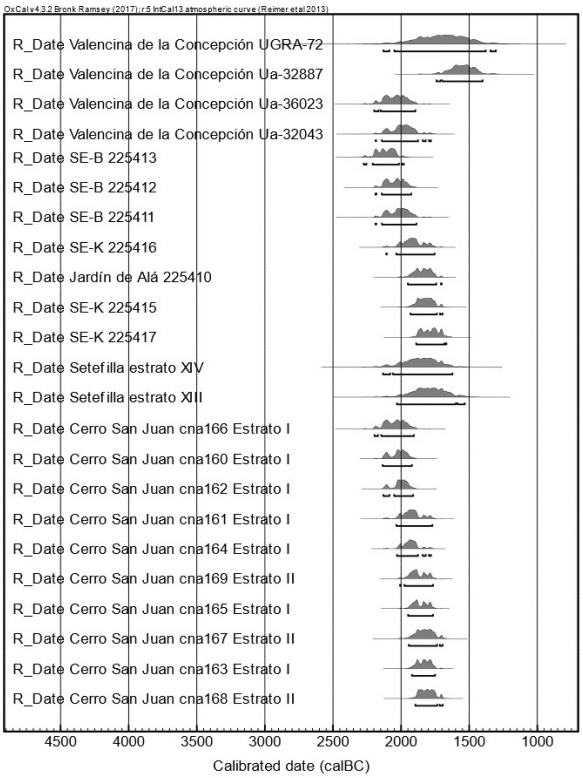

Fig. 3. Calibration spans of ^{14}C data from Full Bronze Age sites in the lower and middle Guadalquivir valley (see fig. 2 and table 2 for references).

2.3. Chronology

The processes that caused the changes from the Copper Age to the Bronze Age identified in the funerary and settlement record in the lower and middle Guadalquivir valley are still difficult to overlook. A series of ^{14}C data available from the lower and middle Guadalquivir valley exists, however, the corpus of data from the Chalcolithic with more than a hundred dates, dwarfs the only 24 available ^{14}C dates for the Early and Middle Bronze Age that span between c. 2200 and 1550 calBC (*fig. 2, 3*) (Aubet Semmler et al. 1983; López Palomo 1993; Hunt Ortiz et al. 2008; García Sanjuán/Hurtado Pérez 2011; García Rivero/Escacena Carrasco 2015), hindering a precise definition for this transition.

The largest series of ^{14}C data from the Chalcolithic, with 178 dates, comes from funerary contexts at Valencina (dating mainly human bones and teeth, but also animal bones, ivory, charcoal, and marine mollusc shells). These data extend only slightly beyond 2200 cal BC (2σ) (García Sanjuán et al. 2018). Just two samples from Valencina provided date ranges that clearly extend into the first half of the 2nd mill. (Nocete Calvo et al. 2011; García Sanjuán et al. 2018, 190, 252 f.), one from the so-called metallurgical quarter (PP4-Matarrubilla), and one from the IES sector (García Rivero/Escacena Carrasco 2015, 33; García Sanjuán et al. 2018, 190, 302). ^{14}C samples from stone cist tombs that can be clearly ascribed to the Bronze Age on

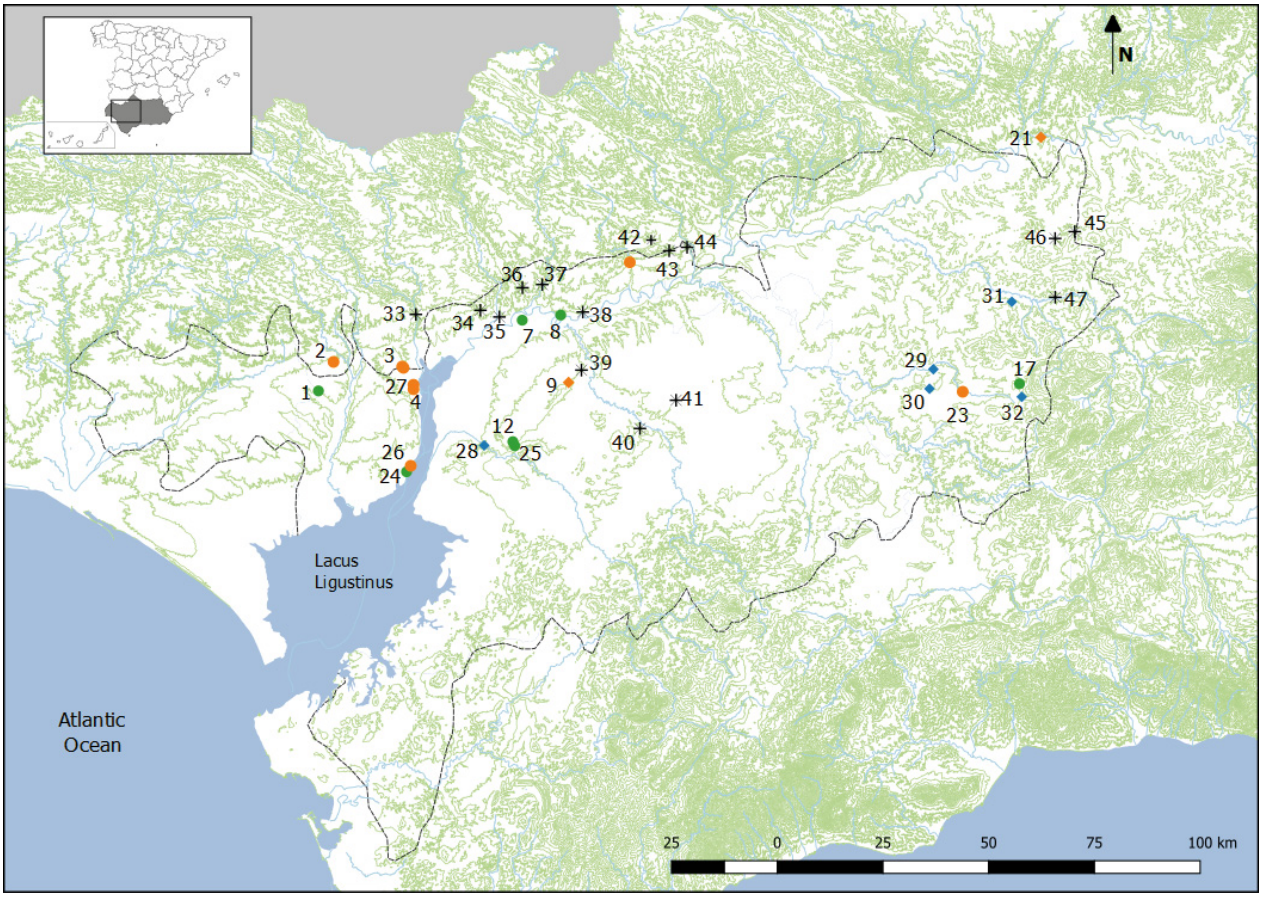

Fig. 4. Lower and middle Guadalquivir Valley sites dated to the Full Bronze Age via ceramics (for references and location of the sites see table 1).
♦ Settlements with both construction features and burials: 9. Carmona (Calle Torre del Oro, Calle General Freire, Plaza de Santiago); 21. Llanete de los Moros; 23. Monturque (López Palomo 1993).
○ Sites with only funerary structures: 1. Chichina; 7. Cortijo Maria Luisa; 8. Canama; 12. Cueva del Vaquero; 17. La Beleña; 24. Cerro del Arca; 25. El Gandul.
◊ Settlements identified by surface or stratified finds: 28. Castillo de Alcalá de Guadaíra; 29. Zóñar; 30. Castillo de Aguilar; 31. Guta; 32. La Fuente del Río.
+ Sites identified by surface collections and undocumented interventions: 33. Borbollón; 34. Cerro de Mesa Redonda; 35. Cantillana Naeva; 36. Cerro de la Encarnación; 37. Piedra Resbaladiza; 38. El Castillejo Arva; 39. La Ranilla; 40. Montoto; 41. Cerro Barrero I; 42. El Carrasco; 43. Castillo de Almenara; 44. Mesa Cordobesa; 45. Arroyo del Sardinero; 46. Cerro de la Galiana; 47. Lomas del Cortijo de La Ramira.

the basis of associated artefacts, have so far yielded data from the end of the 3rd and the first half of the 2nd mill. (SE-K, SE-B and Jardín de Alá: Hunt Ortiz et al. 2008). Both the shape of the tombs and the singular burials in them clearly distinguishes them from the collective tombs culturally associated with the Chalcolithic period. Data in need of an explanation come from the Cerro de San Juán in Coria del Río. Some C14 data originate from layer I ascribed to the Chalcolithic via pottery finds and of which seven dates ranging between 2200 BC and the first half of the 2nd mill. Three data from stratum II with material of the Full Bronze Age, however, confirm the chronology of other sites with that kind of material and fall also into the first half of the 2nd mill. BC (García Rivero/Escacena Carraso 2015, 30 f.). The same do the ^{14}C data that have been recovered from the settlement sites of El Trastejón and La Papúa in the Sierra Morena and were associated with material that can be culturally ascribed to the Full Bronze Age. The chronological range is here from the last third of the 3rd mill. BC until the mid-2nd mill. BC) (García Sanjuán/Hurtado Pérez 2011, 138–166).

Although, the general picture is that the transition from the Chalcolithic to the Bronze Age took place at the end of the 3rd mill. BC, the events marking this cultural transition cannot be described

with the necessary precision to fully understand them due to the prevailing scarcity of ^{14}C data from the Full Bronze Age. For the lower and middle Guadalquivir valley, there are only eight sites with ^{14}C dates spanning the Chalcolithic/Bronze Age transition. Another important issue is the lack of sites with stratigraphy across Chalcolithic and Full Bronze Age layers where a secure sequence of materials could be established. Therefore, many sites have been classified as belonging to the Bronze Age by typological comparison of ceramics (shapes, surface and matrix treatments) with securely dated sites in SE Andalusia or Portugal. By this, for the lower and middle Guadalquivir valley, another 34 Full Bronze Age sites (mainly settlements, funerary structures and sites identified by surface collections) could thus be added from the literature (*fig. 4*; *table 1*).

3. Evidence for Bronze Age Resource and Landscape Use in the Guadalquivir Valley

For the Bronze Age in the lower and middle Guadalquivir valley, it is assumed that the exploitation of resources largely followed that of the preceding Chalcolithic with gradual changes and evidence for intensification, as it can be observed in the Upper Guadalquivir valley (Peña Chocarro 2000; Montes Moya 2011) and in eastern Andalusia in the cultural area of El Argar (Aranda Jiménez et al. 2015, 71–106). In view of the lack of systematic settlement excavations in the Guadalquivir valley, it is necessary to consider site relations and the comparison with external sites in better investigated landscapes. According to the localisation of Full Bronze Age sites, the rich agricultural potential of the fertile river terraces in the Guadalquivir catchment area was in the foreground, as well as the possibilities offered by the river itself and the mountain landscapes, especially those of the Sierra Morena.

In contrast to the Chalcolithic, with its concentration of settlements close to the agricultural areas in the Guadalquivir valley (Costa Caramé 2011, 278–280), the Bronze Age is characterised by the extensive abandonment of settlement areas in valley locations and the predominant settlement of elevated positions. Given the natural conditions, there is no reason to see why naturally protected hilltops were increasingly inhabited since this resulted in a significantly less favourable access (more difficult and further away) to the (primarily agricultural) economic areas in the Guadalquivir valley (mainly arable land and pastures). The resulting disadvantage must have been compensated by the more defensible and outstanding location of the settlements on the hills (Mesa de Setefilla, Mesa Redonda, Mirasiviene (Díaz-Guardamino et al. 2019),[3] Carmona, or Cerro de San Juán in Coria del Río). Here, in addition to protection, a visual control of the landscape and a dominance of the surrounding territory due to conspicuity were the most important advantages of such a prominent position. As it has been stressed before, the change in the settlement pattern at the beginning of the Bronze Age should be regarded as a culturally driven decision.

The hilltop settlements along the border zone between the Guadalquivir valley and the Sierra Morena (Mesa Redonda, Mesa de Setefilla and probably Mirasiviene as the ones known so far) also had the possibility to make use of the mountains as a resource landscape providing raw materials such as ores, stones (rocks and flints) as well as specific plants and game. However, due to the lack of extensive excavations of the corresponding layers of these sites, this cannot be verified by finds. River valleys in the area like that of the Viar, Huéznar or Guadalbacar provided good access to the highlands, from where a system of traffic and transhumance routes enabled crossing over to the next major river system in the Guadiana valley and beyond. Research into a section of the corresponding path system suggests a prehistoric use of this kind of connections and a probably conscious layout (Murrieta Flores et al. 2012). Bronze Age settlement sites in that region, like El Trastejón, presumably used these cross-mountain routes for the shipping of copper ores they exploited in their surroundings (Garcia Sanjuán et al. 2011, 336–340).

3 As yet no Full Bronze Age material has been published, although some surface pottery finds point in this direction. Given the many parallels to the nearby-site of Setefilla that starts in the Full Bronze Age, it would be no surprise, if also in Mirasiviene the Full Bronze Age marks the beginning of the settlement.

N°	Name	Location	Type of site	Main Reference (further references in the bibliography)
1	Chichina	San Lúcar la Mayor (Sevilla)	Funerary	Fernández et al. 1976
2	Aznalcollar (Cobre las Cruces, Las Mesas and Los Páramos)	Salteras-Gerena (Sevilla)	Funerary	Hunt Ortiz 2012
3	SE-B and SE-K	Salteras (Sevilla)	Settlement with funerary structures	Hunt Ortiz 2012
4	Jardín de Alá	Salteras (Sevilla)	Funerary	Hunt Ortiz 2012
5	La Pastora	Valencina de la Concepción (Sevilla)	Funerary	Hurtado Pérez/Amores Carredano 1984
6	Parque municipal de Puebla del Río	La Puebla del Río (Sevilla)	Funerary	Escacena Carrasco 1993
7	Cortijo Maria Luisa	Cantillana (Sevilla)	Funerary	Santana Falcón 1988
8	Canama	Alcolea del Río (Sevilla)	Funerary	Sierra Alfonso 1991
9	Calles Torre del Oro, General Freire y Plaza de Santiago	Carmona (Sevilla)	Settlement	Román Rodríguez 2004
10	Carmona	Carmona (Sevilla)	Settlement with funerary structures	unpublished data
11	Tholos de las Canteras	Alcalá de Guadaíra (Sevilla)	Funerary	Hurtado Pérez/Amores Carredano 1984
12	Cueva del Vaquero	Alcalá de Guadaíra (Sevilla)	Funerary	Domínguez Berenjeno/Vera Fernández 2008
13	El Olivar Alto	Utrera (Sevilla)	Funerary	Pérez Quesada 2006
14	Salpensa	Utrera (Sevilla)	Funerary	Ruiz Mata 1979
15	La Nava Grande	Morón de la Frontera (Sevilla)	Funerary	Moreno Menayo 1986*
16	Castillo de Poley	Aguilar de la Frontera (Córdoba)	Funerary	Ruiz Lara/Murillo Redondo 1992
17	La Beleña	Cabra (Córdoba)	Funerary	Delgado Fernández/Vera Rodríguez 1996
18	El Laderón	Doña Mencía (Córdoba)	Funerary	Ruiz Lara 1987
19	Cuevas de las Laderas, Bermeja, La Detrita y Huerta Anguita	Priego de Córdoba (Córdoba)	Funerary	Gavilán Ceballos 1990
20	Cerro Cambrón	Alcaudete (Jaén)	Funerary	Montilla Pérez 1987
21	Llanete de los Moros	Montoro (Córdoba)	Settlement with funerary structures	Martín de la Cruz 1987
22	Setefilla	Lora del Río (Sevilla)	Settlement with funerary structures	Aubet Semmler et al. 1983

N°	Name	Location	Type of site	Main Reference (further references in the bibliography)
23	Castillo de Monturque	Monturque (Córdoba)	Settlement	López Palomo 1993
24	Cerro del Arca	La Puebla del Río (Sevilla)	Funerary	Belén et al. 2000
25	El Gandul	Alcalá de Guadaíra (Sevilla)	Funerary	Hurtado Pérez/Amores Carredano 1984
26	Cerro de San Juan	Coria del Río (Sevilla)	Settlement	García Rivero/Escacena Carrasco 2015
27	Valencina de la Concepción (Cerro de la Cabeza)	Valencina de la Concepción (Sevilla)	Surface collection	Castro Martínez et al. 1996
28	Castillo de Alcalá de Guadaíra	Alcalá de Guadaíra (Sevilla)	Settlement	Pozo/Tabales 1991
29	Zóñar	Aguilar de la Frontera (Córdoba)	Settlement	Ruiz Lara/Murillo Redondo 1992
30	Castillo de Aguilar	Aguilar de la Frontera (Córdoba)	Settlement	Ruiz Lara/Murillo Redondo 1992
31	Guta	Castro del Río (Córdoba)	Settlement	Carrillero Millán/Martínez Fernández 1985
32	La Fuente del Río	Cabra (Córdoba)	Settlement	Delgado Fernández/Vera Rodríguez 1996
33	Borbollón	Espejo (Córdoba)	Surface collection	Archivo Central de la Consejería de Cultura*
34	Cerro de Mesa Redonda	Villaverde del Río (Sevilla)	Surface collection	Huntingford 1983
35	Cantillana Naeva	Cantillana (Sevilla)	Surface collection	Archivo Central de la Consejería de Cultura*
36	Cerro de la Encarnación	Villanueva del Río y Minas (Sevilla)	Surface collection	Carriazo 1979
37	Piedra resbaladiza	Villanueva del Río y Minas (Sevilla)	Surface collection	Pérez Macías 2013
38	El Castillejo Arva	Alcolea del Río (Sevilla)	Surface collection	Moreno Menayo 1986
39	La Ranilla	Carmona (Sevilla)	Surface collection	Archivo Central de la Consejería de Cultura*
40	Montoto	Marchena (Sevilla)	Surface collection	Archivo Central de la Consejería de Cultura*
41	Cerro Barrero	Fuentes de Andalucía (Sevilla)	Surface collection	Tinoco Muñoz 1999
42	El Carrasco	Puebla de los Infantes (Sevilla)	Surface collection	Ojeda Calvo et al. 1988
43	Castillo de Almenara	Peñaflor (Sevilla)	Surface collection	Archivo Central de la Consejería de Cultura*
44	Mesa Cordobesa	Peñaflor (Sevilla)	Surface collection	Ferrer Albelda et al. 2002

N°	Name	Location	Type of site	Main Reference (further references in the bibliography)
45	Arroyo del Sardinero	Baena (Córdoba)	Surface collection	Morena López 1990
46	Cerro de la Galiana	Cañete de las Torres (Córdoba)	Surface collection	Martín de la Cruz et al. 1989
47	Lomas del cortijo de la Ramira	Baena (Córdoba)	Surface collection	Archivo Central de la Consejería de Cultura*

* In the last two decades, the increase of archaeological surveys and excavations in the course of construction/agricultural/industrial activities has yielded a vast series of new sites, of which many, unfortunately, are not yet published. The yearbook of archaeological reports of Andalusia (Anuario Arqueológico de Andalucía) is available only until 2008. However, the Andalusian government has developed a geographical database of archaeological sites where it is possible to consult and locate, among others, Full Bronze Age sites (funerary/settlements/surface collections) reported by contract archaeologists and researchers even after 2008. The database is available only with the permission of the Andalusian heritage authority (IAPH) and is a source of information about archaeological sites that need to be further investigated.
This table is not a definitive list of Full Bronze Age sites in the lower and middle Guadalquivir valley. The geographic database contains even more sites, however, further research is needed to confirm the presence of Full Bronze Age materials. This list is just an invitation to researchers to expand it or even correct it.

Tab. 1. Lower and middle Guadalquivir valley Full Bronze Age sites referred in this article.

It seems rather likely that the mentioned hilltop sites also exerted control over the passage ways and the access routes towards the raw materials.

It is conceivable that control was also exercised over connecting routes in the Guadalquivir river valley, such as river crossings at fords. For example, one has a good view of the lower course of the river from the settlement of Mesa Redonda, which is known to have fed the Lacus Ligustinus in prehistory, based on geoarchaeological investigations at nearby Alcalá del Río (Arteaga Matute et al. 2016). The settlement on the Cerro de San Juán is located above an arm of Lacus Ligustinus overlooking the river estuary.

Regarding the use of the landscape, the Guadalquivir river itself and its estuary offered a wide range of resources such as fishing, irrigation, transportation, salt extraction and pebbles. Since the areas of fishing, ship-building and salt extraction are often closely interwoven, as they depend on each other for the optimal use of water as a source of food and fishing grounds, it is likely that this has also been the case in prehistory (Féaux de la Croix/Bartelheim 2020). This ResourceComplex could have been activated, as is traditionally the case in the estuary area of the Guadalquivir, by networks of fishermen, ship-builders and salt boilers, the latter extracting the salt traditionally required for the conservation of fish (Agudo Torrico 1991). Salt extraction has been evidenced for the Neolithic e.g. in La Marismilla (Escacena Carrasco et al. 1996; Escacena Carrasco 2010) in the area of the prehistoric Guadalquivir estuary that in prehistory went up to the area of present day Alcalá del Río, north of Seville (Borja Barrera 2013; Arteaga Matute et al. 2016) and there is no reason to assume that it might not have been practised also in the Bronze Age somewhere in the riverine area of the brackish Lacus Ligustinus.

In addition to the pure supply of water for humans, animals and plants, today, as in the past, the river also forms an important traffic route which unfortunately cannot be evidenced for the Bronze Age by archaeological finds. Its riverine forests and the adjacent terraces are and were quite fertile and offered potential for pasture for animal husbandry, small game and firm ground transportation routes.

4. Conclusions

Due to the strong posterior alteration of the region and the current fragmentary state of research for the period of the Full Bronze Age in the lower and middle Guadalquivir valley, it is difficult to

Site	Lab code	Provenance		Radiocarbon age (BP)	Calibrated date (1 σ)	Calibrated date (2 σ)	Material	Reference
		Location	Strata/ Context					
Cerro San Juan	CNA166	9 cau -94-63	Stratum/ Estrato i	3660 ± 50	2057–1960 BC	2146–1903 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 160	3 cau -94-66	Stratum/ Estrato i	3645 ± 35	2038–1952 BC	2065–1922 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 162	5 cau -94-65	Stratum/ Estrato i	3635 ± 30	2032–1951 BC	2050–1912 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 161	4 cau -94-65	Stratum/ Estrato i	3575 ± 45	1980–1881 BC	2034–1771 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 164	7 cau -94-64	Stratum/ Estrato i	3580 ± 35	1974–1888 BC	2031–1876 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 169	12 cau -94-60	Stratum/ Estrato ii	3545 ± 35	1941–1876 BC	1976–1765 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 165	8 cau -94-63	Stratum/ Estrato i	3535 ± 30	1923–1874 BC	1948–1767 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 167	10 cau -94-61	Stratum/ Estrato ii	3505 ± 45	1888–1767 BC	1944–1735 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 163	6 cau -94-64	Stratum/ Estrato i	3515 ± 30	1847–1774 BC	1921–1751 BC	not available	García Rivero/ Escacena Carrasco 2015
Cerro San Juan	CNA 168	11 cau -94-61	Stratum/ Estrato ii	3485 ± 35	1878–1839 BC	1897–1734 BC	not available	García Rivero/ Escacena Carrasco 2015
Valencina de la Concepción	UGRA-72	Cerro de la Cabeza	Domestic context	3380 ± 150	1880–1520 BC	2150–1300 BC	Bone	Castro Martínez et al. 1996
Valencina de la Concepción	Ua-32887	IES	Domestic context	3265 ± 75	1626–1449 BC	1710–1404 BC	Bone	Nocete Calvo et al. 2011
Valencina de la Concepción	Ua-36023	PP-Mat-arrubilla	Production context	3660 ± 55	2133–1947 BC	2199–1887 BC	Bone	Castro Martínez et al. 1996
Valencina de la Concepción	Ua-32043	PP-Mat-arrubilla	Production context	3620 ± 55	2112–1920 BC	2188–1781 BC	Bone	Castro Martínez et al. 1996
SEB - SEK - Jardin de Alá	Beta-225413	SE-B	Grave 12B, pit, 1 undeterminate	3720 ± 40	2190–2040 BC	2260–2020 BC	Bone	Hunt Ortiz et al. 2008
SEB - SEK - Jardin de Alá	Beta-225412	SE-B	Grave 4B, pit, 1 female	3660 ± 40	2130–1970 BC	2140–1930 BC	Bone	Hunt Ortiz et al. 2008

Site	Lab code	Provenance		Radiocarbon age (BP)	Calibrated date (1 σ)	Calibrated date (2 σ)	Material	Reference
		Location	Strata/ Context					
SEB - SEK - Jardin de Alá	Beta-225411	SE-B	Grave 2B, cist, 1 female	3640 ± 50	2120–1940 BC	2140–1890 BC	Bone	Hunt Ortiz et al. 2008
SEB - SEK - Jardin de Alá	Beta-225416	SE-K	Grave 23b, pit, 3 females	3570 ± 50	1970–1880 BC	2030–1760 BC	Bone	Hunt Ortiz et al. 2008
SEB - SEK - Jardin de Alá	Beta-225410	JA	Structure IV, pit, 1 female	3520 ± 40	1900–1770 BC	1950–1740 BC	Bone	Hunt Ortiz et al. 2008
SEB - SEK - Jardin de Alá	Beta-225415	SE-K	Grave 7, cist, 1 male	3500 ± 40	1890–1750 BC	1930–1740 BC	Bone	Hunt Ortiz et al. 2008
SEB - SEK - Jardin de Alá	Beta-225417	SE-K	Grave 25, cist, 1 female	3460 ± 40	1870–1740 BC	1890–1680 BC	Bone	Hunt Ortiz et al. 2008
Setefilla	I-11070	Trench 3	Stratum/ Estrato XIV	3520 ± 95	2010–1690 BC	2134–1623 BC	Charcoal	Aubet Semmler et al. 1983
Setefilla	I-11069	Trench 3	Stratum/ Estrato XIII	3470 ± 95	1920–1640 BC	2031–1533 BC	Charcoal	Aubet Semmler et al. 1983

Tab. 2. ^{14}C data from Full Bronze Age sites in the lower and middle Guadalquivir valley.

demonstrate a conscious human creation of the landscape as a resource assemblage to suit the exploitation of resources. The exploitation of the landscape was most likely carried out according to a similar pattern to that already established in earlier periods. However, what can be detected is a shift of settlements to elevated positions at the transition from the 3rd to the 2nd mill. BC, which can be interpreted with high probability as a socio-economically motivated activity to reorganise landscapes. The optical dominance of the surrounding area by the elevated positions of the settlements could have been an expression of a claim to control the landscape linked to an incipient hierarchisation and thus an identification with it as an area for the use of resources and associated ResourceComplexes.

It is quite conceivable that this change in settlement pattern and the restructuring of the settlement was not only intended as a protective measure, but went along also with the reorganisation of economic activities and social changes. In the course of these concentration processes, communities could have been organised hierarchically in the individual villages in a different way than previously in order to take account of the new, denser settlement pattern. From a socio-cultural point of view, similar mechanisms may have been at work here as have already been discussed for the nearby settlements of Setefilla and Mirasiviene in the Final Bronze Age (Díaz-Guardamino et al. 2019) or for the El Argar region. In southeastern Iberia, similar processes of settlement concentration in difficult to access elevated positions have been observed in many places for the period at the end of the 3rd and the first half of the 2nd mill. BC, after the Chalcolithic settlement had previously concentrated primarily on more open lowland areas (Aranda Jiménez et al. 2015, 43–59). Within those Bronze Age settlements, the often numerous intramural grave finds have provided opportunities to determine evidence for local social structures. Especially places like Fuente Álamo, province of Almería, but also Peñalosa, province of Jaén, provide evidence of local hierarchical structures, possibly in family or

kinship associations (Bartelheim 2012). Archaeological evidence for supra-local political organisational structures is not yet available (Bartelheim in print).

In the lower and middle Guadalquivir valley, the grave finds recovered so far do not permit any significant statements on the social structure. Too few graves are known so far, which also hardly reflect large population groups and also contained too little variety of grave goods. It is conceivable that the previously hidden social structure in the case of the extensive excavation of one of the hilltop settlements of the region will reveal itself in a similar way as in the El Argar culture. The burials in layer XIV of the Full Bronze Age within the settlement of Mesa de Setefilla give reason for this assumption. In addition, grave goods closely related to the El Argar culture were found (Aubet Semmler/Serna 1981; Aubet Semmler et al. 1983, 62–69) with a San Antón type halberd and a three-riveted dagger blade (Brandherm 2003, 246, 274). After all, what would we know about the social structures in the El Argar culture without the extensive excavations that have been going on for over 150 years in now over 40 settlements (Aranda Jiménez et al. 2015)? Despite the predominant form of burial in settlements, grave finds have also become known outside the settlements (Aranda Jiménez 2013; 2015; Lozano Medina/Aranda Jiménez 2018), but these by no means reflect the social spectrum as comprehensively as the grave finds in the settlements (e.g. Schubart/Ulreich 1991).

It is quite probable that one of the main reasons for the difference in the level of knowledge between the Full Bronze Age in the lower and middle Guadalquivir valley and that of the El Argar culture in southeastern Iberia, is due to *longue durée* occupational patterns of historic sites in the Guadalquivir valley and the therefore often hidden Bronze Age levels below multi-phasic layers there. It seems that in many cases, sites in southeastern Iberia took a different development after the end of the Full Bronze Age and were not so intensively used anymore (Molina González 1983, 108; Lorrio Alvarado 2009/2010). Therefore, they are easier to identify and accessible and have been investigated more intensively elevation the last decades. Extensive excavations in a site in elevated position in the Guadalquivir valley on the other hand, would give the chance to elucidate in one place the long-term development and resource use in the region, which might even comprise the whole Bronze and Iron Ages or large parts of them (*table 2*).

Martin Bartelheim
Döbereiner Chala-Aldana
Marta Díaz-Zorita Bonilla
Eberhard-Karls Universität Tübingen
Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters
Schloss Hohentübingen
72070 Tübingen, Germany

Eberhard-Karls Universität Tübingen
SFB 1070 RessourceCultures
Gartenstraße 29
72074 Tübingen, Germany
martin.bartelheim@uni-tuebingen.de
dobereiner.chala-aldana@uni-tuebingen.de
marta.diaz-zorita-bonilla@uni-tuebingen.de

Bibliography

Aguayo de Hoyos/García Sanjuán 2006: P. Aguayo de Hoyos/L. García Sanjuán, The Megalithic Phenomenon in Andalusia (Spain). An Overview. In: R. Joussaume/L. Laporte/C. Scarre (eds.), Origin and Development of the Megalithic Phenomenon of Western Europe. Proceedings of the International Symposium (Bougon, France, October 26th–30th 2002) (Niort 2006) 452–472.

Agudo Torrico 1991: J. Agudo Torrico, El Bajo Guadalquivir. Artes y técnicas de pesca tradicionales (Sevilla 1991).

Anglada Curado/Rodríguez Rodríguez 2000: R. Anglada Curado/I. Rodríguez Rodríguez, Excavaciones de Urgencia en la Calle Galindos N° 4 de Carmona, Sevilla. Anuario Arqueológico de Andalucía, Volume 2: Actividades de Urgencia (Sevilla 2000) 1236–1244.

Aranda Jiménez 2013: G. Aranda Jiménez, Against Uniformity Cultural Diversity. The "Others" in Argaric Societies. In: M. Cruz Berrocal/L. Garcia Sanjuán/A. Gilman (eds.), The Prehistory of Iberia. Debating Early Social Stratification and the State (New York 2013) 99–118.

Aranda Jiménez 2015: G. Aranda Jiménez, Resistencia e involución social en las comunidades de la Edad del Bronce del sureste de la Península Ibérica. Trabajos de Prehistoria 72, 2015, 126–144.

Aranda Jiménez et al. 2015: G. Aranda Jiménez/S. Montón Subías/M. Sánchez Romero, The Archaeology of Bronze Age Iberia. Argaric Societies (New York 2015).

Aranda Jiménez et al. 2017: G. Aranda/A. Lozano Medina/M. Díaz-Zorita Bonilla/M. Sánchez Romero/J. Escudero Carrillo, Cultural Continuity and Social Resistance. The Chronology of Megalithic Funerary Practices in Southern Iberia. European Journal of Archaeology 21.2, 2017, 192–216.

Arboledas Martínez 2010: L. Arboledas Martínez, Minería y metalurgia romana en el Sur de la Península Ibérica. Sierra Morena oriental. BAR International Series 2121 (Oxford 2010).

Arboledas Martínez et al. 2014: L. Arboledas Martínez/F. Contreras Cortés/A. Moreno Onorato, La Explotación Minera Antigua en Sierra Morena Oriental y su Vinculación con el Territorio. Cuadernos de Prehistoria y Arqueología de la Universidad de Granada 24, 2014, 111–145.

Arteaga Matute et al. 2016: O. Arteaga Matute/D. Barragán Mallofret/A.-M. Roos/H. D. Schulz, Primicia cartográfica del río Guadalquivir hace 6500 años. Revista Atlántica-Mediterránea 18, 2016, 139–161.

Arteaga Matute/Roos 1995: O. Arteaga Matute/A. M. Roos, Geoarchäologische Forschungen im Umkreis der Marismas am Río Guadalquivir (Niederandalusien). Madrider Mitteilungen 36, 1995, 199–218.

Arteaga Matute/Schubart 1980: O. Arteaga Matute/H. Schubart, Fuente Álamo, excavaciones de 1977. Noticiario Arqueológico Hispánico 9, 1980, 245–292.

Aubet Semmler 1989: M. E. Aubet Semmler, La Mesa de Setefilla. La secuencia estratigráfica del Corte I. In: M. E. Aubet Semmler (ed.), Tartessos. Arqueologia Protohistórica del Bajo Guadalquivir (Sabadell 1989) 297–338.

Aubet Semmler et al. 1983: M. E. Aubet Semmler/M. R. Serna/J. L. Escacena Carrasco/M. M. Ruiz Delgado, La Mesa de Setefilla. Lora del Río (Sevilla). Campaña de 1979. Excavaciones Arqueológicas en España 122 (Madrid 1983).

Aubet Semmler/Serna 1981: M. E. Aubet Semmler/M. R. Serna, Una sepultura de la Edad del Bronce en Setefilla (Sevilla). Trabajos de Prehistoria 38, 1981, 225–256.

Bartelheim 2007: M. Bartelheim, Die Rolle der Metallurgie in vorgeschichtlichen Gesellschaften. Sozioökonomische und kulturhistorische Aspekte der Ressourcennutzung. Ein Vergleich zwischen Andalusien, Zypern und dem Nordalpenraum/The Role of Metallurgy in Prehistoric Societies. Socioeconomic and Cultural Aspects of the Use of Resources. A Comparison between Andalusia, Cyprus and the North Alpine Area. Forschungen zur Archäometrie und Altertumswissenschaft 2 (Rahden/Westf. 2007).

Bartelheim 2012: M. Bartelheim, Detecting Social Structures in the Bronze Age of Southeastern Spain, Beyond Elites. In: T. Kienlin/A. Zimmermann (eds.), Metals and Societies. Alternatives to Hierarchical Systems in Modelling Social Formations. International Conference at the Ruhr-Universität Bochum, Germany, October 22–24, 2009. Universitätsforschungen zur Prähistorischen Archäologie 215 (Bonn 2012) 339–354.

Bartelheim in print: M. Bartelheim, Societies and Resources in the Bronze Age of Southern Iberia. In: M. Bartelheim/F. Contreras Cortés/R. Hardenberg (eds.), Landscapes and Resources in the Bronze Age of Southern Spain. RessourcenKulturen 17 (Tübingen, in print).

Bartelheim et al. 2017: M. Bartelheim/P. Bueno Ramirez/M. Kunst (eds.), Key Resources and Socio-Cultural Developments in the Chalcolithic of the Iberian Peninsula. RessourcenKulturen 6 (Tübingen 2017).

Belén et al. 2000: M. Belén/R. Anglada/E. Conlin/T. Gómez/A. Jiménez, Expresiones funerarias de la prehistoria reciente de Carmona (Sevilla). SPAL 9, 2000, 385–403.

Bellin et al. 2013: N. Bellin/V. Vanacker/S. De Baets, Anthropogenic and Climatic Impact on Holocene Sediment Dynamics in SE Spain. A Review. Quaternary International 308–309, 2013, 112–129.

Berrocal Rangel 2004: L. Berrocal Rangel, El control de los caminos como recurso. El entramado viario de la Beturia céltica. In: J. G. Gorges/E. Cerrillo/T. Nogales Basarrate (eds.), V Mesa redonda internacional sobre Lusitania romana. Las comunicaciones (Cáceres 2004) 149–175.

Borja Barrera 2013: F. Borja Barrera, La desembocadura del Guadalquivir en la segunda mitad del Holoceno. Síntesis palaeogeográfica. In: L. García Sanjuán/J. M. Vargas Jiménez/V. Hurtado Pérez/T. Ruíz Moreno/R. Cruz-Auñón Briones (eds.), El Asentamiento Prehistórico de Valencina de la Concepción (Sevilla). Investigación y Tutela en el 150 Aniversario del Descubrimiento de La Pastora (Sevilla 2013) 93–112.

Brandherm 2003: D. Brandherm, Die Dolche und Stabdolche der Steinkupfer- und der älteren Bronzezeit auf der Iberischen Halbinsel. Prähistorische Bronzefunde 6.12 (Stuttgart 2003).

Bubner 1981: T. Bubner, Endneolithikum und Frühbronzezeit im unteren Guadalquivirbecken. Zephyrus 32/33, 1981, 133–155.

Cámara Serrano/Molina González 2004: J. A. Cámara Serrano /F. Molina González, El megalitismo en el sureste de la Península Ibérica. Ideología y control territorial. Mainake 26, 2004, 139–163.

Cardenete et al. 1990: R. Cardenete/M. T Gómez/A. Jiménez/R. Lineros/I. Rodríguez, Excavaciones arqueológicas de urgencia en el solar de la Plaza de Santiago n.º 1. Anuario Arqueológico de Andalucía 3, 1990, 488–497.

Caro Bellido et al. 1986: A. Caro-Bellido/P. Acosta-Martínez/J. L. Escacena-Carrasco, Informe sobre la prospección arqueológica con sondeo estratigráfico en el solar de la Calle Alcazaba (Lebrija, Sevilla). Anuario Arqueológico de Andalucía. Actividades sistemáticas y puntuales. Informes y memorias (Sevilla 1986) 168–174.

Caro Bellido 1989: A. Caro Bellido, Consideraciones sobre el Bronce Antiguo y Pleno en el Bajo Guadalquivir. In: M. E. Aubet Semmler (ed.), Tartessos. Arqueologia Protohistórica del Bajo Guadalquivir (Sabadell 1989) 85–120.

Carriazo 1979: J. Carriazo, El descubrimiento de Munigua y de la espiral de oro del Cerro de Montorcaz. Madrider Mitteilungen 20, 1979, 271–281.

Carrillero Millán/Martínez Fernández 1985: M. Carrillero Millán/G. Martínez Fernández, El Yacimiento de Guta y la prehistoria reciente de la Campiña cordobesa. Cuadernos de Prehistoria y Arqueología de la Universidad de Granada 10, 1985, 187–223.

Castro Martínez et al. 1996: P. V. Castro Martínez/R. Micó Pérez/V. Lull Santiago, Arqueología. Algo más que Tafonomía. Arqueología Espacial 16–17, 1996, 19–28.

Chapman 2008: R. Chapman, Producing Inequalities. Regional Sequences in Later Prehistoric Southern Spain. Journal of World Prehistory 21, 2008, 195–260.

Contreras Cortés 2000: F. Contreras Cortés (ed.), Proyecto Peñalosa. Análisis histórico de las comunidades de la Edad del Bronce del piedemonte meridional de Sierra Morena y depresión Linares-Bailén. Arqueología, Monografías 10 (Sevilla 2000).

Costa Caramé 2011: M. E. Costa Caramé, La Metalurgia y sus Repercusiones Económicas, Sociales e Ideológicas en las Comunidades del III y II Milenios cal ANE en el Suroeste de la Península Ibérica (Sevilla 2011).

Cruz Berrocal et al. 2013: M. Cruz Berrocal/L. Garcia Sanjuán/A. Gilman (eds.), The Prehistory of Iberia. Debating Early Social Stratification and the State (New York 2013) 99–118.

Cruz-Auñón Briones/Arteaga Matute Matute 1996: R. Cruz-Auñón Briones/O. Arteaga Matute Matute, La Alcazaba. Un espacio social aledaño a la periferia del poblado prehistórico de Valencina de la Concepción (Sevilla). Excavación de urgencia de 1996. Anuario Arqueológico de Andalucía 1996, 701–710.

De la Torre/Aguayo de Hoyos 1979: F. de la Torre Peña/P. Aguayo de Hoyos, La Edad del Bronce en Alcalá la Real (Jaén). Cuadernos de Prehistoria y Arqueología de la Universidad de Granada 4, 1979, 133–166.

Delgado Fernández/Vera Rodríguez 1996: M. R. Delgado Fernández/J. C. Vera Rodríguez, Estudio y revisión cronológica de los yacimientos de la Fuente del Río y La Veleña. Cabra. A propósito del paso del III al II milenio a.C. en el SE de Córdoba (Córdoba 1996) 35–44.

Díaz-Zorita Bonilla 2017: M. Díaz-Zorita Bonilla, The Copper Age in South-West Spain. A Bioarchaeological Approach to Prehistoric Social Organisation. BAR International Series S2840 (Oxford 2017).

Díaz-Zorita Bonilla et al. in print: M. Díaz-Zorita Bonilla/D. Chala Aldana/M. Bartelheim, Prospección superficial de los terrenos contiguos al curso medio del río Guadalquivir. Términos municipales de Carmona, Tocina, Villanueva del Río y Minas, Alcolea del Río, Lora del Río, Peñaflor y La Campana (Sevilla). Annuario Arqueológico de Andalucía (in print).

Díaz-Guardamino et al. 2019: M. Díaz-Guardamino/L. García Sanjuán/D. W. Wheatley/J. A. Lozano Rodríguez/M. Á. Rogerio Candelera/M. Krueger/M. Krueger/M. Hunt Ortiz/M. Murillo-Barroso/V. Balsera Nieto, Rethinking Iberian 'Warrior' Stelae. A Multidisciplinary Investigation of Mirasiviene and its Connection to Setefilla (Lora del Río, Seville, Spain). Archaeological and Anthropological Sciences 11, 2019, 6111–6140.

Domergue 1987: C. Domergue, Catalogue des mines et des fonderies antiques de la Péninsule Ibérique (Paris 1987).

Domínguez Berenjeno/Vera Fernández 2008: E. Domínguez Berenjeno/A. Vera Fernández, Actividad Arqueológica puntual en la Cueva del Vaquero. Anuario Arqueológico de Andalucía (Sevilla 2008) 5845–5855.

Escacena Carrasco 1993: J. L. Escacena Carrasco, Reflexiones acerca del mundo funerario de la transicion calcolitico bronce en andalucia occidental. Tabona 8.2, 1992–1993, 447–464.

Escacena Carrasco 2010: J. L. Escacena Carrasco, La salina prehistórica de La Marismilla y la ocupación neolítica de la paleodesembocadura del Guadalquivir. In: J. L. Escacena Carrasco (ed.), La Puebla del Río, Miscellanea Histórica (Sevilla 2010) 167–190.

Escacena Carrasco 2018: J. L Escacena Carrasco, Sevilla fenicia. In: J. Beltrán Fortés/O. Rodríguez Gutierrez (eds.), Sevilla Arqueológica. La ciudad en época protohistórica, antigua y andalusí (Sevilla 2018) 25–69.

Escacena Carrasco et al. 1996: J. L. Escacena Carrasco/M. Rodríguez De Zuloaga Montesino/I. Ladrón de Guevara Sánchez, Guadalquivir Salobre. Elaboración Prehistórica de Sal Marina en las Antiguas Bocas del Río (Sevilla 1996).

Escacena Carrasco et al. 2018: J. L. Escacena Carrasco/A. Gómez Peña/L. Gethsemaní Pérez Aguilar (eds.), CAURA. Arqueología en el Estuario del Guadalquivir. SPAL Monografías Arqueología 26 (Sevilla 2018).

Escudero Carrillo et al. 2017: J. Escudero Carrillo/M. Díaz-Zorita Bonilla/M. Bartelheim/L. García Sanjuán, Chalcolithic Enclosures in the Lower Guadalquivir Basin. La Loma del Real Tesoro (Carmona, Seville, Spain) and its Resources. In: M. Bartelheim/P. Bueno Ramirez /M. Kunst (eds.), Key Resources and Socio-Cultural Developments in the Chalcolithic of the Iberian Peninsula. RessourcenKulturen 6 (Tübingen 2017) 257–272.

FARMM 2014: Fondo Arqueológico Ricardo Marsal Monzón (Sevilla 2014), <https://www.juntadeandalucia.es/export/drupaljda/Marsalfinal.pdf> (last access 8.4.2021).

Féaux de la Croix/Bartelheim 2020: J. Féaux de la Croix/M. Bartelheim, Conceiving Water Bodies and their Uses across Disciplines. How to Grasp Riparian Relations with the Guadalquivir and Syr Darya Rivers. In: S. Teuber/M. Bartelheim/T. Scholten/A. Scholz (eds.), Waters as Resource. Conference Proceedings of the SFB 1070 ResourceCultures and DEGUWA Conference from March 15th to 18th 2018 in Tübingen. RessourcenKulturen 11 (Tübingen 2020) 21–38.

Fernández Flores et al. 2016: Á. Fernández Flores/L. García Sanjuán/M. Díaz-Zorita Bonilla (eds.), Montelirio. Un gran monumento megalítico de la Edad del Cobre (Sevilla 2016).

Fernández et al. 1976: F. Fernández/D. Ruiz Mata/S. de Sancha Fernández, Los enterramientos en cistas del cortijo de Chichina. Trabajos de Prehistoria 33, 351–386.

Ferrer Albelda et al. 2002: E. Ferrer Albelda/M. Camacho/M. L. de la Bandera Romero/F. J. García Fernández, Informe de la prospección arqueológica superficial del Término Municipal de Peñaflor, Sevilla. Anuario Arqueológico de Andalucía 2002, III: Actividades de Urgencia, Volumen 2, 2002, 586–595.

García Rivero/Escacena Carrasco 2015: D. García Rivero/J. L. Escacena Carrasco, Del Calcolitico al bronce antiguo en el Guadalquivir inferior. El Cerro de San Juan (Coria del Río, Sevilla) y el 'modelo de reemplazo'. Zephyrus 76, 2015, 15–38.

García Sanjuán 1998: L. García Sanjuán, La Traviesa. Análisis del registro funerario de una comunidad de la Edad del Bronce. In: L. García Sanjuán (ed.), La Traviesa. Ritual Funerario y Jerarquización Social en una Comunidad de la Edad del Bronce de Sierra Morena Occidental (Sevilla 1998) 101–190.

García Sanjuán 1999: L. García Sanjuán, Los Orígenes de la Estratificación Social. Patrones de Desigualdad en la Edad del Bronce del Suroeste de la Península Ibérica (Sierra Morena Occidental c. 2100–1300 ANE). BAR International Series S823 (Oxford 1999).

García Sanjuán 2017: L. García Sanjuán, Farming Economy and Wealth Economy in the Copper Age of the Lower Guadalquivir River. Debating Strategic Resources at Valencina de la Concepción (Seville, Spain). In: M. Bartelheim/P. Bueno Ramírez/M. Kunst (eds.), Key Resources and Socio-Cultural Developments in the Iberian Chalcolithic (Tübingen 2017) 237–256.

García Sanjuán et al. 2011: L. García Sanjuán/V. Hurtado Pérez/J. Márquez Pérez, El marco territorial de El Trastejón en el contexto de las estrategias de asentamiento en la Edad del Bronce de Sierra Morena Occidental. In: V. Hurtado Pérez/L. García Sanjuán/M. A. Hunt Ortiz (eds.), El asentamiento de El Trastejón (Huelva) (Huelva 2011) 302–347.

García Sanjuán et al. 2013: L. García Sanjuán/J. M. Vargas Jiménez/V. Hurtado Pérez/T. Ruiz Moreno/R. Cruz-Auñón Briones (eds.), El Asentamiento Prehistórico de Valencina de la Concepción (Sevilla). Investigación y Tutela en el 150 Aniversario del Descubrimiento de La Pastora (Sevilla 2013).

García Sanjuán et al. 2017: L. García Sanjuán/C. Scarre/D. W. Wheatley, The Mega-Site of Valencina de la Concepcion (Seville, Spain). Debating Settlement Form, Monumentality and Aggregation in Southern Iberian Copper Age Societies. Journal of World Prehistory 30.3, 2017, 239–257.

García Sanjuán et al. 2018: L. García Sanjuán/J. M. Vargas Jiménez/L. M. Cáceres Puro/M. E. Costa Caramé/M. Díaz-Guardamino Uribe/M. Díaz-Zorita Bonilla/Á. Fernández Flores/V. Hurtado Pérez/P. M. López Aldana/E. Méndez Izquierdo/A. Pajuelo Pando/J. Rodríguez Vidal/D. Wheatley/C. Bronk Ramsey/A. Delgado-Huertas/E. Dunbar/A. Mora González/A. Bayliss/N. Beavan/D. Hamilton/A. Whittle, Assembling the Dead, Gathering the Living. Radiocarbon Dating and Bayesian Modelling for Copper Age Valencina de la Concepción (Seville, Spain). Journal of World Prehistory 31, 2018, 179–313.

García Sanjuán/Hurtado Pérez 2011: L. García Sanjuán/V. Hurtado Pérez, Las dataciones radiocarbónicas de El Trastejón en el marco de la cronologia absoluta de la Edad del Bronce (c. 2200–850 cal A.N.E.) en el Sur de la Península Ibérica. In: V. Hurtado Pérez/L. García Sanjuán/M. A. Hunt Ortiz (eds.), El asentamiento de El Trastejón (Huelva) (Huelva 2011) 138–157.

García Sanjuán/Díaz-Zorita Bonilla 2013: L García Sanjuán/M. Díaz-Zorita Bonilla, Prácticas funerarias en estructuras negativas en el asentamiento prehistórico de Valencina de la Concepción (Seville, España). Análisis contextual y osteoarqueológicos. In: L. García Sanjuán/V. Hurtado Pérez/J. M. Vargas Jiménez/T. Ruiz Moreno/R. Cruz-Auñón Briones (eds.), Valencina Prehistórica. Actas del Congreso Conmemorativo del Descubrimiento de La Pastora (1860–2010) (Sevilla 2013) 387–404.

Gavilán Ceballos 1990: B. Gavilán Ceballos, La Cueva de Huerta Anguita de Priego de Córdoba. Análisis de los materiales prehistóricos. Antiquitas 1, 1990, 12–17.

Gómez Pantoja 2001: J. Gómez Pantoja (ed.), Los rebaños de Gerión. Pastores y trashumancia en Iberia antigua y medieval (Madrid 2001).

Gómez Ramos 1999: P. Gómez Ramos, Obtención de metales en la prehistoria de la Península Ibérica. BAR International Series 753 (Oxford 1999).

Granado Lorenzo/Sánchez Royo 1985: C. Granado Lorenzo/F. Sánchez Royo, La pesca en el río Guadalquivir. Pasado, presente y futuro (Sevilla 1985).

Hardenberg et al. 2017: R. Hardenberg/M. Bartelheim/J. Staecker, The 'Resource Turn'. A Socio-Cultural Perspective on Resources. In: A. K. Scholz/M. Bartelheim/R. Hardenberg/J. Staecker (eds.), Resource-Cultures. Sociocultural Dynamics and the Use of Resources – Theories, Methods, Perspectives. RessourcenKulturen 5 (Tübingen 2017) 13–24.

Hinz et al. 2019: M. Hinz/J. Schirrmacher/J. Kneisel/C. Rinne/M. Weinelt, The Chalcolithic–Bronze Age Transition in Southern Iberia under the Influence of the 4.2 kyr Event? A Correlation of Climatological and Demographic Proxies. Journal of Neolithic Archaeology 21, 2019, 1–26.

Huntingford 1983: E. Huntingford, La estratigrafía Arqueológica de Mesa Redonda y el Bajo Guadalquivir (unpublished PhD-Thesis University of Barcelona 1983).

Hunt Ortíz 2003: M. A. Hunt Ortíz, Prehistoric Mining and Metallurgy in South West Iberian Peninsula. BAR International Series 1188 (Oxford 2003).

Hunt Ortíz 2012: M. A. Hunt Ortíz, Intervenciones Arqueológicas en el Área del Proyecto Minero Cobre Las Cruces (1996–2011). De la Prehistoria a la Época Contemporánea (Provincia de Sevilla, España) (Sevilla 2012).

Hunt Ortíz et al. 2008: M. A. Hunt Ortíz/J. Vázquez Paz/D. García Rivero/J. C. Pecero Espín, Dataciones Radiocarbónicas de las Necrópolis de la Edad de Bronce, Se-K, Se-B y Jardín de Alá (Términos Municipales de Salteras y Gerena, Sevilla). In: S. Rovira Llorens/M. Garcia-Heras/M. Gener Moret/I. Montero Ruiz (eds.), Actas del VII Congreso Internacional de Arqueometría (Madrid 2008) 226–234.

Hurtado Pérez/Amores Carredano 1984: V. Hurtado Pérez/F. Amores Carredano, El Tholos de las Canteras y los enterramientos del Bronce en la necrópolis de El Gandul (Alcalá de Guadaira, Sevilla). Cuadernos de Prehistoria y Arqueología de la Universidad de Granada 9, 147–174.

Hurtado Pérez et al. 2011: V. Hurtado Pérez/L. García Sanjuán/M. A. Hunt Ortíz (eds.), El asentamiento de El Trastejón (Huelva). Investigaciones en el marco de los procesos sociales y culturales de la Edad del Bronce en el Suroeste de la Península Ibérica (Sevilla 2011).

Jiménez Hernández 2004: A. Jiménez Hernández, La secuencia cultural del II milenio a.C. en los Alcores (Sevilla). Carel – Carmona. Revista de estudios locales 2, 2004, 425–590.

Leisner/Leisner 1943: G. Leisner/V. Leisner, Die Megalithgräber der Iberischen Halbinsel. Erster Teil: Der Süden. Römisch-Germanische Forschungen 17 (Berlin 1943).

Lillios et al. 2016: K. T. Lillios/A. Blanco-González/B. L. Drake/J. A. López-Sáez, Mid-Late Holocene Climate, Demography, and Cultural Dynamics in Iberia. A Multi-Proxy Approach. Quaternary Science Reviews 135, 2016, 138–153.

López Palomo 1993: L. A. López Palomo, Calcolítico y edad del bronce al sur de Córdoba. Estratigrafía en Monturque (Córdoba 1993).

López Sáez et al. 2015: J. A. López-Sáez/R. M. Martínez-Sánchez/S. Pérez-Díaz/F. Alba-Sánchez/S. Núñez-de-la-Fuente/C. Serra-González, Dinámica paleoambiental en la campiña de Córdoba (Andalucía) entre el IV y el I milenios cal. BC. Análisis palinológico del yacimiento arqueológico de Torreparedones. Cuaternario y Geomorfología 29.3–4, 2015, 35–55.

Lorrio Alvarado 2009/2010: A. J. Lorrio Alvarado, El Bronce Final en el sureste de la península ibérica. Una (re)visión desde la arqueología funeraria. Anales de Prehistoria y Arqueología. Universidad de Murcia 25–26, 2009–2010, 119–176.

Lorrio Alvarado/Montero Ruiz 2004: A. J. Lorrio Alvarado/I. Montero Ruiz, Reutilización de sepulcros colectivos en el Sureste de la Península Ibérica. La Colección Siret. Trabajos de Prehistoria 61, 2004, 99–116.

Lozano Medina/Aranda Jiménez 2018: A. Lozano Medina/G. Aranda Jiménez, Long-Lasting Sacred Landscapes. The Numerical Chronology of the Megalithic Phenomenon in South-Eastern Iberia. Journal of Archaeological Science: Reports 19, 2018, 224–238.

Márquez Romero/Jiménez Jáimez 2010: J. E. Márquez Romero/V. Jiménez Jáimez, Recintos de Fosos. Genealogía y Significado de una Tradición en la Prehistoria del Suroeste de la Península Ibérica (IV–III milenios AC) (Málaga 2010).

Martín de la Cruz 1987: J. C. Martín de la Cruz, El Llanete de los Moros. Excavaciones Arqueológicas en España 151 (Madrid 1987).

Martín de la Cruz 1988: J. C. Martín de la Cruz, Mykenische Keramik aus bronzezeitlichen Siedlungsschichten von Montoro am Guadalquivir. Madrider Mitteilungen 29, 1988, 77–92.

Martín de la Cruz 1989: J. C. Martín de la Cruz, El bronce en el valle medio del Guadalquivir In: M. E. Aubet Semmler (ed.), Tartessos. Arqueologia Prothistórica del Bajo Guadalquivir (Sabadell 1989) 121–143.

Martín de la Cruz/Barrios Neira 2012: J. C. Martín de la Cruz/J. Barrios Neira, Cogotas I en la secuencia del Llanante de los Moros. Montoro. Córdoba. In: J. A. Rodríguez Marcos/J. Fernández Manzano (eds.), Cogotas I: Una cultura de la Edad del Bronce en la Península Ibérica. Homenaje a Mª Dolores Fernández-Posse (Madrid 2012) 581–606.

Martín de la Cruz et al. 1989: J. C. Martín de la Cruz/J. Serrano Carrillo/J. A. Morena López. Aportación al estudio del Calcolítico en la Campiña Baja. Córdoba-Jaén. Cuadernos de Prehistoria y Arqueología 16, 1989, 43–72.

Martín de la Cruz/Garrido Anguita 2015: J. C. Martín de la Cruz/J. M. Garrido Anguita, Tradición e innovación durante el II milenio A.N.E en el tramo medio del Guadalquivir, I: Los rituales funerarios. Tradition and Innovation along the 2nd Millennium B.C. in the Central Guadalquivir Region, I: The Funerary Rituals. Cuadernos de préhistoria y arqueología de la Universidad Autónoma de Madrid 41, 2015, 181–194.

Martínez Sánchez 2013: R. M. Martínez Sánchez, Cerdos, Caprinos y Náyades. Aproximación a la explotación ganadera y fluvial en el Guadalquivir entre el Neolítico y la Edad del Cobre (3500–2200 A.N.E.). SPAL 22, 2013, 29–46.

Mataloto et al. 2013: R. Mataloto/J. M. Matos Martins/A. M. Monge Soares, Cronologia absoluta para o Bronze do Sudoeste. Periodização, base de dados, tratamento estatístico. Estudos Arqueológicos de Oeiras 20, 2013, 303–338.

Molina González 1983: F. Molina González, Prehistoria. In: F. Molina/J. M. Roldán (eds.), Historia de Granada I. De las primeras culturas al Islam (Granada 1983) 3–131.

Montes Moya 2011: E. Montes Moya, Agriculture of the 3rd and 2nd Millennia BC in the District of Loma (Jaén). Data for Plant Remains of the Eras del Alcázar (Úbeda) and Cerro del Alcázar (Baeza). Menga 2, 2011, 244–250.

Montilla Pérez 1987: S. Montilla Pérez, Prospeccion arqueológica superficial en el término municipal de Alcaudete (Jaén). Anuario Arqueológico de Andalucía (Sevilla 1987) 146–147.

Morena López 1990: J. A. Morena López, Informe preliminar de la prospección arqueológica de superficie realizada en el término de Cañete de las Torres, Córdoba. Anuario Arqueológico de Andalucía 1987 (Sevilla 1990) 108–114.

Moreno Menayo 1986: M. T. Moreno Menayo, Inventario de yacimientos arqueológicos de la Provincia de Sevilla. La Nava Grande. El Castillejo Arva (Sevilla 1986).

Murrieta Flores 2012: P. Murrieta Flores, Understanding Human Movement through Spatial Technologies. The Role of Natural Areas of Transit in the Late Prehistory of South-Western Iberia. Trabajos de Prehistoria 69, 2012, 103–122.

Nocete Calvo et al. 2011: F. Nocete Calvo/R. Sáenz/M. R. Rodríguez Bayona/A. Peramo/N. Inacio/D. Abril López, Direct Chronometry (^{14}C AMS) of the Earliest Copper Metallurgy in the Guadalquivir Basin (Spain) during the Third Millennium BC. First Regional Database. Journal of Archaeological Science 38, 2011, 3278–3295.

Ojeda Calvo et al. 1988: R. Ojeda Calvo/I. Santana Falcon/A. García Gómez, Prospección arqueológica superficial de los terrenos afectados por la presa "José Torán". Anuario arqueológico de Andalucía (Sevilla 1988) 345–353.

Pellicer Catalán 2006: M. Pellicer Catalán, Las investigaciones arqueológicas sobre la protohistoria de Carmona (Sevilla). Temas de estética y arte 20, 2006, 197–222.

Peña Chocarro 2000: L. Peña Chocarro, Agricultura y alimentación vegetal en el poblado de la Edad del Bronce de Peñalosa (Baños de la Encina, Jaén). Complutum 11, 2000, 209–220.

Peral López 2018: J. Peral López, Guadalquivir. Mapas y relatos de un río (Sevilla 2018).

Pérez Macías 1997: J. A. Pérez Macías, Anotaciones sobre el Bronce del Suroeste. Necrópolis de cistas en el entorno del Embalse de Aracena. Huelva en su historia 6, 1997, 67–81.

Pérez Macías 2013: J. A. Pérez Macías, Las minas de Tarteso. In: J. Alvar Ezquerra/J. Campos Carrasco (eds.), Tarteso. El emporio del metal. Actas del I Congreso Internacional (Córdoba 2013) 555–583.

Pérez Macías/Frías 1989: J. A. Pérez Macías/C. Frías, La necrópolis de cistas de La Parrita (Nerva, Huelva) y los inicios de la metalurgia de la plata en las minas de Río Tinto. Cuadernos del Suroeste 1, 1989, 11–21.

Pérez Quesada 2006: P. Pérez Quesada, Carta Arqueológica del Término Municipal de Utrera. Memoria Científica 9.12. Catálogo de Entidades Arqueológicas 2.2 (El Olivar Alto 2006).

Pozo/Tabales 1991: F. Pozo/M. A. Tabales, Intervención arqueológica de apoyo a la restauración en el castillo de Alcalá de Guadaíra. Anuario Arqueológico de Andalucía 1989, 3, Actividades de Urgencia (Sevilla 1991) 536–545.

REDIAM: Red de Información Ambiental de Andalucía (Geographic database), <http://www.juntadeandalucia.es/medioambiente/site/portalweb/menuitem.7e1cf46ddf59bb227a9ebe205510e1ca/?vgnextoid=3beae207c1935310VgnVCM2000000624e50aRCRD&vgnextchannel=871e4d0e54345310VgnVCM1000001325e50aRCRD> (last access 19.1.2020).

Román Rodríguez 2004: J. M. Román Rodríguez, Evidencias funerarias de la Edad del Bronce en Carmona. I.A.P. En el solar N° 1 de la Calle Torre del Oro. Anuario Arqueológico de Andalucía (Sevilla 2004) 1000–1004.

Ruiz Lara 1987: M. D. Ruiz Lara, Calcolítico y Edad del Bronce en la Campiña de Córdoba. Aproximación a su estudio. Estudios de Prehistoria Cordobesa 2, 1987, 61–88.

Ruiz Lara/Murillo Redondo 1992: M. D. Ruiz Lara/J. F. Murillo Redondo, Aproximación al Bronce Antiguo y Pleno en el Sureste de la Campiña Cordobesa. Los Yacimientos del Cerro del Castillo de Aguilar y de Zóñar. Anales de Arqueología Cordobesa 3, 1992, 9–35.

Ruiz Mata 1979: D. Ruiz Mata, Nuevos yacimientos campaniformes de la Provincia de Sevilla. Cuadernos de Prehistoria y Arqueología 5/6, 1978–1979, 41–57.

Sánchez Vizcaíno et al. 2005: A. Sánchez Vizcaíno/J. P. Bellón Ruíz/C. Rueda Galán, Nuevos datos sobre la Zona Arqueológica de Marroquíes Bajos. El quinto foso. Trabajos de Prehistoria 62.2, 2005, 151–164.

Santana Falcón 1988: I. Santana Falcón, Excavación de urgencia de una estructura siliforme de enterramiento en el cortijo de María Luisa (Cantillana, Sevilla). Anuario Arqueológico de Andalucía (Sevilla 1988) 283–284.

Schirrmacher et al. 2019: J. Schirrmacher/M. Weinelt/T. Blanz/N. Andersen/E. Salgueiro/R. R. Schneider, Multi-Decadal Atmospheric and Marine Climate Variability in Southern Iberia during the Mid- to Late-Holocene. Climate of the Past 15, 2019, 617–634.

Schirrmacher et al. 2020: J. Schirrmacher/J. Kneisel/D. Knitter/W. Hamer/M. Hinz/R. R. Schneider/M. Weinelt, Spatial Patterns of Temperature, Precipitation, and Settlement Dynamics on the Iberian Peninsula during the Chalcolithic and the Bronze Age. Quaternary Science Reviews 233, 2020, 1–17.

Scholz et al. 2017: A. K. Scholz/M. Bartelheim/R. Hardenberg/J. Staecker (eds.), ResourceCultures. Sociocultural Dynamics and the Use of Resources – Theories, Methods, Perspectives. RessourcenKulturen 5 (Tübingen 2017).

Schubart 1975: H. Schubart, Die Kultur der Bronzezeit im Südwesten der Iberischen Halbinsel. Madrider Forschungen 9 (Mainz am Rhein 1975).

Schubart/Ulreich 1991: H. Schubart/H. Ulreich, Die Funde der Südostspanischen Bronzezeit aus der Sammlung Siret. Mit Beiträgen von M. Hopf, Kulturpflanzenreste aus der Sammlung Siret in Brüssel und H.-J. Hundt, Gewebereste aus dem frühbronzezeitlichen Gräberfeld von El Argar (Almeria). Madrider Beiträge 17 (Mainz am Rhein 1991).

Schubart et al. 2000: H. Schubart/O. Arteaga Matute/V. Pingel, Fuente Álamo. Las excavaciones arqueológicas 1977–1991 en el poblado de la Edad del Bronce (Sevilla 2000).

Serna et al. 1984: M. R. Serna/J. L. Escacena/M. E. Aubet, Nuevos datos para la definición de un Bronce Antiguo y Pleno en el Bajo Guadalquivir. In: W. H. Waldren/R. Chapman/J. Lewthwaite/R. C. Kennard (eds.), The Deya Conference of Prehistory. Early Settlement in the Western Mediterranean Islands and the Peripheral Areas. BAR International Series 229 (Oxford) 1051–1073.

Sierra Alfonso 1991: F. Sierra Alonso, Excavaciones de urgencia en la necrópolis de Canama. Anuario Arqueológico de Andalucía (Sevilla 1991) 467–475.

Soares/Tavares da Silva 2016: J. Soares/C. Tavares da Silva, Bronze Médio do Sudoeste Ibérico. Indicadores de complexidade social. In: A. C. Sousa/A. Carvalho/C. Viegas (eds.), Terra e Água. Escolher sementes, invocar a Deusa. Estudos em Homenagem a Victor S. Gonçalves. Estudos e Memórias 9 (Lisboa 2016) 359–384.

Teuber/Schweizer 2020: S. Teuber/B. Schweizer, Resources Redefined. Resources and ResourceComplexes. In: S. Teuber/M. Bartelheim/T. Scholten/A. Scholz (eds.), Waters as Resource. Conference Proceedings of the SFB 1070 ResourceCultures and DEGUWA Conference from March 15th to 18th 2018 in Tübingen. RessourcenKulturen 11 (Tübingen 2020) 9–20.

Tinoco Muñoz 1999: J. Tinoco Muñoz, Revisión y actualización del inventario de yacimientos arqueológicos del Término Municipal de Fuentes de Andalucía (Sevilla). Cerro Barrero I (Sevilla 1999).

Torres Ortiz 2002: M. Torres Ortiz, Tartessos. Bibliothea Archaeologica Hispana 14 = Studia Hispano-Phoenicia 1 (Madrid 2002).

Vaquerizo Gil 1986: D. Vaquerizo Gil, Prospección arqueológica superficial en el área de las subbéticas cordobesas. Fase I. Anuario Arqueológico de Andalucía. Actividades sistemáticas y puntuales. Informes y memorias (Sevilla 1986) 85–96.

Zafra de la Torre et al. 1999: N. Zafra de la Torre/F. Hornos Mata/M. Castro López, Una macro-aldea en el origen del modo de vida campesino. Marroquíes Bajos (Jaén) c. 2500–2000 cal. ANE. Trabajos de Prehistoria 56.1, 1999, 77–102.

Zafra de la Torre et al. 2003: N. Zafra de la Torre/M. Castro López/F. Hornos Mata, Sucesión y simultaneidad en un gran asentamiento. La cronología de la macro-aldea de Marroquíes Bajos, Jaén. C. 2500–2000 cal ANE. Trabajos de Prehistoria 60.2, 2003, 79–90.

Astrid Skou Hansen

Defining a Landscape

The Socio-Cultural Significance of Man-Made and Natural Demarcations in a Danish Early Iron Age Landscape

Keywords: resources, pre-Roman Iron Age, pit zone alignment, landscape, settlement

Summary

The case centres on an area in northwestern Denmark, north of the river Storå, and describes the changes in settlement pattern and infrastructure within the timeframe of 500 to 200 BCE. Around this time, the archaeological record shows significant changes in settlement patterns and infrastructure, as well as the introduction of a new raw material: locally sourced iron.

The paper gives a preliminary overview of the evidence, and invites discussion on the implications of defining a prehistoric landscape. By analysing the resource use within the landscape, as well as the demarcations in and around it, the paper aims to show the diversity of a complex landscape, which both form spatial occupation, and is formed by the inhabitants. This duality is at the heart of trying to understand the prehistoric landscape through the eyes of its inhabitants. It also poses an opportunity to determine the interrelation of social dynamics and resource use.

Research Questions

In this paper, two ResourceComplexes, one of which emerges, and one of which is transformed in the first centuries of the pre-Roman Iron Age, approximately from 500 to 200 BCE will briefly be presented. The ResourceComplexes both centre on the exploitation of natural resources: in this case, bog iron and arable land.

The discussion centres on whether there is a link between a new settlement structure emerging during the last centuries BCE, and the pit zones. In other words, were the pit zones dug to affirm the changes in the way people moved through the landscape, associated with the major change of society, economy and settlement linked to the transformation from Late Bronze Age to Early Iron Age societies?

The Research Area

Several natural and human-made demarcations define the densely populated landscape around the river Storå in Denmark. For the purpose of this paper, the scope of research has been limited to the Early Iron Age landscape in Mejrup, east of Holstebro (*fig. 1*), occasionally branching out to the neighbouring Borbjerg and Måbjerg for comparisons. During the last decade, the Mejrup area has been subject to large-scale surveys and excavations in connection with infrastructure and development projects. Holstebro Museum is currently working to establish a multi-disciplinary research project, focusing on settlement and land use in this area from the Late Neolithic until the beginning of the 20th cent., involving archaeology, aerial surveys and historical sources.

The Mejrup area is located at the edge of the Weichselian ice sheet, creating a unique range of naturally occurring features, associated with both the clayey end moraine hills to the north and the

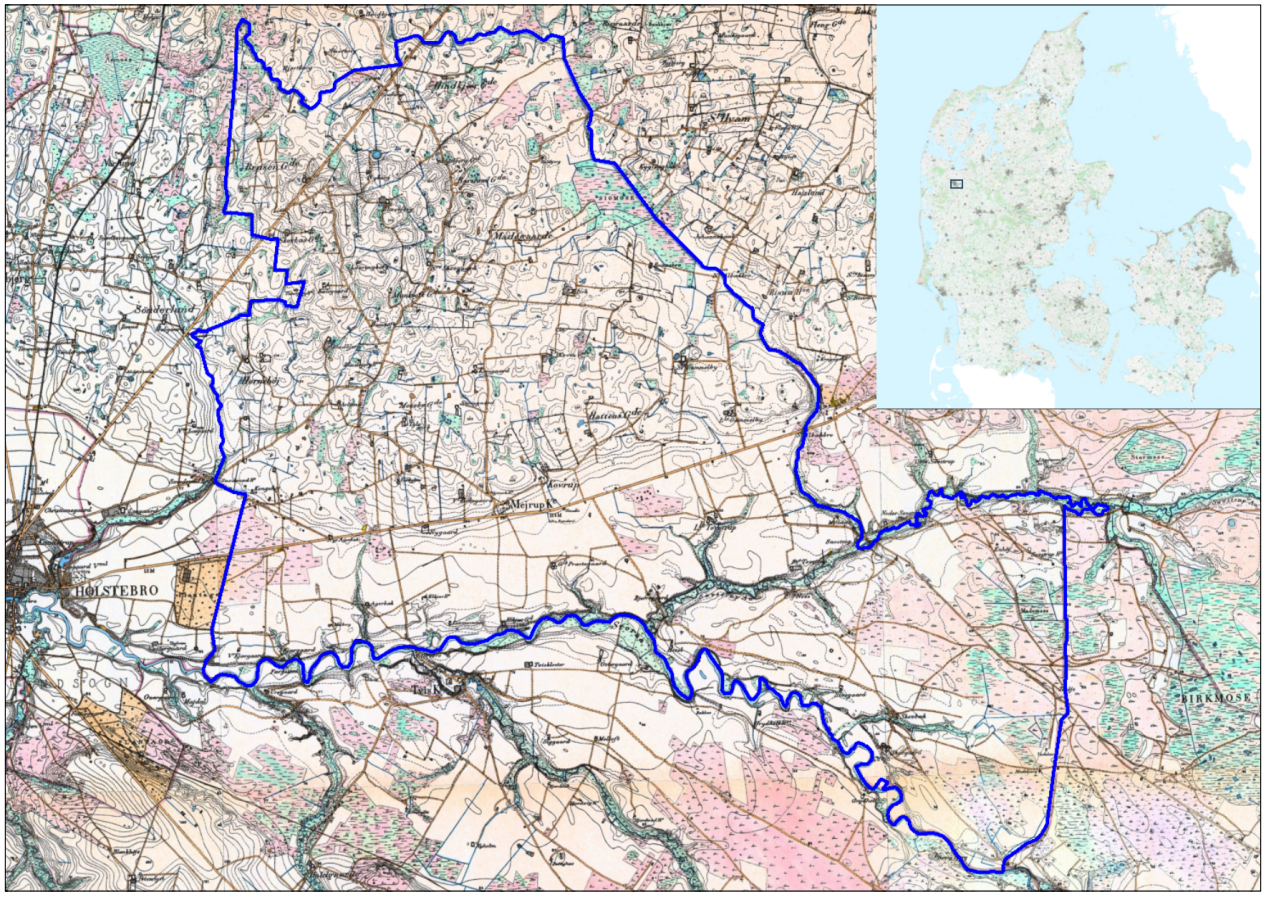

Fig. 1. The Mejrup area is located east of Holstebro, in northwest Denmark. Map (the 1880 survey map) supplied by the Agency for Data Supply and Efficiency.

sandy river valley to the south (Møller/Porsmose 1997; Christensen et al. 2016, 11–33). Some of the natural features of the landscape, which must have characterised the area in the Iron Age, are evident even today. For example, the river to the south with the steep riverbanks and broad river valley, and the small streams that feed it from the hilly northern part of the area. Or the stark contrasts between the flat, sandy plains to the south with large unbroken stretches of arable land, and the hills to the north, where the fields are interspersed with small streams, meadows, or steep hillsides, where herbs and bushes have been allowed to take over. Other features are less obvious, such as the small bogs, containing bog iron, which seem to have featured heavily in the northern part of the area. Today, these small bogs are drained, but they are still visible as wet areas in the fields during the heavy rain periods of late autumn and early spring. Other features again are even less discernible in today's landscape. For example, the expanse of forested areas, which we only know from historical maps and written accounts such as taxation records or legal documents concerning heritage (Møller/Porsmose 1997), or prehistoric sources of fresh water, which are visible on historical maps, but obscured by modern drainage.

Resources in the Landscape

It is evident, that the inhabitants of the area considered many of the landscape features to be valuable resources at different points in history. Well into the 20th cent., the people in the northern and southern part of the area adopted very different subsistence patterns. The northern area was characterised by large farms and the south by smallholdings, which were not able to sustain a family without additional paid work in town or on larger farms (Trap 1906, 516 f.). Resources, of course, are not limited to the exploitation of naturally occurring raw materials. In fact, a narrow socio-economic definition of resources may be

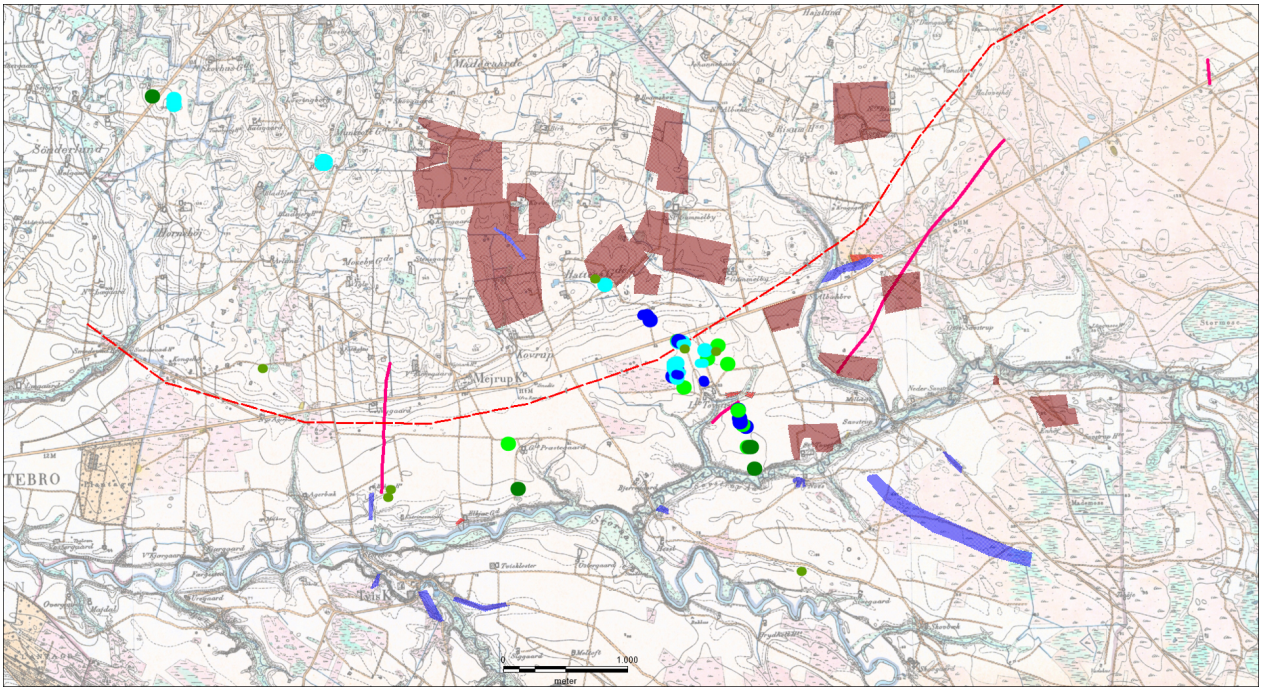

Fig. 2. Late Bronze Age and pre-Roman Iron Age features in Mejrup. Red line: row of mounds. Pink lines: pit zone alignments. Brown raster: Celtic fields. Blue raster: sunken roads. Settlements are indicated by dots. Small dots indicate typological dates; large dots indicate that the feature is radiocarbon dated. Dark green: approximately 700–500 BCE. Light green: approximately 500–350 BCE. Light blue: approximately 350–200 BCE. Dark blue: approximately 200–1 BCE. Map (the 1880 survey map) supplied by the Agency for Data Supply and Efficiency.

limiting to the understanding of the prehistory of a landscape and its inhabitants (Hardenberg et al. 2017). However, the exploration of less material parts of ResourceComplexes, such as communicative, social and spiritual resources, depends on the interpretation of archaeological remains. This is especially true in a pre-literate society, such as southern Scandinavia in the 1st cent. BCE. To interpret the archaeological remains, it is imperative to know, which remains belong to which social units. A logical place to start is the anthropogenic demarcations, which supplemented the natural features of the landscape, from the Late Neolithic onwards. That is where the main emphasis of this paper will be. First, a summary of the archaeological evidence (*fig. 2*), related to the early and middle parts of the pre-Roman Iron Age, or approximately 500 to 200 BCE.

Settlements

In Mejrup parish, the primary archaeological evidence consists of eight excavated settlement sites. Three sites are fully excavated: Luren and Tvis Møllevej in the southwestern part of the area with one house at each site (Steen 2009), and Langemarken with approximately 100 houses (Hansen 2018d), dating to between approximately 650 and 200 BCE. Five sites, among them Store Tovstrup (Thy et al. 2018) and Lille Tovstrup (Hansen 2018a) south of Langemarken, and Øster Hattens/Hattens Nord, Damtoft and Kalsgård in the northeastern part of the area, are partially excavated, with only one or two houses on each site. Most of the houses are either dated typologically, stratigraphically or both. Radiocarbon dates do exist from most of the sites, but they lie on the Hallstatt radiocarbon plateau, and therefore by definition cover a longer period, making them less useful for sequencing the houses (Hansen 2018d). The Iron Age houses at Luren and Tvis Møllevej both represent the latest phase of a Bronze Age single farm. This final phase dates to approximately 500 to 400 BCE. The settlement at Damtoft also dates to this time, while Øster Hattens/Hattens Nord seems to be a bit later, dating to approximately 450 to 350 BCE. The Langemarken settlement has a much longer

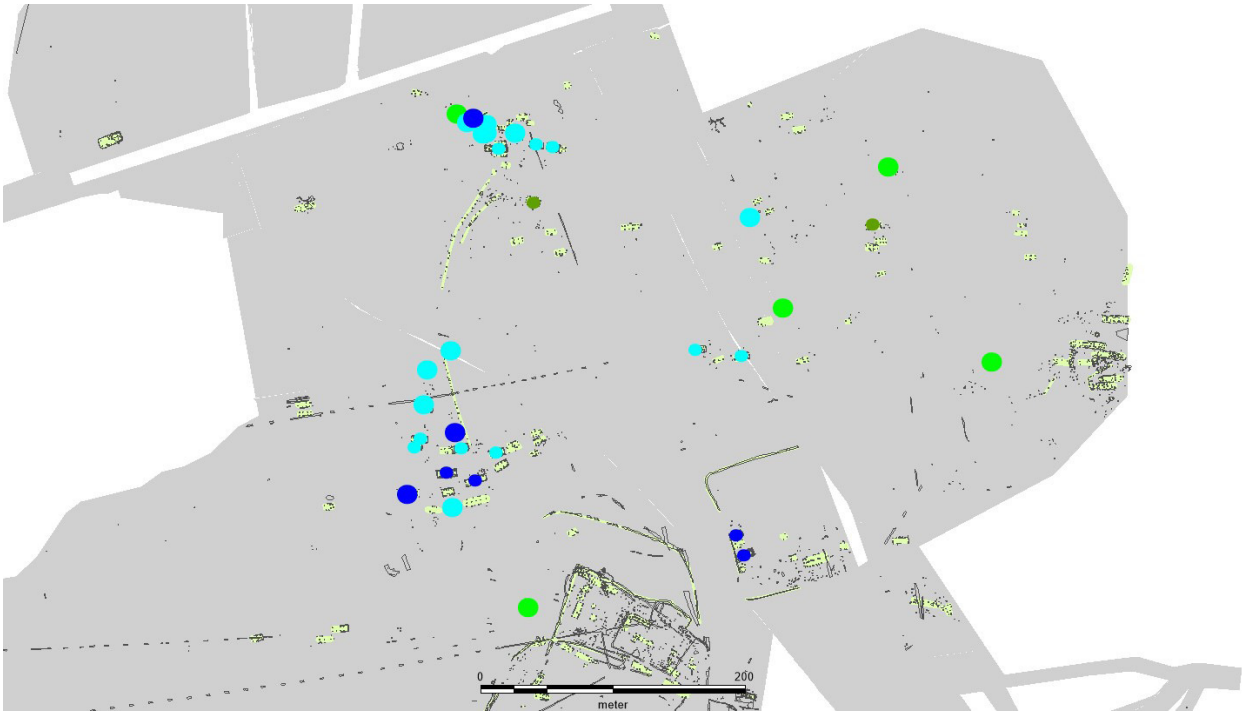

Fig. 3. The settlement site at Langemarken. Small dots indicate typological dates, large dots indicate that the feature is radiocarbon dated. Dark green: approximately 700–500 BCE. Light green: approximately 500–350 BCE. Light blue: approximately 350–200 BCE. Dark blue approximately 200–1 BCE.

lifespan, starting as a dispersed settlement during the Late Bronze Age, and with the youngest houses dating to approximately 200 BCE.

A look at the internal structure of Langemarken confirms that the settlement grows more clustered during the first three centuries of the Iron Age (*fig. 3*). The houses at Langemarken are not fenced, and it is not always possible to determine if a house is a main building or a secondary building. However, since most of the houses contain both living areas and byres, each house is assumed to represent an independent farm. While the older phases display a pattern of dispersed single farms, the youngest houses merge into two separate clusters, one of which is slightly older than the other. This corresponds well with the general changes in settlement structure in western Denmark during the Early Iron Age (Mikkelsen 2002; Møller et al. 2011; Runge 2018), even though the complete lack of fences or other dividing features is a little unusual. The change from dispersed to clustered settlement at the site seems to happen around 400 to 350 BCE, roughly coinciding with the abandonment of the dispersed farms at Luren, Tvis Møllevej and Damtoft.

During the 1st mill. BCE, a system of Celtic fields evolved in the northern part of the area. Very little is known about these particular fields. They are only discernible on aerial photographs, and have not been subject to excavation. Thus, the date is only determined typologically, relying on other field systems in the region (e.g. Nielsen et al. 2018). The majority of Celtic fields date to around the same time as the settlement at Langemarken (approximately 650 to 200 BCE). They might indicate the same change in access to resources – from a dispersed settlement, with fields surrounding each farm, to a nucleated settlement with a larger, coherent arable area consisting of smaller plots or fields surrounded by earthen banks. In other words, the settlement structure and the emergence of Celtic fields seem to indicate a shift, where new ResourceComplexes related to agricultural production emerge approximately 400 BCE.

Iron Smelting and Iron Working

Iron emerges as a resource in Jutland during the first centuries of the Iron Age (500 to 200 BCE)

Fig. 4. Traces of anvil and forge from the Skivevej settlement in Måbjerg.

(Olesen et al. in preparation). At first, the iron working sites are few and clustered in select areas, but during the 3rd cent. BCE they become more numerable, and are found in more areas. In the area around Mejrup, the first traces of iron smelting and smithies date to the first century of the Iron Age (500 to 400 BCE) (Olesen et al. 2020; Hansen 2018d). The presence of bog iron ore and the technology associated with working the ore into iron bars and finished tools are easily identifiable as valuable resources in a society, where the previous long distance metal trade relations of the Bronze Age (Kaul 2018) seem to have dwindled. The emergence of this new ResourceComplex dates to around 500 to 400 BCE, at the very beginning of the Iron Age.

There are only limited traces of iron smelting at Langemarken and the surrounding sites. All that is left is a large slag found in a roof bearing posthole from an Early Iron Age house, a few smaller slag fragments found in various pits and postholes, and traces of a single smelting oven. However, at contemporary sites a bit further north, in Måbjerg, there is evidence of extensive smelting and ironworking. The oldest traced date back to the very beginning of the pre-Rroman Iron Age, but the traces intensify from around 300 BCE (Olesen et al. 2020). Among the features associated with ironworking are several small smithies and smelting huts. One of the well-preserved huts contained an impression left behind by the foundation for an anvil. The foundation (*fig. 4*) was made from a large wooden post covered in clay. The heat from the nearby forge caused the clay to harden and turn red, thus preserving the outline of the post. On the other side of the anvil, a shallow pit containing scalings, ash and charcoal, shows the location of the blacksmiths' working area. A pit containing traces of metalworking on the same site contained several hundred kilos of slag, as well as 49 partially melted bellows-protectors made from clay (Olesen et al. in preparation). Måbjerg is located in the clay hills, and the smelting sites are located at the edge of small bogs, containing bog ore. Therefore, while ironworking might not have been present in large quantity at Langemarken, iron tools were presumably obtainable from neighbouring settlements just 3 to

4km away. Thus, iron might represent a resource to which access was limited. Either by the occurrence of bog iron as a raw material, which is more prevalent in the northern part of the area, or by access to the new set of skills, that meant the iron ore became a valuable resource.

Barriers and Passages, Pit Zones and Sunken Roads

During the Late Neolithic and the Bronze Age, the natural features of the landscape were supplemented by several hundred burial mounds, forming a line parallel to the river. The mounds may indicate a main route for travel, communication and transportation. This feature is known simply as Oldtidsvejen, which translates as the Ancient Road. The row of mounds stretches almost 90km inland from the western coast of Jutland (Müller 1904; Olesen/Skov 1989). During the Late Bronze Age and Early Iron Age, several new features were added. These new features can be divided into two groups: barriers, and passages.

Several passages are still visible in the form of sunken roads, worn into the riverbanks at important crossings. The roads are difficult to date, but one such sunken road at Store Tovstrup correlates stratigraphically to the Late Bronze Age settlement phase. Similar sunken roads at river crossings further south, at Lønborg by the Skjern Å river, have been carbon dated to the Late Bronze Age (Egebjerg 2004, 48). Thus, it is plausible, and even probable, that some of the sunken roads in the Mejrup area were in use during the Early Iron Age.

The barriers consist of four pit zone alignments, constructed during the Early Iron Age. Two pit zone alignments in Mejrup parish, and two in the neighbouring Borbjerg parish (Hansen 2018a; 2018b; 2018c). Pit zone alignments are defined as (Eriksen/Rindel 2001): 'et langstrakt anlæg – et bælte – af mindst tre rækker tætstillede huller, der I anlæggets funktionstid var åbne' or in English: 'a long feature – an alignment – of at least three rows of closely spaced pits, which were open during the use of the feature' (authors translation). The pit zone alignments consist of several hundred small, shallow pits, stretching up to at least 2.4km across the landscape (Eriksen 2018). Some of them are divided into sections, and some have rows of postholes along one side. When pit zone alignments were first discovered, they were compared to 'Cesar's Lilies' or *Cheveux de Frise*, but the pit zone alignments in the Mejrup area contain no evidence of spikes or other objects being placed in or between the pits. Thus, the most plausible interpretation is that they were simply long rows of small, empty pits. They might have been a temporary hindrance for a group intent on crossing them, but they are not a substantial defence. While the roads are still (partially) in use and the mounds are visible as relics in the landscape today, the pits were never re-dug. They must have sanded over within a decade or two at most, thus representing a very specific but unknown event.

Together, the anthropogenic and natural features and demarcations have shaped the landscape, adding a valuable aspect to understanding the dynamic of ResourceComplexes on and around sites within the area. However, the features themselves are also part of the ResourceComplexes of the inhabitants. Thus, the question arises, what significance did the demarcations hold to the inhabitants?

On a macro level, the purpose of the mounds seems self-evident. They were constructed to contain burials from the Late Neolithic or Bronze Age. However, the placement of the mounds is not as easily explained. Rows of mounds are common throughout Jutland and seem to be an integrated part of the Bronze Age cosmology (Müller 1897; 1904). At this point, the settlement pattern consisted of single or double farmsteads with no traces of regional centres. Thus, the construction of this particular row of mounds – spanning almost 90km – must have been the result of a common understanding of the 'correct' way to place a mound in the landscape, shared throughout a substantial area, but not directly regulated by a single, regional power such as a chieftain (Müller 1904; Johansen et al. 2004). The mounds were often placed a small distance away from the settlement. This may have a practical explanation: in order to obtain building materials for the mounds, fertile topsoil had to be stripped from vast areas. Since fields were placed near the settlement, it was less costly to agricultural production to strip the soil

in other areas. During the Neolithic, the mounds were relatively small and placed in lower laying areas. During the Bronze Age, they are larger, and placed more prominently in the terrain. The Bronze Age mounds seem to be placed in locations, where they were easily seen from a distance. This placement, high in the terrain, easily visible, is the reason for the suggestion that the row of mounds indicate a travel route through the area, running along the border between the hilly moraines and the heathlands (Müller 1904; Olesen/Skov 1989, 3–13).

The pit zones and sunken roads were added during the Early Iron Age, when the settlement and land use patterns were under transformation. The purpose of the sunken roads seems self-explanatory: they wore into the hills, because people continuously sought out the best places to cross the rivers and river valleys. Thus, they represent very concrete access points to areas further away, facilitating exploitation of raw materials in other areas, as well as communication and exchange with neighbours. In that way, they become a part of the ResourceComplex surrounding several activities, which all depend on infrastructure,

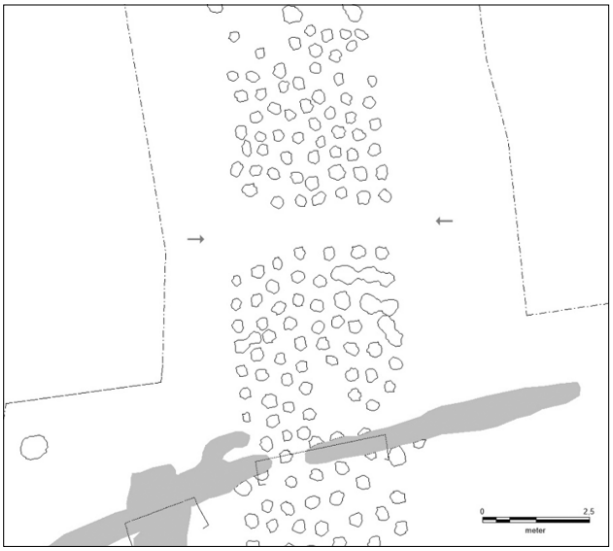

Fig. 5. The southern opening in the pit zone alignment at Tvis Møllevej. The nearest contemporary house was located 85m east of the opening.

for example exchange of goods, diplomatic or political ties with allies, herding of livestock.

The four pit zone alignments are all located relatively near the old Bronze Age route, marked by the row of mounds. Two are running parallel to the old route, one crosses it, and one is only known

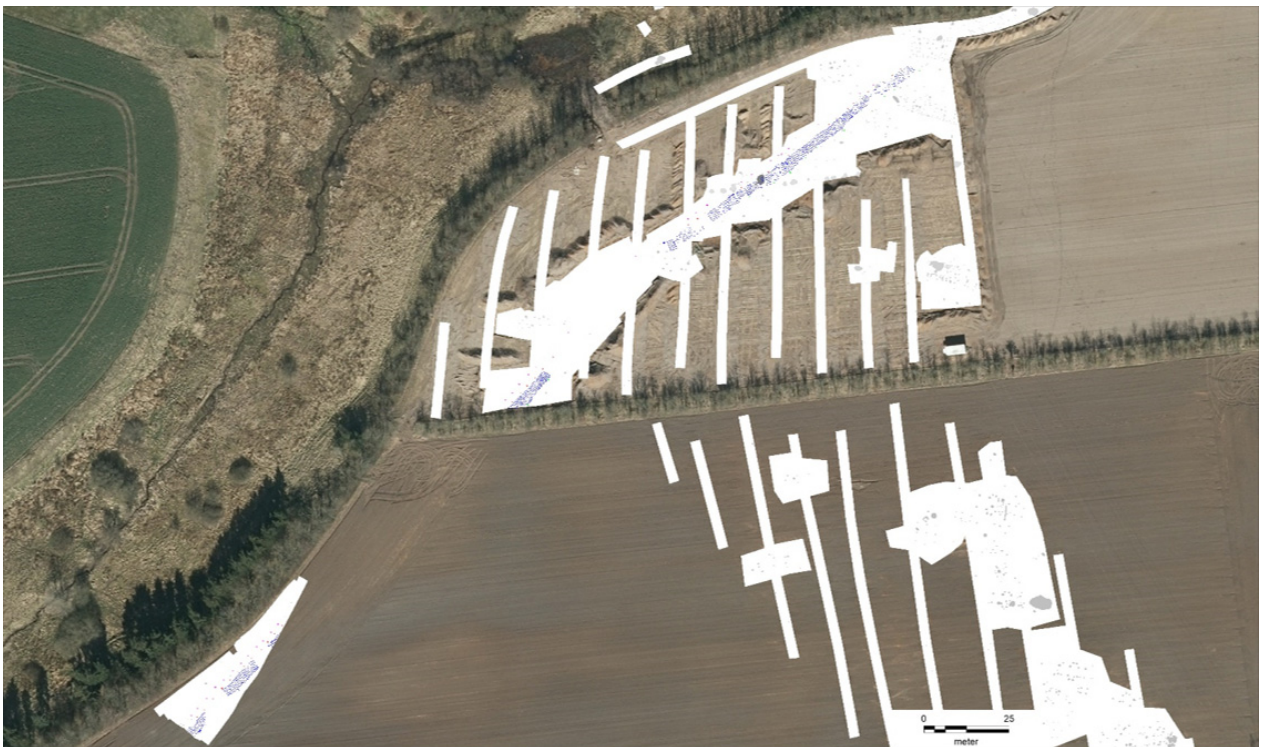

Fig. 6. The pit zone alignment at Lille Tovstrup. The pit zone runs parallel to a small river valley (Aerial photo supplied by the Agency for Data Supply and Efficiency).

Sample nr.	Feature nr.	Lab code	Sample type	Uncalibrated	Calibrated age (1 & 2 sigma ranges)
DKM 20.700 X13008.1	A13024	Poz-83320	Charcoal (corylus)	2425 +/- 30 BP	68.2% probability 700BCE (1.3%) 696BCE 540BCE (66.9%) 411BCE 95.4% probability 749BCE (17.6%) 684BCE 667BCE (5.5%) 641BCE 588BCE (0.9%) 579BCE 562BCE (71.4%) 403BCE (IntCal13)
DKM 20.700 X13021.1	A13698	Poz-83321	Charcoal (alnus)	2400 +/- 30 BP	68.2% probability 508BCE (5.8%) 499BCE 493BCE (62.4%) 406BCE 95.4% probability 731BCE (7.4%) 691BCE 660BCE (1.4%) 651BCE 544BCE (86.6%) 399BCE (IntCal13)
DKM 20.700 X13022.1	A13687	Poz-83322	Charcoal (alnus)	2385 +/- 30 BP	68.2% probability 489BCE (68.2%) 401BCE 95.4% probability 728BCE (1.3%) 717BCE 706BCE (1.6%) 694BCE 542BCE (92.5%) 395BCE (IntCal13)

Tab. 1. Lille Tovstrup. Radiocarbon dates (Calibrated w. OxCal).

from a small trial trench, thus its direction is yet undetermined. The three pit zone alignments with determinable directions are all associated with sunken roads and river crossings.

The westernmost pit zone alignment at Tvis Møllevej crosses the row of mounds. Its southern end is located just north of a river crossing at Storebro (Steen 2009; Hansen 2018c) and from here it stretches at least 1.3km north. It has two smaller openings, one near the southern end (*fig. 5*), and one approximately 800m further north. The openings allowed pedestrian traffic through, but made it difficult for heavier traffic, such as wagons, riders or herds of cattle to cross. The openings are lightly funnel-shaped with the widest part to the west. The southernmost opening is situated just 85m west of the Tvis Møllevej settlement. If the pit zone alignment was dug while this settlement was still in use, the small opening might have allowed the inhabitants to move freely through this new feature in their immediate surrounding, while still leading traffic from further away towards the river crossing.

The northeastern end of the pit zone alignment at Lille Tovstrup (*fig. 6*) sits at the edge of the crossing at Gammelby Bæk. This pit zone alignment is located a bit further away from the row of mounds. It runs parallel to a small river valley, cutting off a narrow strip of land, only about 50m wide (Hansen 2018a), thus preventing heavy traffic from crossing the river valley along the pit zone alignment, leading traffic towards the river crossing at the northeastern end, closest to the settlement at Langemarken. The pit zone alignment at Lille Tovstrup is radiocarbon dated to 562–403 BCE, 544–399 BCE and 542–395 BCE (Hansen 2018a, 309).

The pit zone at Risum Østergård, further east runs parallel to the row of mounds, with the southwestern end located at the brink of a river valley south of the crossing at Store Albæk Bro (Steen 2005; Hansen 2018b). This pit zone alignment is the longest known feature of its kind, stretching at least 2.3km northeast/southwest. The northwestern endpoint has not been located. The feature is radiocarbon dated to 700–530 BCE and 330–200 BCE (Hansen 2018b, 117). The dates were obtained from a piece of oak, and a small twig of heather (*tab. 1, 2*). Taking into account the possible age of the oak timber, and the possibility that the twig of heather might have been deposited in the pit at any time during the use of the feature, due

Sample nr.	Feature nr.	Lab code	Sample type	Uncalibrated	Calibrated age (1 & 2 sigma ranges)
HOL 20.443 X39	N39	Aar-10074	Charcoal (quercus sp.)	2535 +/- 30 BP	68.2% probability 800BCE (26.6%) 740BCE 690BCE (13.5%) 660BCE 650BCE (24.5%) 590BCE 580BCE (3.7%) 560BCE 95.4% probability 800BCE (34.4%) 710BCE 700BCE (61.0%) 530BCE (IntCal04)
HOL 20.443 X11B	N10	Aar-10073	Charcoal (calluna vulgaris)	2249 +/- 32 BP	68.2% probability 390BCE (25.4%) 350BCE 290BCE (42.8%) 230BCE 95.4% probability 400BCE (31.0%) 340BCE 330BCE (64.4%) 200BCE (IntCal04)

Tab. 2. Risum Østergård. Radiocarbon dates (Calibrated w. OxCal).

to seasonal burning of the surrounding moor, the date of the pit zone alignment at Risum Østergård can be tentatively set to 500–200 BCE. If the pit zone alignment is assumed contemporary with the one at Lille Tovstrup, less than a kilometre away, then the later part of the timespan seems to be the most plausible.

Interpretation

Were the pit zones dug to affirm the changes in the way people moved through the landscape, associated with a new settlement pattern? If we look at the question through the lens of simple transportation, the old route, loosely marked by the row of mounds, winding through a dispersed settlement, was no longer optimal, when settlement became more centralised. The new spatial organisation may have necessitated more tightly regulated travel routes, ensuring that traffic went through the appropriate channels, bringing it close by the settlement and thereby ensuring access to the resources brought by the flow of people, be it access to and control of traded goods, news, or the ability to control who passed through the area.

Looking at the problem from a more immaterial viewpoint, controlling the flow of people might not just be about securing access to resources, but also about social coherence, and consolidating a new way of organising space (Løvschal 2014). However, things are not always so clean cut. Most of the time, archaeological phenomena are both practical and social in nature. The purpose may have been practical, but digging the long rows of pits must have been a considerable effort for a farming community, like the one at Langemarken. Experimental archaeology, carried out by the University of Copenhagen, suggests that a team of 26 able-bodied individuals (e.g. archaeology students) would be able to complete 100 meters of pit zone in one day (Lyngstrøm 2015, 191 f.). However, the study also makes the point that calculating the amount of time related to completion of work processes in a prehistoric context is very difficult, bordering on impossible. The conclusion remains: digging a pit zone alignment was time consuming and demanded cooperation. Thus, it must have been quite the social event, probably remembered long after the pits sanded over, even if the purpose of the pit zones themselves was practical in nature. Which brings the argument back to the concept of duality, where the landscape is both formed by, and forming the inhabitants.

Concluding Remarks

The pit zone alignments were dug at a time when the settlement structure was changing from dispersed single farms, to larger, more coherent settlements, thus redefining the landscape as seen by its inhabitants. Regardless of the reason

for, and the consequences of this transformation of the settlement pattern, the changing use of the landscape called the old conventions of barriers, passages and routes through the area into question. The landscape shaped the way people moved through it – the easiest places to cross the rivers and streams became focal points. At the same time, the trade- and communication routes became part of a ResourceComplex related to infrastructure, such as trade, communication, and an overall understanding of the 'correct' way to move in the landscape. By repeating these activities through time, the people formed the landscape, confirming the routes and focal points by wearing sunken roads into the hills to the point where the old crossings are still in use today, more than two millennia after the pit zones were dug.

Astrid Skou Hansen
Holstebro Museum
Museumsvej 2b
7500 Holstebro
astrid.hansen@holstebro-museum.dk

Bibliography

Christensen et al. 2016: T. H. Christensen/N. K. Larsen/J. R. Wilson/S. Raarup/M. Kjærstrup/A. Petersen/T. Damholt, Application for Geopark West Jutland to become a UNESCO Global Geopark (Lemvig 2016).

Egebjerg 2004: T. Egebjerg, Høje og hjulspor i tusindvis – færdsel i det vestjyske landskab. FRAM. Fra Ringkøbing Amts Museer 2004, 44–51.

Eriksen 2018: P. Eriksen, Hulbælter. In: P. Eriksen/P. O. Rindel (eds.), Lange linjer i landskabet – Hulbælter fra jernalderen (Højbjerg 2018) 11–20.

Eriksen/Rindel 2001: P. Eriksen/P. O. Rindel, Lyngsmose og Lystbækgård – et borremoseanlæg og Cæsars liljer i Vestjylland. FRAM. Fra Ringkøbing Amts Museer 2001, 9–21.

Hardenberg et al. 2017: R. Hardenberg/M. Bartelheim/J. Staecker, The 'Resource Turn'. A Sociocultural Perspective on Resources. In: A. K. Scholz/M. Bartelheim/R. Hardenberg/J. Staecker (eds.), ResourceCultures. Sociocultural Dynamics and the Use of Resources – Theories, Methods, Perspectives. RessourcenKulturen 5 (Tübingen 2017) 13–24.

Hansen 2018a: A. S. Hansen, Lille Tovstrup. In: P. Eriksen/P. O. Rindel (eds.), Lange linjer i landskabet – Hulbælter fra jernalderen (Højbjerg 2018) 301–309.

Hansen 2018b: A. S. Hansen, Risom Østergård. In: P. Eriksen/P. O. Rindel (eds.), Lange linjer i landskabet – Hulbælter fra jernalderen (Højbjerg 2018) 112–119.

Hansen 2018c: A. S. Hansen, Tvis Møllevej. In: P. Eriksen/P. O. Rindel (eds.), Lange linjer i landskabet – Hulbælter fra jernalderen (Højbjerg 2018) 120–126.

Hansen 2018d: A. S. Hansen, Typehuse fra jernalderen. Holstebro museums Årsskrift 2018, 31–38.

Johansen et al. 2004: K. L. Johansen/S. Terp/M. K. Holst, Spatial Patterns of Social Organization in the Early Bronze Age of South Scandinavia. Journal of Anthropological Archaeology 23, 2004, 33–55.

Kaul 2018: F. Kaul, Gennem europæiske landskaber Bronzealderens vidtstrakte forbindelser – og hvordan var de mulige? In: S. Boddum/N. Terkildsen (eds.), Status og samfundsstruktur i yngre bronzealders kulturlandskab. Yngre bronzealders kulturlandskab 6 (Viborg 2018) 9–36.

Lyngstrøm 2015: H. Lyngstrøm, Experiments on Digging Pits in Pit Zone Alignments. Danish Journal of Archaeology 3.2, 2014, 187–193.

Løvschal 2014: M. Løvschal, Emerging Boundaries. Social Embedment of Landscape and Settlement Divisions in Northwestern Europe during the First Millennium BC. Current Anthropology 55.6, 2014, 725–750.

Mikkelsen 2002: M. Mikkelsen, Bebyggelsen i bronzealder og tidlig ældre jernalder i Østthy (unpublished PhD-Thesis University of Aarhus 2002).

Müller 1897: S. Müller, Vor Oldtid (København 1897).

Müller 1904: S. Müller, Vei og Bygd i Sten- og Bronzealderen. Aarbøger for Nordisk Oldkyndighed og Historie 2.19, 1904, 1–64.

Møller et al. 2011: N. A. Møller/S. S. Quistgaard/S. F. Jensen, Nyt fra Vestfronten. Nord- og vestjyske bebyggelser fra ældre jernalder (København 2011).

Møller/Porsmose 1997: P. G. Møller/E. Porsmose, Kulturhistorisk inddeling af landskabet (København 1997).

Nielsen et al. 2018: N. H. Nielsen/M. K. Holst/A. C. Gad/K. K. Holst, The Layout and Internal Development of Celtic Fields. Structural and Relative Chronological Analyses of Three Danish Field Systems. European Journal of Archaeology 21.3, 2018, 385–410.

Olesen/Skov 1989: L. H.Olesen/T. Skov, Oldtidsvejen fra Vesterhavet til Karup Å. En registrering af vejforløbets historie og nuværende tilstand (Holstebro 1989).

Olesen et al. 2020: M. W. Olesen/A. S. Hansen/P. M. Christensen, Iron Smelting in Central and Western Jutland in the Early Iron Age, 500 BC to AD 200. In: M. Brumlich/E. Lehnhardt/M. Meyer (eds.), The coming of Iron. The Beginnings of Iron Smelting in Central Europe. Berliner Archäologische Forschungen 18 (Berlin 2020) 61–80.

Runge 2018: M. Runge, Regionale aspekter af hierarki og samfundsstruktur på overgangen mellem bronze- og jernalder. In: S. Boddum/N. Terkildsen (eds.), Status og samfundsstruktur i yngre bronzealders kulturlandskab. Yngre bronzealders kulturlandskab 6 (Viborg 2018) 59–76.

Steen 2005: B. Steen, Stolpehulsbæltet ved Risum Østergård. Holstebro Museums Årsskrift 2005, 15–27.

Steen 2009: B. Steen, Forsvarsanlæg og bebyggelse ved Tvis Møllevej. Holstebro Museums Årsskrift 2009, 5–16.

Thy et al. 2018: P. Thy/G. Barfoed/A. S. Hansen/L. B. Christensen, Conditions and Source Recorded in Scoria from an Intentional Fire at Store Tovstrup Iron Age House, Central Jutland, Denmark. Journal of Archaeological Science 21, 2018, 702–711.

Trap 1906: J. Trap, Kongeriget Danmark 5 (København 1906).

Michael Kempf

The Designed Landscape

Spatial Concepts of Human-Environmental Interactions in Early Medieval South Germany

Keywords: landscape archaeology, GIS, glocalisation, land-use, settlement continuity, Early Middle Ages

Acknowledgements

This article benefitted greatly from the constructive input of Thomas Meier (Heidelberg) and a second anonymous reviewer. I would further like to thank Margaux Depaermentier (Basel) and Eli Weaverdyck (Freiburg) who proof-read the paper and added valuable comments to the discussion. I am also grateful to Uwe Müller, Hannah Bohnenberger, and the editorial team of the SFB 1070 for their support during the editing process. Michael Kempf received funding from the Czech Republic under grant number CZ.02.2.69/0.0/0./18_053/00 16952; Postdoc2MUNIm order number 21 0053; Masayk University, Brno, Czech Republic.

Abstract

Quantitative analysis and modelling of the archaeological record are common tools for the definition of activity spheres of individuals and groups. However, these cultural models quickly tend to draw clearly limited distribution ranges of ethnically distinct 'peoples' and their 'territories'. But communication corridors, material distribution and individual mobilities are subject to a rather multi-layered variety of physical-natural and cognitive-experienced parameters that lead to a certain created landscape that is transformed and expanded over time. The potential of landscape or system archaeology lies in the combination and integration of the various parameters that form the specific individual landscapes. In order to evaluate and apply these parameters to past societies, however, archaeologists are dependent on modern surface conditions that are interpolated to draw conclusions about past environmental feedbacks. But how do patterns of pre-modern societies behave in comparison to those of today's land surfaces? How strong is the impact of modern land-use activity and surface modification on our perception of the dispersal of the archaeological record? This article analyses spatial patterns of Early Medieval land-use in the Upper Rhine Area with regard to settlement continuity and the modern bias of the archaeological distribution.

1. Problems and Inaccuracies

Landscape archaeology is *en vogue*. In this context, discussion about the terminology of landscape is also increasing. This leads to a mixture of concepts and definitions from many scientific fields and subcategories, which results in an increasingly blurred terminology that makes it difficult to understand the methodology and its limitations. Perhaps this is because archaeologists cannot determine precisely where the interfaces between physical environmental factors and mental landscapes are. Detailed arguments about the terms landscape archaeology and environmental archaeology have been proposed by Thomas Meier in 2009 and further in 2017. This article,

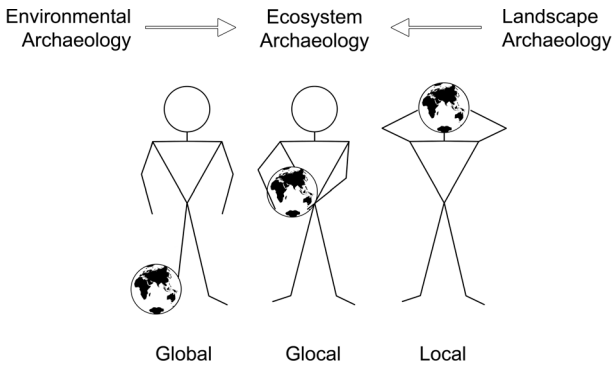

Fig. 1. Differentiation of the concepts of landscape and environmental archaeology and the development of so-called ecosystem archaeology. The spatial spheres of interaction shift: the global (objective) level of observation is abandoned in order to approach the local (cognitive) level of experience. The local perception of the landscape and a global exchange and communication network are integrated on the glocal level.

however, aims to widen the terminological discussion through the integration of a concept proposed by Rainer Schreg: system archaeology (e.g. Schreg 2008). A landscape concept based on human ecology includes not only the ecosystem, but also the traditional horizons of experience of an anthropogenically transformed environment. For this reason, theoretical concepts for the integration of natural sciences in archaeology and material aspects of cultural transfer and activity spheres of individuals and groups will be critically revised. Finally, a multivariate landscape analysis of the Upper Rhine Area will focus on shifting land-use opportunities and site dispersal from the Roman Period to the Early Middle Ages.

1.1. Landscape Archaeological Concepts

Landscape archaeology has a rather short-term history and came into use in the mid-1970s (Fleming 2006, 267; David/Thomas 2008, 27). However, it took until the 1980s and Colin Renfrew's advance in the field of cognitive archaeology for landscape archaeology to become established in post-processual approaches (Doneus 2013, 303): the categorical separation or inclusion of culture and environment (Ingold 2000; Meier 2009, 704 f.). Basically, landscape archaeology has become an umbrella term for spatial patterns in archaeology (Doneus 2013, 39). It aims to understand how space has been organised and structured in pre-modern societies through emotional meaning, experience and categorisation of landscapes (Meier 2009, 731 f.). Landscape archaeology thus does not simply represent an extension of environmental or settlement archaeology, but in contrast, a conglomerate with explicitly cultural-scientific methods for the social reconstruction of spatial life worlds (Meier 2017, 17). In this context, it is methodologically difficult to reflect on the spatial level of landscape archaeology and thus the life worlds of societies, groups or individuals. According to Thomas Meier, environmental archaeology is defined as 'the investigation of the cause-and-effect relationships and interactions between societies and the natural spaces they use' (Meier 2017, 13). This assumption reflects large-scale and globally active natural-spatial networks, circulations, control, and feedback patterns. Rainer Schreg proposes a connection between cultural-scientific aspects of landscape and human-nature interaction, and thus also testifies to the unclear definition criteria of these scientific aspects (Schreg 2008, 140). But Schreg adds a subcategory to the concepts of landscape and environment beyond classificatory dilemmas: human ecology (Schreg 2008, 140). The integration of trans-regional geographic networks and the dissolution of the local environment enable an objective consideration of resource distribution, land-use, supraregional communication, mobility, and exchange as well as transcultural adaptation and development processes.

An elegant alternative (or possible extension) to environmental archaeology would be the orientation towards a system or process archaeology (*fig. 1*) (Schreg 2011, 208). Although Schreg considers this extension of environmental archaeology as a major component of the reconstruction of past landscapes, he focuses on the environment and humans as integrative parts of a comprehensive ecosystem (Schreg 2011, 208). It can be debated whether pre-modern landscapes can be reconstructed (Kempf 2019; 2020c). The change to a holistic geosystem concept, however, seems to address the right scale and combines a multitude of elements of flora and fauna, climate and soil, geomorphology and hydrology. Probably, this is the key to the understanding of supra-regional interaction patterns of past societies.

Landscapes can be subject to a variety of aggregated cultural and physical entities of human life worlds. Recently, the internal and external relationships between an object and its observer(s) were pointed out by Stefan Schreiber (2018). These relationships are continuously perceived transfers between an object and its participants in a specific moment in a specific spatial framework. The term assemblages that Schreiber uses to describe the constant exchange between already existing pasts and new, constantly added experiences and changes (Schreiber 2018) can be applied to the construction of landscapes. Landscape assemblages, therefore, would allow the idea of a non-static use of environmental resources that constantly emerge and vanish: a situational reflection of an individual's surrounding in spatial and temporal perspectives.

In this context, the question of the spatial and temporal character, the variability of the landscape and the possible interpretation of archaeological material arises. This approach is also applicable to the theoretical discussion on observation and participation outside or within a specific (mental) system. In contrast to the uninvolved observer, who acts as an objective narrator of the landscape (Barrett 1999, 22), the inclusion of the observer leads to a multitude of possible interpretations of the archaeological evidence (Fleming 2006, 268).

These two systems are not considered to be interconnected. A similar concept can be found in the spatial categorisation or characterisation of interconnected places. Mental concepts of places that are interwoven over long distances can sometimes show intensive functional interdependencies, while other places that are only a few kilometres apart are increasingly decoupled from each other due to a lack of exchange and communication (Freytag 2014, 19). The concept of globalisation as 'time-space distanciation' (absence-presence) (Robertson 1995) can only be applied to pre-modern societies in an abstracted form. If the cognitive level of a perceived landscape is described as a distant, constant background noise (absence), and the immediate, permanently established everyday environment as a level of continuity (presence), the relationship between distant and direct location lies in the perception of the totality of the experienced landscapes. This ultimately points towards the concept of glocalisation and its further abstraction of a 'global outlook adapted to local conditions' (Robertson 1995, 28). Glocalisation means local overworking and recycling of the output of supraregional (or somewhat global)[1] factories of ideas (Bauman 2013, 1 f.).[2] In this case glocal is to be understood as connection element between large- and small-scale landscape spheres (and hence human sphere of activity), which include not only all direct ecological (potential agriculture and livestock farming, soil quality, water access and availability, local flora and fauna etc.) and cultural parameters (social forms, family, hierarchy, religion, cult, myth etc.) but also supraregional and global patterns (prevailing wind direction, seasonal cycles, rainfall patterns and changes, plant ecological factors, infrastructures, trade routes, fashion etc.).

1.2. Spheres of (Inter-) Activity

The integration of landscapes in the world of human movements, relationships and perceptions characterises the complex interaction of people, space and things (Bender 2001, 76). But what spatial or temporal criteria define these human-environmental interactions? Primary factors are availability and accessibility (Butzer 1982). Depending on the spatial extent of available land, the area of potential land-use is restricted or not. Those limits, however, are set by mere physical variables disregarding the mental perception of the direct landscape. Landscapes not only provide

1 To assume a concept of a global and objective understanding of space seems impossible not only for pre-modern societies. This concept theoretically encompasses the wholeness of all spatial manifestations of culture (cultural landscape) and the environment. The human being acting in it is assumed to have a permanent knowledge of the complex totality of this space, on the basis of which he acts at all times. However, this *homo geographicus* does not exist (Borsdorf 2002, 48).

2 Zygmunt Bauman describes the concept of glocalisation as 'local repair workshops servicing and recycling the output of global factories of problems' (Baumann 2013, 2). It refers to the concept of large cities, which of course cannot be used in this article. Terminologically, however, the model is highly interesting with regard to the term 'material culture' (that still needs to be clarified) and the associated concept of original and imitation of objects.

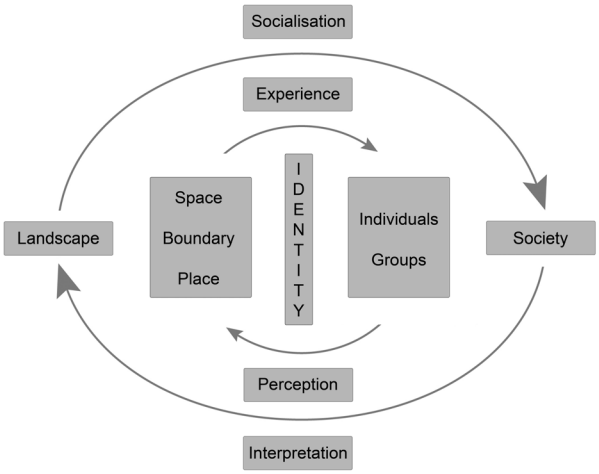

Fig. 2. The constitution of landscape. Interaction and perception of landscapes by individuals and groups in a hypothetical society (rearranged and modified by the author, with permission by Alexander Gramsch 1996, 29, Fig. 2).

resources but also include a system of layered cultural, social, religious and cultic meanings (Brather 2011, 132–134; Zimmermann et al. 2004, 39). That demands the idea and concept of a designed landscape with interacting individuals and a constant rearrangement of nature – including the hypothesis that landscapes are built not only by direct human intervention but also by human experiences (*fig. 2*) (Gramsch 1996). That personal idea of spheres generates a mental topography of good and bad perceptions creating cross-generational narratives of landscapes. In other words, landscape functions as image carrier of individual or group identity.

The extent to which the landscape is restricted is closely connected to the homogeneity of human activity ranges (*fig. 3*). Human activity is hardly homogeneous and adjacent spheres cannot always be separated from each other. This approach also applies to the concept of landscape, in which there are no natural boundaries and whose components do not create boundaries. The interaction of individual and environment or individual and landscape, on the other hand, creates a cultural sphere of influence through the transformation of space, which can be distinguished from other spheres of influence. However, these situational boundaries are semantically negotiable rather than static and reflect sociocultural or cultic markers more than actual spaces of activities of individuals (Gramsch 1996, 27).

The congruence of human activity ranges with the archaeological distribution (the distribution of findings or the greatest density of findings) is used to understand dependence on natural parameters and the propagation of material culture and thus the human activity spheres themselves. However, this theoretical approach does not accommodate the interpretation of the absence of finds and thus the question of the modelling of 'empty spaces' (or 'no-data spaces') in the archaeological landscape. Archaeologically empty areas in the landscape are usually associated with 'unfavourable areas' and are thus exemplary for a natural space limited by itself. On the other hand, the fact that these empty regions have undergone constant use and transformation that has resulted in an increased archaeological record, is either forgotten due to a lack of interpretation possibilities or suppressed due to their 'non-modelability'. The traditional approach defines certain areas within a landscape that do not provide a record of human activity and are therefore considered uninhabited and unused. However, these spheres sometimes create communication corridors that are important for the mental identities of society. In order to overcome a perceived environmental barrier, to expand the material or immaterial property of a person through trade or communication, the perception of a designed border must already exist, at least at the cognitive level. The prerequisite for the idea of passing a barrier is the acceptance of the existence of a barrier. The simple perception of natural boundaries does not contradict their importance as network builders. Areas of space and activity in an archaeological context are therefore only made accessible through an understanding of the physical, mental, spatial, and cultural influencing factors.

2. Approaches to the Reconstruction of Human/Landscape Interactions

Geography is the source of numerous concepts of landscape archaeology. However, these components are manifold and underlie a variety of methodical limitations, different scales and hence different digital approaches and models. Global phenomena are coupled on the large scale, but

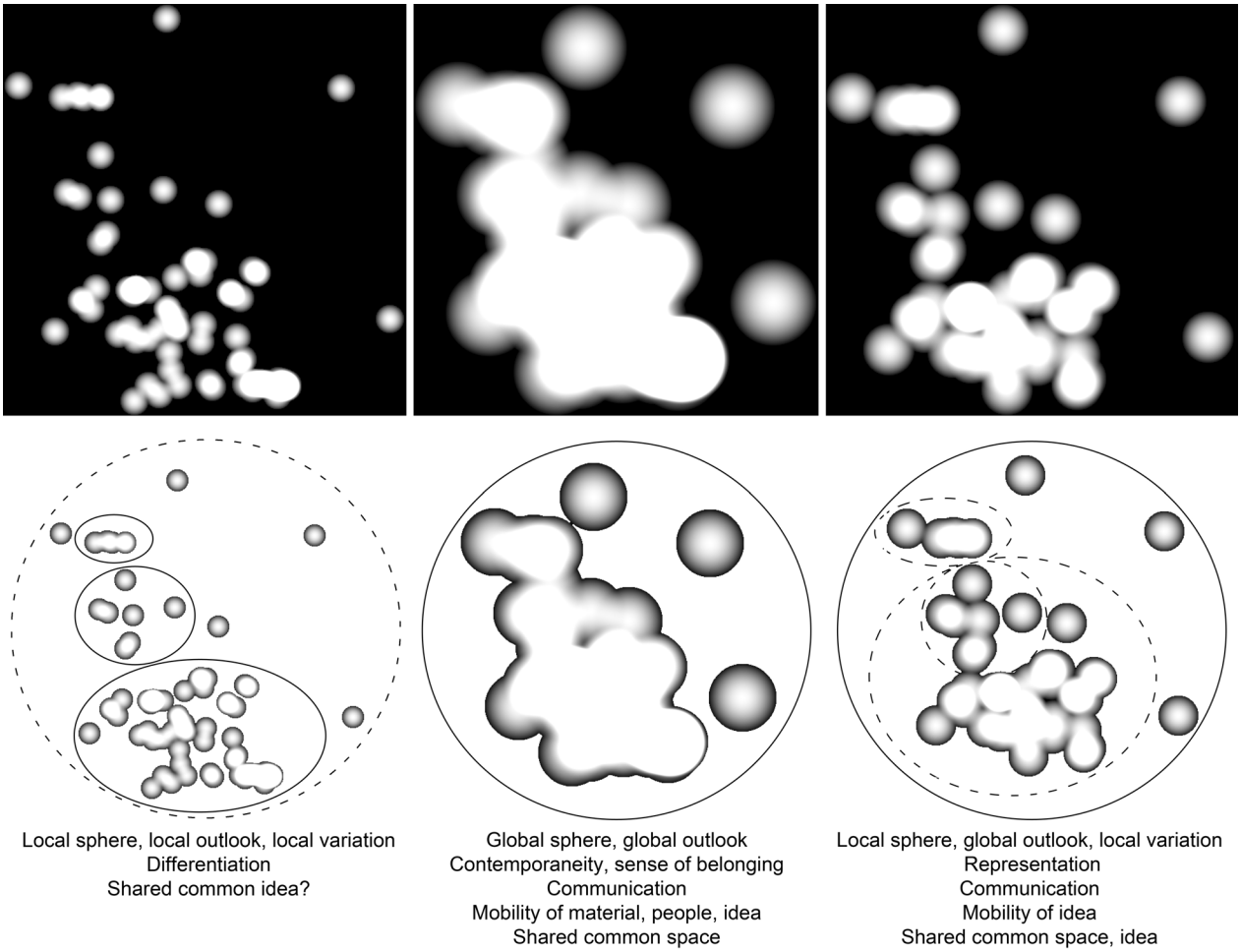

Fig. 3. Abstract model of blended spheres. The left part shows limited activity ranges with individual and small-scale mobility patterning. The middle part represents large-scale mobility patterns and mixture of activity spheres. The right image shows a conglomerate of regional or local spheres, which are not distinct but rather interlinked.

they are locally apparent in extreme events that happen in specific areas at specific times. The question is, what do we actually model? The previously mentioned variety of patterns and parameters of landscape (resource) assemblages form the immediately perceived surroundings of individuals and groups. Consequently, landscapes are not only subject to mere physical modifications on the long-term environmental scale but also to technological, cultural, and social adaptation processes that create new resource patches in previously non-utilised areas. On the other hand, specific areas can lose their importance due to decreasing demands. Consequently, differences in landscape affordances can also reflect differences in the composition of the society (Kempf 2020b).

Although the concept of affordance is much older than the multivariate landscape modelling that is presented here, both systems essentially consist of similar components: the selection and evaluation of environmental parameters and preferable sites in relation to the personal interests and actions of individuals in their environment. Preferences in land-use are not only physical interrelations of needs and demands of people and their immediate land. Like the basic concept of landscape *per se*, it is a temporally fluctuant perception of demands placed on certain landscape features that show various qualification criteria at different temporal stages. This applies to economic enhancements as well as to political or administrative reorganisation. According to Marcos Llobera (1996; 2001), shifts in affordances reflect social changes within a group. The reason is because individuals of a certain group share common or similar structures (here referred to as

habitus + resources) and produce and reproduce similar practices – hence they share similar affordances (Llobera 1996; 2001). Evidence of this can be seen in the different spatial patterns of the archaeological record at the transition from one chronological (and social?) period to another. The shift from the Roman Period to the Early Middle Ages in southern Germany represents a suitable research area to investigate land-use strategy development and the technological enhancements of a fragmented society. Small-scale subsistence husbandry and communication patterns replace a centralised market-oriented social system with an increasing need for independent representation and resource exploitation.

2.1. Scale and Time

Processes and events generate spatial patterns. Conversely, distribution maps can be used to draw conclusions about the systems hidden behind these patterns (Doneus 2013, 278). An event is a discontinuity of a series in time and thus always has reference to this series. In order to be perceived in its total extent, the moment of surprise and the subsequent transformation of the society are followed by fundamental changes that cannot be further linked to the previous structures of the social system (Meier 2005, 254). The observation that events or processes lie on different time scales is no surprise. Rather, it is interesting to see how these changes (can) affect the social system and by what means archaeologists could succeed in uncovering, analysing and finally depicting these changes. If an archaeologist dates an artefact, properties associated with other non-temporal dimensions are evaluated, such as the spatial location at which the object was found, its physical properties, or its stylistic features (Crema 2012, 441). Ultimately, categorisations and classifications are created that compare and contextualise this object with others. Depending on the chronological range of the comparanda that were used, the records show narrow or wide value ranges that are strictly separated from the adjacent ranges. Hence, material categorisation proposes breaks in the development of 'material culture' while at the same time temporal continuity and further development is suggested. The subsequent mapping of temporally different levels of archaeological evidence is directly dependent on the range of chronological classifications. Narrow value ranges suggest little material mobility, slow but continuous developments and static, closely interwoven communication networks. Wide chronological spectra, on the other hand, suggest massive changes, large-scale networks, and supra-regional material exchange. The scale of individual or group systems and the associated cultural and social patterns that form the core of archaeological research are directly dependent on the temporal scale of spatial development. This leads to the question of the goal of an archaeological distribution map. Should close-meshed reference networks be depicted in micro-regions, or should attention be paid to large-scale changes in so-called transition periods?

2.2. Land-Cover Reconstruction

Transferring modern land surfaces to pre-modern periods quickly reaches the limits of the data's potential and its modellability. Are contemporary landscapes also a copy of past landscapes? The mapping of archaeological finds on natural units for the assessment of land-use strategies depends particularly on the size, accessibility and permeability of the research area (e.g. Dincauze 2000). A mere illustration of the results could hide the actual origin and circumstances of the material, which automatically leads to a possible misinterpretation and ultimately to environmental determinism: 'archaeological gaps' in the landscape do not primarily emerge from lack of evidence, but rather from lack of knowledge. And that, in turn, is strongly associated with today's landcover. Vegetation cover is responsible for finding and not finding archaeological traces (e.g. Bevan/Conolly 2004; van Leusen 2002). Modern vegetation cover has an influence on archaeological density through two possible mechanisms. First, it is controlled by physical parameters such as soil type and hydrogeological systems, which also influence the potential quality of the cultivable area. Areas with less fertile soils could therefore preferably be used as grassland and pasture, while intensively

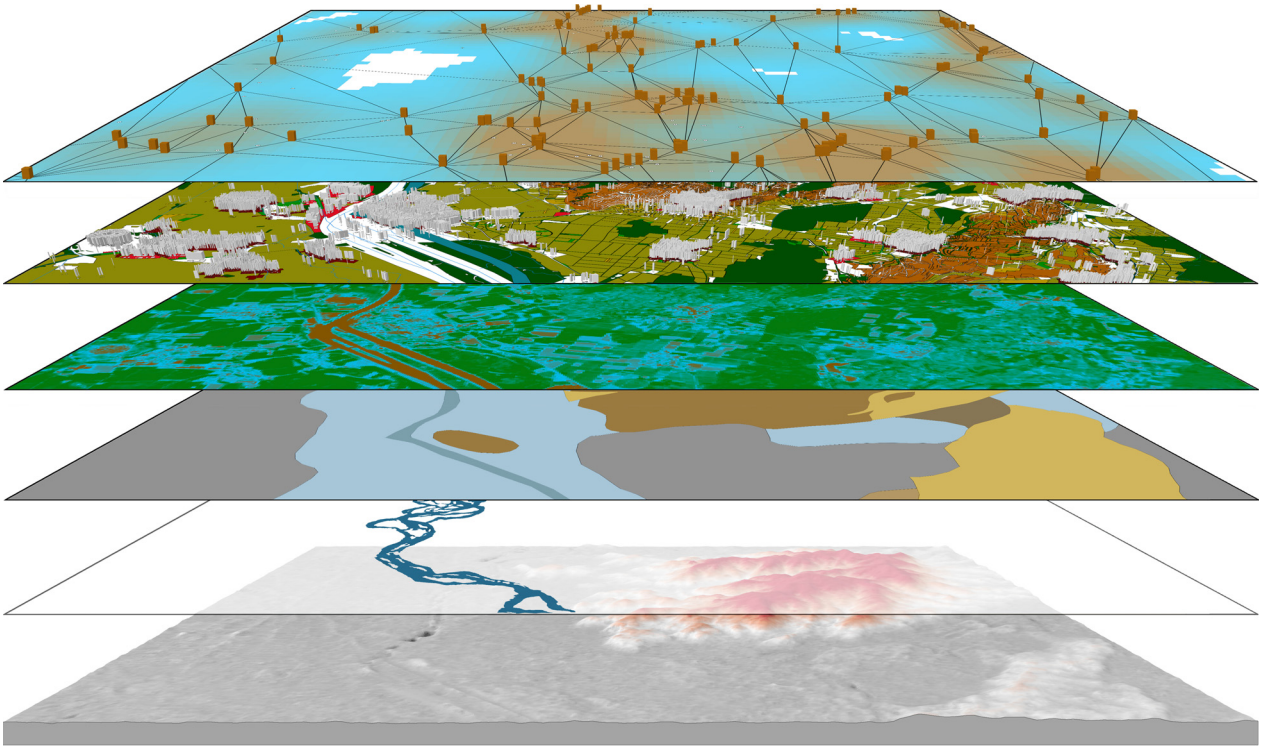

Fig. 4. Bottom-up model for the reconstruction of palaeo-landscapes and human-landscape interactions: topography, riverbed-reconstruction, geology, vegetation coverage, landcover, archaeological distribution (all maps modelled by the author based on topography [ASTERGDEM © USGS], historical maps [©Topographische Karte über das Grossherzogthum Baden {1839}], GK1000 [© BGR Hannover], satellite imagery [Landsat-8 © NASA/METI], Corine Landcover [© CLC 2019] and a Delaunay triangulation of the archaeological record).

cultivated arable land could be found on fertile soils in the immediate vicinity of a settlement. Archaeological find-density would be lower on the extensively used areas – even though the landscape may have experienced cultural exploitation (Kempf 2019; 2020a; 2020c). In addition, modern, intensified land-use has brought to light a multitude of fragmented archaeological evidence. However, areas with little earth movement such as forests and pastures remain largely untouched, giving the impression of uninhabited 'badlands'. For this reason, the empirical approach to estimating land-use patterns can only be achieved by combining the archaeological evidence and the (potential) natural and ecological balances of modern and past vegetation and land-cover.

Fig. 4 shows a bottom-up method of a potential (palaeo)-landscape reconstruction in a part of the Upper Rhine Area. On the basis of a palaeotopographical reconstruction and georeferenced historical maps, river courses are modelled through landscape analyses. Geological and soil data sets provide estimates of potential arable land and extensively used pasture and grassland areas as well as forest-use and the resulting erosion and colluvial. This information is further enhanced by satellite-based remote sensing data, which provides information on the type and condition of vegetation cover via reflection ratios of the physical plant condition. From this, it is possible to derive surface cover models that allow a fine-grained land surface classification. A grid of modern landcover is put over the datasets to differentiate sealed areas and the calculated vegetation indices.

Areas with a weak physical vegetation signal and locally bare soils or sealed surfaces can thus be correlated with industrially shaped or heavily recompacted urban and new development zones. Finally, archaeological distribution maps were clipped with the data to identify patterns in land-use changes and resource exploitation. However, these quickly acquired push-button results are subject to further filtering. Archaeological sites are concentrated in modern settlement areas due to increased built-up change and an engaged cultural heritage community. Furthermore, those areas are still intensively used which have already experienced intensive land-use in pre-modern times.

There is a threat of potential (archaeological) circular reasoning. However, the greatest problem of archaeological research lies in the simple fact that palaeo-landscapes cannot be completely reconstructed. Land-use processes inevitably cause land-change processes, the course and influence of which can be estimated under favourable circumstances by colluvial formation, pollen databases and macro remains, dendroarchaeological analyses and simple stratigraphic overlaps. However, the immediate local and short-term influence on the natural environment and the associated short-term adaptation strategies are not predictable. There are various influencing factors, but they tend to be rapidly ignored: The reconstruction of climatic parameters is not generally possible, because the archaeologically relevant areas are mostly situated in the lowlands or in the lower parts of the low mountain ranges. However, the samples used for climate reconstruction refer to extreme margins such as the high latitudes (Fennoscandia, Altai) or the high altitudes of the Alpine region. The dendrochronologically dated wood samples are used to model periodic fluctuations in the global climate balance (Büntgen et al. 2011). The transferability of proxy samples from extreme climatic margins to regional or local areas of the mid-latitudes is highly questionable (Ljungqvist 2009). Furthermore, there are certain parameters which are beyond the simple modelling of topographical maps. Especially in favourable areas the decisive control factors for settlement and land-use patterns are not directly visible on the surface. The difficulty of interpreting hydrogeological strata and their water conductivity to reconstruct a locally heterogeneous aquifer is usually underestimated.

2.3. Early Medieval 'Peoples': Modelling the Unknown

Human mobility means that individuals or groups encounter a landscape matrix consisting of a mixture of elements with which they engage and transform (Howey 2015, 88). This concept is based on the ecological theory of Anderson et al. according to which landscape permeability is defined as 'the degree to which a given landscape is conducive to the movement of organisms and the natural flow of ecological processes' (Anderson et al. 2014, 960). Meghan Howey adds basic archaeological components in terms of social, economic, political, and ideological processes – not to mention the anthropocentric approach within a landscape consisting of various physical and social variables (Howey 2015, 88). In applied ecology, human beings are quickly equated with 'disturbing' or 'external factors', but human beings and their cultural capacity are not only subject to anthropological, biological, and human ecological, but also archaeological research (Winiwarter 2002, 197). But how do we model mobility, and what proxies can we use to make this mobility visible (Furholt 2018; Knipper et al. 2013; Schweissing/Grupe 2000)? Migration and mobility are finally dependent on the correct scale and the formative equation of 'peoples' and distinct regions of potential origin. Especially in Early Medieval archaeology, grand narratives are constructed in order to propose theories about the 'culture', 'ethnos', 'language', 'origin' and 'identity' of 'peoples'. It is obvious that these 'peoples' must be based on distinct groups to compare them with each other – only groups who are fundamentally different can act differently. In this context, the cemeteries, grave groups and individual graves that are directly related to the Early Medieval settlements are regarded as the primary source that is used to record Early Medieval settlements (e.g. Jankuhn 1977).

3. The Early Medieval Upper Rhine Area

Can a shift in social organisation and activity spheres also be seen in the (Early Medieval) record? This question quickly reaches methodological limitations. Societal transformations can only be recognised over a longer period, which in turn is based on classificatory chronologies (and suggestive material boundaries) (e.g. Friedrich 2016). Furthermore, these chronologies are again subject to inaccuracies. Finally, two chronological and non-ethnic groups are created to determine the change in material culture, settlement location and the economic system. Since these inaccuracies are the constant side effect of archaeological research, they all too often go unmentioned.

However, this is precisely where the possibility of quantitative archaeology emerges: to recognise changes in structure and patterns via the largest possible databases (e.g. Nakoinz/Knitter 2016). To estimate economic and socio-cultural changes at the transition to the Early Middle Ages, Roman findings are included in the quantitative evaluation of this article.

3.1. Environmental Settings of the Study Site

The Upper Rhine Area belongs to a region intensively used for agriculture with mild winters, an early phenological phase and long vegetation periods (Storck/Menzel 2016). The region between the mountain ranges of the Black Forest to the east and the Vosges to the west lies in a section of the frontal zone of the northern hemisphere at the transition from a continental to a maritime influenced temperate climate (Bieling/Konold 2014; Häckel 2016). The location of the mountain ranges, which are opposite to the prevailing westerly winds, leads to small-scale precipitation patterns with local precipitation anomalies and dry conditions in the eastern foreland of the Vosges (Minářová 2013; Minářová et al. 2017). Rain shadows on the lee side in the Upper Rhine lowlands cause an average rainfall of only 550mm per year (Minářová 2013). Pedogenesis on the geological fractions of the outflowing mountain ranges is primarily controlled by the available content of weatherable minerals in the soil as a function of rock composition, relief, and extreme weather events with high precipitation (Thomas et al. 1999a; 1999b). The lowlands are formed by Pleistocene and Holocene terraces and alluvial fans covered by loess and secondary relocated loess deposits along the foothills (Lehmkuhl et al. 2016; Parlow 1996). The discharge regime of the Rhine can be divided into two sections: the alpine zone upstream of Basel with early summer snow melting regime in feedback with maximum convective precipitation. Downstream, a pluvial regime with a pronounced winter maximum dominates the runoff behavior (Pfister et al. 2006). In terms of vegetation history, the Upper Rhine plain is strongly anthropogenically influenced: former floodplain forests disappeared almost completely between 1817 and 1876 after the canalisation of the Rhine by groundwater lowering and increased erosion downstream of Basel (Parlow 1996; Wetter et al. 2011). The formation of deep, nutrient-rich soils with high root penetration potential is directly related to the loess-covered areas along the foothills and the secondarily accumulated loess-rich alluvial deposits in the transition zone to fluvial sediments from palaeochannels or tributaries of the Rhine (Ehlers et al. 1983; Glinski 2018).

3.2. Methods and Material

In order to gain an overview of the various topographic, geomorphological, geological, hydrogeological and pedological parameters in the study area, a large number of GIS-based layers, digital terrain models, satellite imagery and georeferenced historical maps were combined to form a basic data network. On this basis, the databases of the ArkeoGIS project of the University of Strasbourg were used to extract distribution patterns of the archaeological record. The data has been filtered and harmonised depending on the availability and the choice of the chronological period (*fig. 6*) (Bernard 2014; David et al. 2017).

A digital elevation model (ASTER_GDEM2) was obtained from the United States Geological Survey (USGS) (Herzog/Yépez 2015; Suwandana et al. 2012). Multispectral satellite images provided remote sensing data (LC08L1 TP_195026_201700312_201700317, spectral bands [µm]: blue [ch2]: 0.452-0.512; NIR [infrared, ch5]: 0.851-0.879; SWIR [short wave infrared, ch6]: 1.566-1.651 [Barsi et al. 2014]). The Landsat image was subsequently recalculated and transformed into a false colour image with the spectral band combination ch6, ch5, ch2 to distinguish agricultural areas from forest stands and open grasslands (Herbei et al. 2015). In addition, so-called vegetation indices were calculated by combining the spectral channels (*fig. 5*).

Vegetation indices allow us to delineate the distribution of forests, grassland, areas for arable farming, open soils and sealed areas based on the spectral reflection patterns of green vegetation (Ke et al. 2015; Gandhi et al. 2015). The Landsat spectral data was used to produce an NDVI (Normalized Difference Vegetation Index) image according

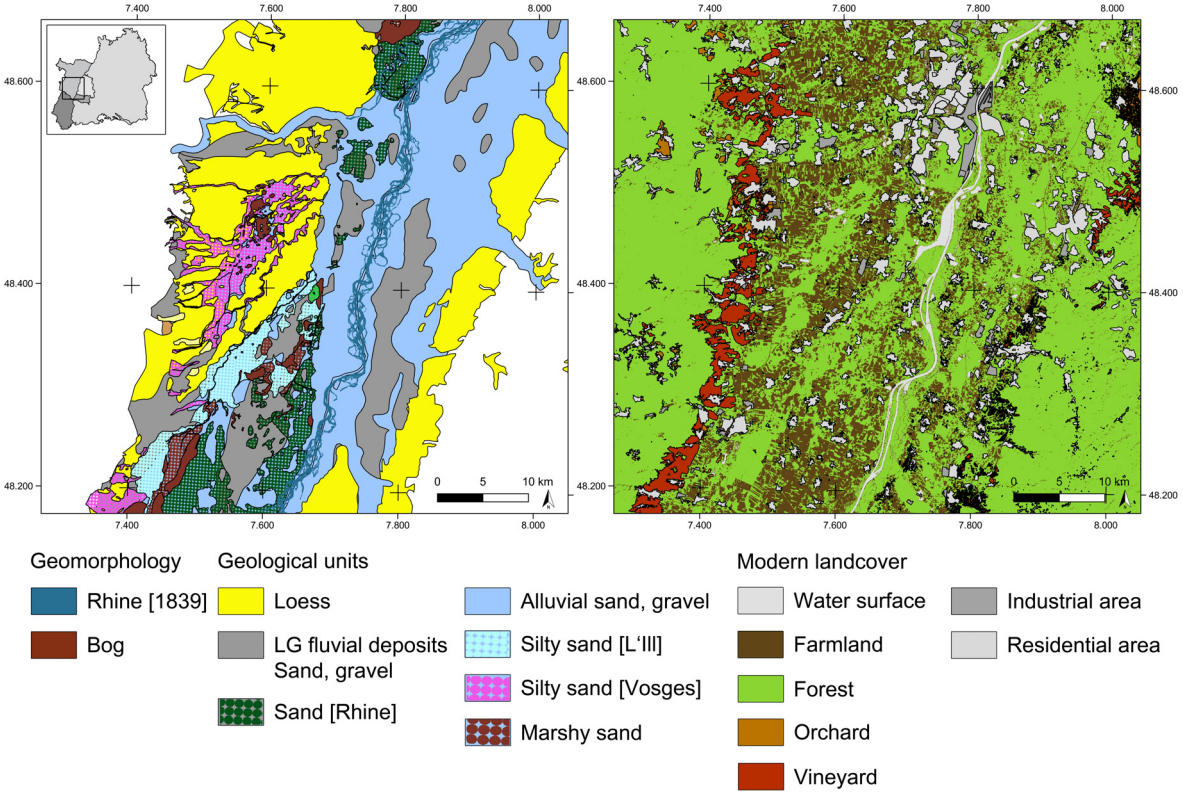

Fig. 5. Natural spatial conditions in the study area based on data sets of the BGR Hannover 2014 (GK1000), LGRB Baden-Württemberg, Regierungspräsidium Freiburg (GK300), the ARAA (Association pour la Relance Agronomique en Alsace) and multispectral satellite image analysis (LC08L1 TP_195026_201700312_201700317).

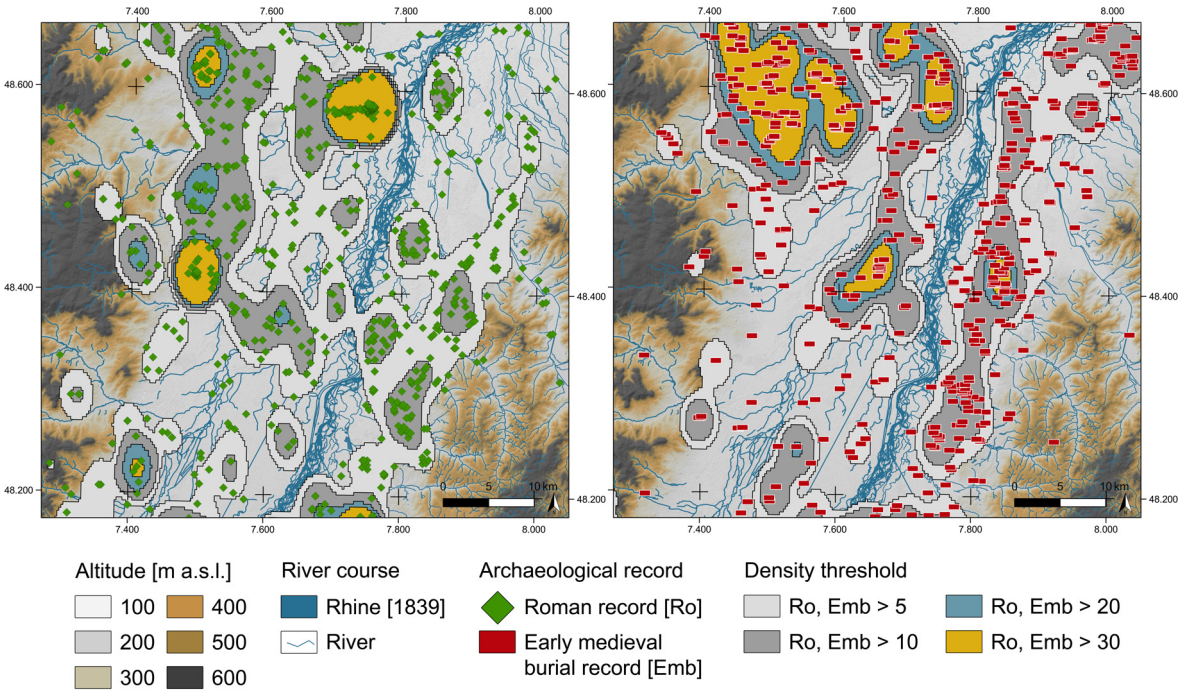

Fig. 6. Distribution of archaeological records in the study area according to topographical conditions. The density layer was produced by kernel density estimation with a radius of 5000m (Ro = Roman record; Emb = Early Medieval burials). Data: ArkeoGIS (University of Strasbourg), databases: Patriarche67, Campagnes entre Moselle et Rhin dans L'Antiquité, Charlene Morel, HabitatsBF3-Aug, Adabweb2011. Digital elevation model based on ASTERGDEM (USGS). Historical maps of the river Rhine were georeferenced and extracted from Topographische Karte über das Grossherzogthum Baden (1839).

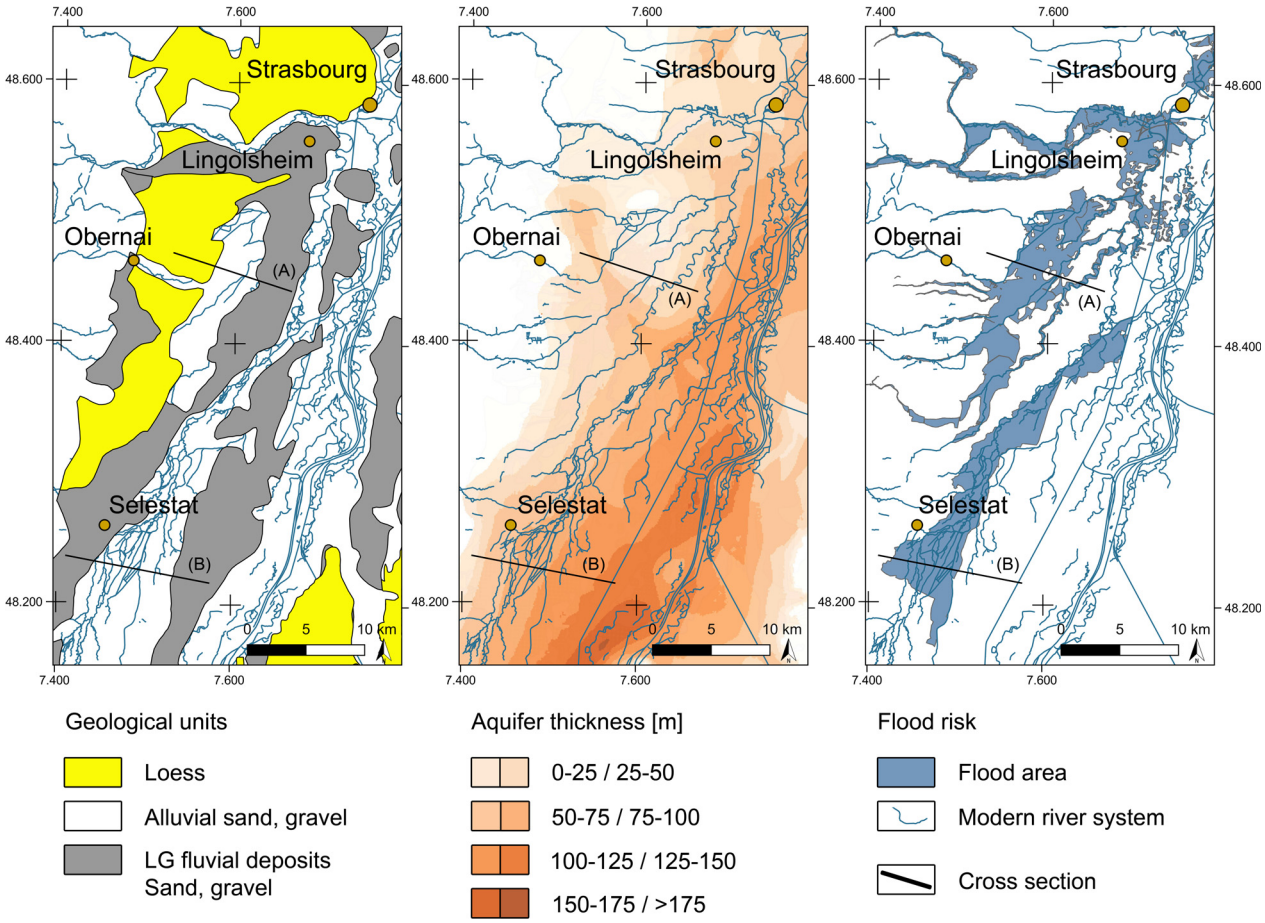

Fig. 7. Section of the study area and detailed geological, hydrogeological and geo-morphological conditions. The loess-covered zones of the western foothills of the Upper Rhine Area differ significantly from the recent flood sediments (alluvium) and the glacial and interglacial gravel fills. In combination with a high aquifer, the clayey-sandy soils of the high flood sediments lead to waterlogged conditions and seasonal flooding. The profile sections clearly show the high groundwater level (see *fig. 8*).

to the equation: NDVI = (NIR5) - (Red4) / (NIR5) + (Red4). A combination of both multispectral images allows the classification of superficial vegetation stocks.

Loess-covered zones in the research area alternate with alluvial sediments and displaced loess along the draining streams (*fig. 5*). These elongated, gully-like channels represent erosion channels in the otherwise homogeneous loess areas. The terrain is relatively flat with only small outcropped plateaus towards the lower terrace. However, the roughness increases towards the western foothills. A pronounced alluvium deposit between lowlands and highlands represents a transition between the flood zone and the higher areas. The sediment stratigraphy with Rhine gravel and sand banks of the drainage zone also marks the shift from a zone with high groundwater level and periodic flooding of a formerly meandering river towards drier conditions in the western part (e.g. Thierion et al. 2012).

Particularly striking are the hydrogeological conditions, which are not homogeneous in the entire study area. The aquifer of the Upper Rhine depends on the thickness of the quaternary gravel and the underlying layers. This results in strong local variations in the thickness of the groundwater layer, and its distance from the soil surface. The aquifer approaches the surface and intensifies the level of soil moisture and waterlogging in a highly fragmented way (*fig. 7–8*).

3.3. Results and Discussion: Early Medieval Land-Use and Settlement Opportunities

The calculated vegetation indices point directly towards local soil and hydrogeological conditions.

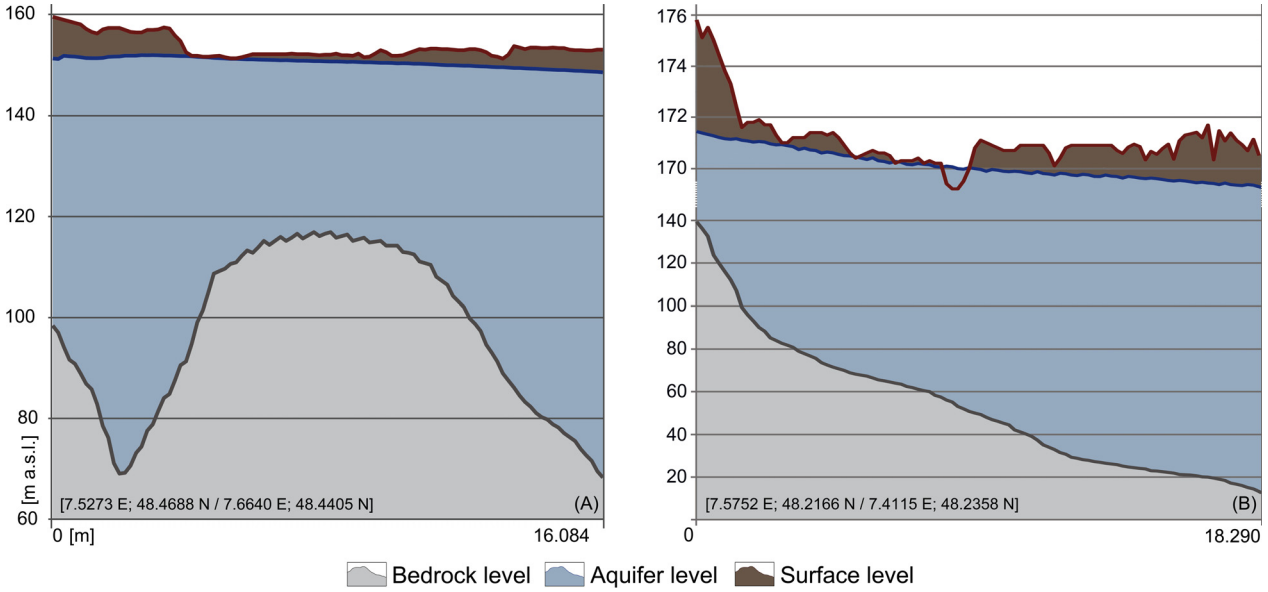

Fig. 8. Profile sections through the aquifer on the Alsatian part of the Upper Rhine Area. (A) The northern flood-zone shows a significant rise in the underlying bedrock and consequently a less voluminous aquifer in quaternary gravel. The high groundwater discharges locally, which leads to seasonal flooding of the so-called Ried during heavy rainfall events in combination with snowmelt and a saturated alpine aquifer. (B) The southern profile section indicates the impact of the shallow discharge regime of the water conducting layers. Modelled with raw data downloaded from Aprona – L'observatoire de la nappe d'Alsace (<www.aprona.net> [last access 02.04.2021]).

This results in two classes of potential land use patterns. Since the aquifer in Alsace is only slightly below the soil surface, circulating groundwater in depressions tends to surge and form waterlogged zones (Trémolières et al. 1993). These zones, which are characterised by recent flood sediments (alluvial deposits), show low drainage potential and are, therefore, predominantly humid. This fact can also be seen in the archaeological land-use patterns. Archaeological evidence of the Roman Imperial Period can mostly be found in the loess-bound areas of the slightly elevated slopes.

In the subsequent Early Middle Ages, a spread of the utilised areas to the coarse gravel interglacial banks can be observed (*fig. 9*). In contrast to the clayey-sandy soils of the flood prone zones, these more strongly drained soil communities with lower flood vulnerability. However, these trends are not only applicable for the Early Middle Ages. To test for the accuracy of the previously mentioned chronological problem, all archaeological records of the study area have been modelled using the ArkeoGIS databases. The total archaeological evidence shows a similar picture as the Early Medieval graveyard distribution and the interpolated settlement areas. This result is reinforced by the dispersal of the modern settlement agglomeration that has an almost identical spread. This means that high-density archaeological evidence can be observed where continuous utilisation, re-densification and the development of new residential areas in the immediate vicinity of a rural agglomeration are significant (*fig. 9*).

Is this evidence for bias or for a narrative of continuity? In the French part of the Upper Rhine Area, the pre-modern land-use and settlement pattern corresponds well with the modern evaluations of landscape favourability. We could be observing continuous utilisation with only minor adaptations in economic, technological, social, and cultural location factors. The modern environmental data would thus represent well the factors that distinguish potential utilisation corridors in the past. Those areas that tend to be periodically flooded are not subject to intensive agriculture but rather to seasonal and non-permanent grassland and pasture. Because of increasing settlement continuity in the late Early Middle Ages, we would expect the optimal settlement locations outside the flood prone areas and in the immediate vicinity of arable land to be rapidly occupied and hence not

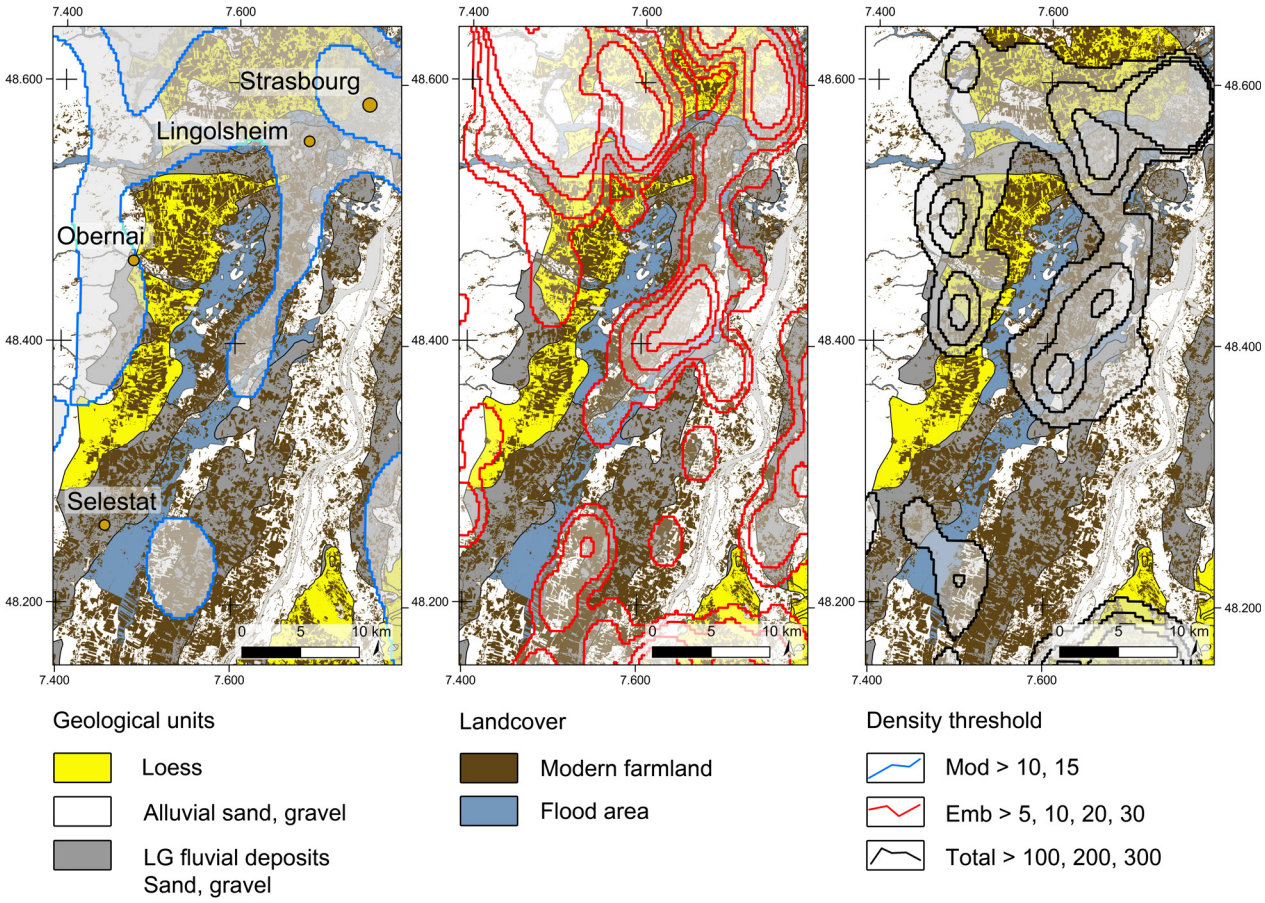

Fig. 9. Kernel density modelling of three databases on geological and hydrogeological conditions as well as type of use and vegetation stock. The left figure shows the density distribution of the modern settlement agglomerations in Alsace (Mod). In the middle figure Early Medieval burial sites are mapped to interpolate the settlement dynamics in the investigated area (Emb). On the right side, all archaeological records in the study area are modelled (Total).

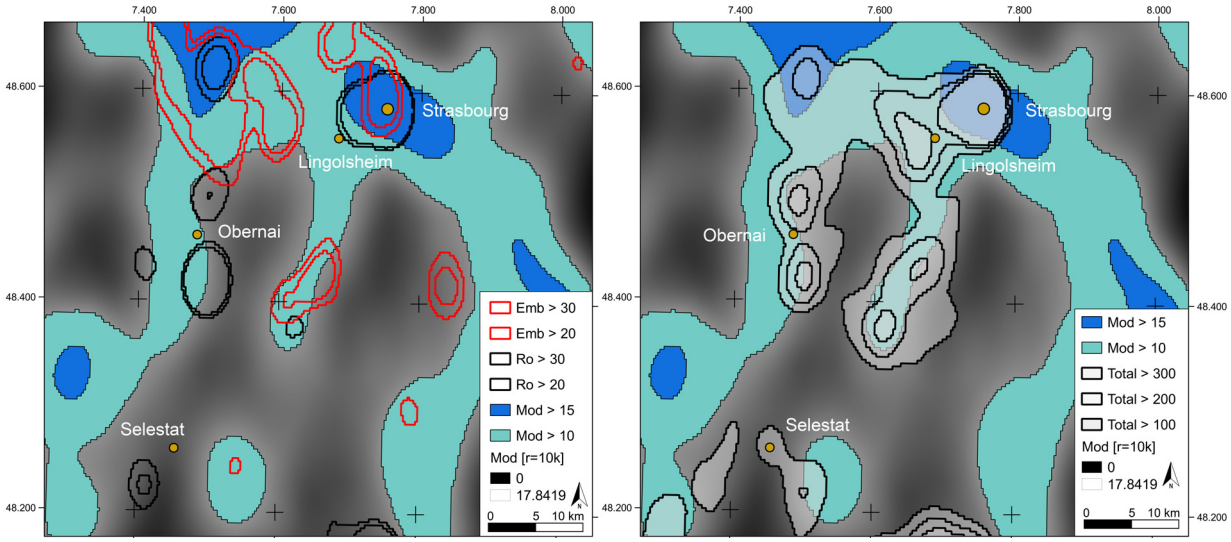

Fig. 10. Interpretation of the archaeological findings in the Alsatian part of the study area. The density threshold values of the Early Medieval burial sites are marked in red (Emb), the total archaeological records are marked in black (Total). The light blue and dark blue density threshold values represent the agglomerations of modern settlements and cities (Mod). The numbers represent the number of sites within the kernel density estimation with a calculated radius of r = 10km.

subject to large-scale spatial relocation in the High and Late Middle Ages (*fig. 10*).

4. Global – Local – Glocal or 'There and Back Again'?

The fundamental concept of (post-processual) landscape archaeology lies in the integration of mental and cognitive structures into the physical life of the individuals of past societies (Doneus 2013, 37). This approach is based on the fact that the idea of landscapes was created from a collection of experienced narratives handed down over generations. That led to a dynamic concept of landscapes. A so to speak native understanding of landscape in the sense of a *homo geographicus* must be revised: the knowledge of a (individual) landscape can only be fostered by experience (Gramsch 1996): landscape is the transmission of knowledge. Since the empirical values of individuals are determined by their spatial interactions, the concept of activity ranges, exchange relationships, and communication networks play a formative role. These parameters produce a social network that simultaneously acts on different spatio-temporal scales. Depending on the individual situation, different pragmatic decisions can be made regardless of their spatial dimension – quite like the construction of identities (e.g. Halsall 2007; recently Maran 2019). However, the 'material culture' that archaeologists use as a source for reconstructing physical and social concepts can be misinterpreted to distinguish and define ethnic boundaries, migration, and origin. But details in the material remains can also be explained quite simply by the connection to local networks and supraregional social relationships. Consequently, funeral representation reflects not so much ethnic identities but rather local networking and contact. Maybe 'new peoples' can simply be replaced by 'new systems'.

New systems, however, would also point towards a new society. A fragmented social composition with a subsistence economy, consisting of scattered agricultural crop cultivation and livestock breeding would result in a localised landscape with several small-scale micro activity spheres. Consequently, the creation of a particular landscape needs to be replaced by the formation of multiple landscapes according to multiple households and their individual ideas of interacting with their immediate surroundings. The spatial juxtaposition of these manifold landscape assemblages generates a patchwork of very distinct human-environment interactions on the local scale. However, land-use strategies and modifications of the surface are simultaneously subject to global and supraregional ecosystem variables. Local clearing and crop cultivation do not trigger global climate change, but the modified surfaces are now prone to desiccation, denudation, and erosion and hence ecosystem transformation on the micro-scale. Spatio-temporal feedbacks are coherent side-effects of local and supraregional landscape fragmentation.

But not only are the environmental spheres strongly interwoven, the material structure (or 'material culture') of the Early Middle Ages demonstrates a global outlook at the very local level. The rich decorations and the high artistic quality of the various representational materials in rich burials of the 5th to the 7th cent. AD point towards large-scale exchange patterns along the river Danube and the river Rhine – indicating long-distance relationships, mobility, and communication networks. Consequently, global networks and social fragmentation, the personification of the landscape and local economic developments can be simultaneously performed. Spatial distances lose their importance in the local social environment of the individual. Global inclusivity is symbolised on the local level without the perception of the actual provenance or agency of the material component. Early Medieval representation is the expression of a glocalised social system.

There are clear indications of local activity spheres during a period of 'dramatic upheaval' in the late 5th cent. in the research area (von Rummel 2013). Small-scale or fragmented economies developed that interacted locally with their immediate environment in a potential proto three-field system (Kempf 2018; Halsall 2014). Technological developments opened up deep and heavy soils to agricultural cultivation (Brombacher/Hecker 2015). However, the fact that we now detect archaeological evidence in areas that were previously not intensely utilised during the Roman Imperial

Period does not necessarily have to be an indication of the integration of 'strangers' – a concept often used in traditional research as the explanatory pattern of the so-called 'Migration Period'. These groups neither show non-local strontium isotope signatures, nor 'foreign' dietary characteristics (Brather-Walter 2019; Brather-Walter/Wirbelauer in preparation), which tells against the idea of massive population exchange at the transition to the Early Middle Ages.

In addition, there are specific links in the material spectra across the Rhine to Baden-Württemberg and towards Basel (Brather-Walter 2015; 2017). Borders in the landscape, as they are often seen to confront and separate 'cultures' from each other, seem to have existed neither on a physical nor on a mental level during the 5th and early 6th cent. All this supports the theory of local settlement and land-use continuities in the research area. The rural population is simply dependent on the local resources of the natural surroundings and acts in accordance with its immediate environment. Areas that can be used for agricultural purposes are preferred (Faustmann 2007), which is reflected in the environmental location parameters such as geology, water availability, topography, and flooding security. Those areas that are subject to a high flood risk and vulnerable to waterlogging are less utilised, or at least not used for farming. Livestock breeding, grassland, and forest represent the predominant land-use.

This raises the question of potential interpretations:

1) Were the areas, which are characterised by a very high aquifer and sandy-clayey soil units with a significant potential for waterlogging not cultivated until modern times? If that is the case, the no-data areas can only be interpreted in terms of its natural control factors.
2) To what extent does modern land-use and vegetation cover construct our present perception of past interaction, communication, and spatial networks? Despite intensive agricultural overstraining, the satellite image analysis shows defined zones of areas used for forestry that are spatially identical with archaeological gaps. Beyond the low location quality, it cannot be ruled out that these 'archaeological badlands' were only created by the fact that recently no large-scale earth movements, no extensive surface transformation and no infrastructural development have taken place.
3) A combination of both possibilities seems plausible. The French part of the Upper Rhine Area differs significantly from its German counterpart. Groundwater level, the thickness of the quaternary deposits, local loess coverage and susceptibility to flooding events cannot be compared without an understanding of past riverbed dynamics and the anthropogenic overprint since the Early Neolithic. Consequently, two different topographical surfaces were created in the lowlands that generated very distinct micro-regional landcover niches and finally potential settlement and crop cultivation surfaces.

In Alsace, there are signs of strong site continuity. This applies to arable land as well as to settlement locations and burial sites that were created outside flood-prone areas. Especially in periods of unstable precipitation patterns, the soils tend to saturate the subsurface layers due to high waterlogging vulnerability and upwelling groundwater (Dister et al. 1990; Middelkoop et al. 2001). In combination with the high aquifer, gradient pressure and a damming effect occur, which results in a rapid increase in the extent of surface water. This means not only a rapid but also a long-lasting flooding event. Depending on the phenological phase of the cultivated crop, massive harvest failures can be expected.

The settlement areas that lie outside these vulnerable zones are usually situated in slightly elevated positions on prominent slabs or plateaus. In the immediate vicinity of the settlements, Early Medieval cemeteries, individual graves, or groups of graves can be observed in many places. However, their spatial distribution must be explained without evidence for the corresponding settlements. One potential explanation is the ongoing continuity of the Early Medieval settlement sites right underneath the village centres. The transition from the system of shifting settlements in the Early Middle Ages to a continuously occupied site closely connected to an early church and the church's institutionalisation after 700 AD could be a key concept in the understanding of

Early Medieval land-use opportunities (Zadora-Rio 2003, 2; Schreg 2014, 74).

But is this the only possible explanation for Early Medieval settlement development in the Upper Rhine Area? The question is to what extent the massive overlapping of mapped graves, groups of graves, and row grave cemeteries biases the image of an Early Medieval settlement landscape. Is it possible to assign each settlement a cemetery and *vice versa* (Kempf 2018)? Which explanatory patterns are used, if there are temporal gaps between the onset of the settlement and the cemetery? The model presented in this article proposes a hypothesis that nicely fits the current theories of Early Medieval settlement development (Schreg 2006, 319). However, it can be argued that this model is based on the interpolation of different source categories (Faustmann 2007, 98). Closing the gap of knowledge by linking potential settlement spots to the closest available burial site can fail because several cemeteries could correspond to one settlement and several settlements to one common cemetery.

Although the theory of continuous land-use is entirely justified, the scale of the respective concepts needs to be considered. At the local level there might have been shifting settlement processes and developments. The so-called Altdorf- and the associated so-called Altsiedellandtheorie seem to be comprehensive explanatory patterns for the reconstruction of so-called Siedlungskammern (e.g. Schreg 2006, 42; 2008). However, the whole theory and the hypothesis of early place names on -ingen and -heim and the ethnically interpreted early reorganisation in small villages or hamlets is outdated (Hoeper 2001, 72–78; Schreg 2008; Kempf in preparation). The simple equation of loess soils and agricultural continuity, on the other hand, is far too uncritical (Faustmann 2007, 99; Hoeper 2001, 73). Especially in the French part of the Upper Rhine Area, other factors such as the potential water supply play a major role that go beyond mere soil-deterministic explanatory models (Kempf 2020a).

Michael Kempf
Masaryk University
Institute of Archaeology and Museology
Faculty of Arts
Arne Nováka 1
Brno 60200, Czech Republic
https://orcid.org/0000-0002-9474-4670
kempf@phil.muni.cz

University of Freiburg
Physical Geography
Institute of Environmental Social Science and Geography
Faculty of Environment and Natural Resources
Schreiberstr. 20
79085 Freiburg, Germany
michael.kempf@geographie.uni-freiburg.de

Bibliography

Anderson et al. 2014: M. G. Anderson/M. Clark/A. O. Sheldon, Estimating Climate Resilience for Conservation across Geophysical Settings. Conservation Biology 28.4, 2014, 959–970.

Barrett 1999: J. C. Barrett, Chronologies of Landscape. In: P. J. Ucko/R. Layton (eds.), The Archaeology and Anthropology of Landscape – Shaping your Landscape (London 1999) 21–30.

Barsi et al. 2014: J. Barsi/K. Lee/G. Kvaran/B. Markham/J. Pedelty, The Spectral Response of the Landsat-8 Operational Land Imager. Remote Sensing 6.10, 2014, 10232−10251.

Bauman 2013: Z. Bauman, Glocalization and Hybridity. Glocalism: Journal of Culture, Politics and Innovation 1, 2013, 1–5.

Bender 2001: B. Bender, Landscapes on-the-Move. Journal of Social Archaeology 1.1, 2001, 75–89.

Bernard 2014: L. Bernard, ArkeoGIS v2.0. Elements d'Analyse de la mise en ligne de bases multilingues sur fond cartographique. Fonctionnalités, apports et limites. In: L. Costa/F. Djindjian/F. Giligny (eds.), Actes des 3ème Journées d'Informatique et Archéologie de Paris JIAP 2012 (Sesto Fiorentino 2014) 228–237.

Bevan/Conolly 2004: A. Bevan/J. Conolly, GIS, Archaeological Survey, and Landscape Archaeology on the Island of Kythera, Greece. Journal of Field Archaeology 28.1/2, 2004, 123–138.

Bieling/Konold 2014: C. Bieling/W. Konold, Common Management of Wood Pasture and Sustainable Regional Development in the Southern Black Forest (Germany). In: T. Hartel/T. Plieninger (eds.), European Wood-Pastures in Transition. A Social-Ecological Approach (London 2014) 235–253.

Borsdorf 2002: A. Borsdorf, Die Mensch-Umwelt-Beziehung – ein zentrales Forschungsthema der Geographie. In: V. Winiwarter/H. Wilfing (eds.), Historische Humanökologie. Interdisziplinäre Zugänge zu Menschen und ihrer Umwelt (Wien 2002) 27–58.

Brather 2011: S. Brather, Siedlungs-, Umwelt- und Landschaftsarchäologie. Entdeckung und Analyse des Raumes. Freiburger Universitätsblätter 192, 2011, 123–136.

Brather 2017: S. Brather, Raumanalysen in der Frühmittelalterarchäologie. Kontexte und Interpretationen. In: S. Brather/J. Dendorfer (eds.), Grenzen, Räume und Identitäten. Der Oberrhein und seine Nachbarregionen von der Antike bis zum Hochmittelalter. Archäologie und Geschichte 22 (Ostfildern 2017) 157–178.

Brather-Walter 2015: S. Brather-Walter, Das Gräberfeld von Niedernai im Elsaß. Archäologische Nachrichten aus Baden 90/91, 2015, 58–63.

Brather-Walter 2017: S. Brather-Walter, Kommunikationsreichweiten und Kleidungsvarianten anhand merowingerzeitlicher Bügelfibeln. In: S. Brather/J. Dendorfer (eds.), Grenzen, Räume und Identitäten. Der Oberrhein und seine Nachbarregionen von der Antike bis zum Hochmittelalter. Archäologie und Geschichte 22 (Ostfildern 2017) 287–302.

Brather-Walter 2019: S. Brather-Walter (ed.), Archaeology, History and Biosciences. Interdisciplinary Perspectives. Reallexikon der Germanischen Altertumskunde, Ergänzungsband 107 (Berlin 2019).

Brather-Walter/Wirbelauer in preparation: S. Brather-Walter/E. Wirbelauer (eds.), Archäologie einer Transformationszeit. Das Gräberfeld von Niedernai und das 5. Jahrhundert am Oberrhein (in preparation).

Brombacher/Hecker 2015: C. Brombacher/D. Hecker, Agriculture, Food and Environment during Merovingian Times. Plant Remains from Three Early Medieval Sites in Northwestern Switzerland. Vegetation History and Archaeobotany 24.2, 2015, 331–342.

Büntgen et al. 2011: U. Büntgen/W. Tegel/K. Nicolussi/M. McCormick/D. Frank/V. Trouet/J. O. Kaplan/F. Herzig/K.-U. Heussner/H. Wanner/J. Luterbacher/J. Esper, 2500 Years of European Climate Variability and Human Susceptibility. Science 331, 2011, 578–582.

Butzer 1982: K. W. Butzer, Archaeology as Human Ecology. Method and Theory for a Contextual Approach (Cambridge 1982).

Crema 2012: E. R. Crema, Modelling Temporal Uncertainty in Archaeological Analysis. Journal of Archaeological Method and Theory 19, 2012, 440–461.

David et al. 2017: R. David/L. Bernard/C. Blanpain/A. Dias/J.-F. Feral/S. Gachet/J. Lecubin/C. Surace/T. Tatoni, Visualisation de données sous forme de graphes en archaeologie. Rencontre opérationelle des archéologues d'ArkeoGIS et des écologues d'IndexMED. Iste Open Science 17.1, 2017, 1–12.

David/Thomas 2008: B. David/J. Thomas, Landscape Archaeology. Introduction. In: B. David/J. Thomas (eds.), Handbook of Landscape Archaeology (Abingdon 2008) 27–43.

Dincauze 2000: D. Dincauze, Environmental Archaeology – Principles and Practice (Cambridge 2000).

Dister et al. 1990: E. Dister/D. Gomer/P. Obrdlik/P. Petermann/E. Schneider, Water Management and Ecological Perspectives of the Upper Rhine's Floodplains. Regulated Rivers: Research Management 5.1, 1990, 1–15.

Doneus 2013: M. Doneus, Die hinterlassene Landschaft – Prospektion und Interpretation in der Landschaftsarchäologie. Mitteilungen der Prähistorischen Kommission der Österreichischen Akademie der Wissenschaften 78 (Wien 2013).

Ehlers et al. 1983: W. Ehlers/U. Kopke/F. Hesse/W. Bohm, Penetration Resistance and Root Growth of Oats in Tilled and Untilled Loess Soil. Soil Tillage Research 3.3, 1983, 261–275.

Faustmann 2007: A. Faustmann, Besiedlungswandel im südlichen Oberrheingebiet von der Römerzeit bis zum Mittelalter. Freiburger Beiträge zur Archäologie und Geschichte des ersten Jahrtausends 10 (Rahden/Westf. 2007).

Fleming 2006: A. Fleming, Post-Processual Landscape Archaeology. A Critique. Cambridge Archaeological Journal 16.3, 2006, 267–280.

Freytag 2014: T. Freytag, Raum und Gesellschaft. In: J. Lossau/T. Freytag/R. Lippuner (eds.), Schlüsselbegriffe der Kultur- und Sozialgeographie (Stuttgart 2014) 12–24.

Friedrich 2016: M. Friedrich, Archäologische Chronologie und historische Interpretation. Die Merowingerzeit in Süddeutschland. Reallexikon der Germanischen Altertumskunde, Ergänzungsband 96 (Berlin 2016).

Furholt 2018: M. Furholt, Massive Migrations? The Impact of Recent aDNA Studies on our View of Third Millenium Europe. European Journal of Archaeology 21.2, 2018, 159–191.

Gandhi et al. 2015: G. M. Gandhi/S. Parthiban/N. Thummalu/A. Christy, Ndvi. Vegetation Change Detection Using Remote Sensing and GIS – A Case Study of Vellore District. Procedia Computer Science 57, 2015, 1199–1210.

Glinski 2018: J. Glinski, Soil Physical Conditions and Plant Roots (Milton 2018).

Gramsch 1996: A. Gramsch, Landscape Archaeology. Of Making and Seeing. Journal of European Archaeology 4, 1996, 19–38.

Häckel 2016: H. Häckel, Meteorologie (Stuttgart 2016).

Halsall 2007: G. Halsall, Barbarian Migrations and the Roman West, 376–568 (Cambridge 2007).

Halsall 2014: G. Halsall, Two Worlds Become One. A 'Counter-Intuitive' View of the Roman Empire and 'Germanic' Migration. German History 32.4, 2914, 515–532.

Herbei et al. 2015: M. V. Herbei/F. Sala/M. Boldea, Using Mathematical Algorithms for Classification of LANDSAT8 Satellite Images. AIP Conference Proceedings 1648, 2015, 670004, DOI.org/10.1063/1.4912899.

Herzog/Yépez 2015: I. Herzog/A. Yépez, The Impact of the DEM on Archaeological GIS Studies. A Case Study in Ecuador. International Conference on Cultural Heritage and New Technologies (Wien 2015) 1–18.

Hoeper 2001: M. Hoeper, Alamannische Siedlungsgeschichte im Breisgau. Zur Entwicklung von Besiedlungsstrukturen im frühen Mittelalter. Freiburger Beiträge zur Archäologie und Geschichte des ersten Jahrtausends 6 (Rahden/Westf. 2001).

Howey 2015: M. C. L. Howey, Geospatial Landscape Permeability Modeling for Archaeology. A Case Study of Food Storage in Northern Michigan. Journal of Archaeological Science 64, 2015, 88–99.

Ingold 2000: T. Ingold, The Perception of the Environment. Essays on Livelihood, Dwelling and Skill (London 2000).

Jankuhn 1977: H. Jankuhn, Einführung in die Siedlungsarchäologie (Berlin 1977).

Ke et al. 2015: Y. Ke/J. Im/J. Lee/H. Gong/Y. Ryu, Characteristics of Landsat 8 OLI-Derived NDVI by Comparison with Multiple Satellite Sensors and In-Situ Observations. Remote Sensing of Environment 164, 2015, 298–313.

Kempf 2018: M. Kempf, Migration or Landscape Fragmentation in Early Medieval Eastern France? A Case Study from Niedernai. Journal of Archaeological Science: Reports 21, 2018, 593–605.

Kempf 2019: M. Kempf, The Application of GIS and Satellite Imagery in Archaeological Land-Use Reconstruction. A Predictive Model? Journal of Archaeological Science: Reports 25, 2019, 16–128.

Kempf 2020a: M. Kempf, Modelling Multivariate Landscape Affordances and Functional Ecosystem Connectivity in Landscape Archaeology. Archaeological and Anthropological Sciences 12.159, 2020, 1–21, DOI.org/10.1007/s12520-020-01127-w.

Kempf 2020b: M. Kempf, From Landscape Affordances to Landscape Connectivity. Contextualizing an Archaeology of Human Ecology. Archaeological and Anthropological Sciences 12.174, 2020, 1–12, DOI.org/10.1007/s12520-020-01157-4.

Kempf 2020c: M. Kempf, Fables of the Past. Landscape (Re-)onstructions and the Bias in the Data, Documenta Praehistorica 47, 2020, 476–492, DOI: 10.4312\dp.47.27.

Kempf in preparation: M. Kempf, Antike und frühmittelalterliche Besiedlung im Umfeld. In: S. Brather-Walter/E. Wirbelauer (eds.), Archäologie einer Transformationszeit. Das Gräberfeld von Niedernai und das 5. Jahrhundert am Oberrhein (in preparation).

Knipper et al. 2013: C. Knipper/D. Peters/C. Meyer/A.-F. Maurer/A. Muhl/B. R. Schöne/K. W. Alt, Dietary Reconstruction in Migration Period Central Germany. A Carbon and Nitrogen Isotope Study. Archaeological and Anthropological Sciences 5.1, 2013, 17–35.

Lehmkuhl et al. 2016: F. Lehmkuhl/J. Zens/L. Krauss/P. Schulte/H. Kels, Loesspaleosol Sequences at the Northern European Loess Belt in Germany. Distribution, Geomorphology and Stratigraphy. Quaternary Science Reviews 153, 2016, 11–30.

Ljungqvist 2009: F. C. Ljungqvist, Temperature Proxy Records Covering the Last Two Millennia. A Tabular and Visual Overview. Geografiska Annaler: Series A, Physical Geography 91.1, 2009, 11–29.

Llobera 1996: M. Llobera, Exploring the Topography of Mind. GIS, Social Space and Archaeology. Antiquity 70, 1996, 612–622.

Llobera 2001: M. Llobera, Building Past Landscape Perception with GIS. Understanding Topographic Prominence. Journal of Archaeological Science 28.9, 2001, 1005–1014.

Maran 2019: J. Maran, Not 'Cultures', but Culture! The Need for a Transcultural Perspective in Archaeology. In: L. Abu-Er-Rub/C. Brosius/S. Meurer/D. Panagiotopoulos/S. Richter (eds.), Engaging Transculturality – Concepts, Key Terms, Case Studies (London 2019) 52–64.

Meier 2005: T. Meier, Siedlungsforschung. Archäologie-Geschichte-Geographie. Siedlungsforschung 23, 2005, 253–290.

Meier 2009: T. Meier, Umweltarchäologie – Landschaftsarchäologie. In: S. Brather/D. Geuenich/C. Huth (eds.), Historia Archaeologica. Festschrift für Heiko Steuer. Reallexikon der Germanischen Altertumskunde, Ergänzungsband 70 (Berlin 2009) 697–734.

Meier 2017: T. Meier, Potentiale und Risiken der Umweltarchäologie. In: S. Brather/J. Dendorfer (eds.), Grenzen, Räume und Identitäten. Der Oberrhein und seine Nachbarregionen von der Antike bis zum Hochmittelalter. Archäologie und Geschichte 22 (Ostfildern 2017) 13–53.

Middelkoop et al. 2001: H. Middelkoop/K. Daamen/D. Gellens/W. Grabs/J. Kwadijk/H. Lang/B. Parmet/B. Schädler/J. Schulla/K. Wilke, Impact of Climate Change on Hydrological Regimes and Water Resources Management in the Rhine Basin. Climatic Change 49.1/2, 2001, 105–128.

Minářová 2013: J. Minářová, Climatology of Precipitation in the Vosges Mountain Range Area. Acta Universitatis Carolinae Geographica 48.2, 2013, 51–60.

Minářová et al. 2017: J. Minářová/M. Müller/A. Clappier, Seasonality of Mean and Heavy Precipitation in the Area of the Vosges Mountains. Dependence on the Selection Criterion. International Journal of Climatology 37, 2017, 2654–2666.

Nakoinz/Knitter 2016: O. Nakoinz/D. Knitter (eds.), Modelling Human Behaviour in Landscapes. Basic Concepts and Modelling Elements (Cham 2016).

Parlow 1996: E. Parlow, The Regional Climate Project REKLIP – an Overview. Theoretical Applications in Climatology 53, 1996, 3–7.

Pfister et al. 2006: C. Pfister/R. Weingartner/J. Luterbacher, Hydrological Winter Droughts over the Last 450 Years in the Upper Rhine Basin. A Methodological Approach. Hydrological Sciences Journal 51.5, 2006, 966–985.

Robertson 1995: R. Robertson, Glocalization. Time-Space and Homogeneity-Heterogeneity. In: M. Featherstone/S. Lash/R. Robertson (eds.), Global Modernities (London 1995) 25–44.

Schreg 2006: R. Schreg, Dorfgenese in Südwestdeutschland – Das Renninger Becken im Mittelalter. Materialhefte zur Archäologie in Baden-Württemberg 76 (Stuttgart 2006).

Schreg 2008: R. Schreg, Bevölkerungswachstum und Agrarisierung. Faktoren des früh- und hochmittelalterlichen Landesausbaus im Spiegel umweltarchäologischer Forschungen. In: B. Herrmann (ed.), Beiträge zum Göttinger Umwelthistorischen Kolloquium 2007–2008 (Göttingen 2008) 117–146.

Schreg 2011: R. Schreg, Die Krisen des späten Mittelalters. Perspektiven, Potentiale und Probleme archäologischer Krisenforschung. In: F. Daim/D. Gronenborn/R. Schreg (eds.), Strategien zum Überleben, Umweltkrisen und ihre Bewältigung. Römisch-Germanisches Zentralmuseum, RGZM-Tagungen 11 (Mainz am Rhein 2008) 197–211.

Schreg 2014: R. Schreg, Uncultivated Landscapes or Wilderness? Early Medieval Land Use in Low Mountain Ranges and Flood Plains of Southern Germany. European Journal of Postclassical Archaeologies 4, 2014, 69–98.

Schreiber 2018: S. Schreiber, Wandernde Dinge als Assemblagen. Neo-Materialistische Perspektiven zum ‚Römischen Import' im ‚Mitteldeutschen Barbaricum'. Berlin Studies of the Ancient World 52 (Berlin 2018).

Schweissing/Grupe 2000: M. M. Schweissing/G. Grupe, Local or Nonlocal? A Research of Strontium Isotope Ratios of Teeth and Bones on Skeletal Remains with Artificial Deformed Skulls. Anthropologischer Anzeiger 58.1, 2000, 99–103.

Storck/Menzel 2016: M. Storck/L. Menzel, Analysis and Simulation of the Water and Energy Balance of Intense Agriculture in the Upper Rhine Valley, South-West Germany. Environmental Earth Sciences 75.16, 2016, 1–14.

Suwandana et al. 2012: E. Suwandana/K. Kawamura/Y. Sakuno/E. Kustiyanto/B. Raharjo, Evaluation of ASTER GDEM2 in Comparison with GDEM1, SRTM DEM and Topographic-Map-Derived DEM using Inundation Area Analysis and RTK-dGPS Data. Remote Sensing 4.8, 2012, 2419–2431.

Thierion et al. 2012: C. Thierion/L. Longuevergne/F. Habets/E. Ledoux/P. Ackerer/S. Majdalani/ E. Leblois/ S. Lecluse/E. Martin/S. Queguiner, Assessing the Water Balance of the Upper Rhine Graben Hydrosystem. Journal of Hydrology 424, 2012, 68–83.

Thomas et al. 1999a: A. L. Thomas/E. Dambrine/D. King/J. P. Party/A. Probst, A Spatial Study of the Relationship between Streamwater Acidity and Geology, Soils and Relief (Vosges, Northeastern France). Journal of Hydrology 217, 1999, 35–45.

Thomas et al. 1999b: A. L. Thomas/D. King/E. Dambrine/A. Couturier/J. Roque, Predicting Soil Classes with Parameters Derived from Relief and Geologic Materials in a Sandstone Region of the Vosges Mountains (Northeastern France). Geoderma 90, 1999, 291–305.

Trémolières et al. 1993: M. Trémolières/I. Eglin/U. Roeck/R. Carbiener, The Exchange Process between River and Groundwater on the Central Alsace Floodplain (Eastern France). Hydrobiologia 254.3, 1993, 133–148.

Van Leusen 2002: M. van Leusen, Pattern to Process. Methodological Investigations into the Formation and Interpretation of Spatial Patterns in Archaeological Landscapes (PhD-Thesis Rijksuniversiteit Groningen 2002).

Von Rummel 2013: P. von Rummel, Ereignis und Narrativ. Erzählungen der Plünderung Roms im August 410 zwischen Textüberlieferung und Archäologie. In: J. Lipps/C. Machados/P. von Rummel (eds.), The Sack of Rome in 410 AD. The Event, its Context and its Impact. Palilia 28 (Wiesbaden 2013) 17–34.

Wetter et al. 2011: O. Wetter/C. Pfister/R. Weingartner/J. Luterbacher/T. Reist/J. Trösch, The Largest Floods in the High Rhine Basin Since 1268 Assessed from Documentary and Instrumental Evidence. Hydrological Sciences Journal 56.5, 2011, 733–758.

Winiwarter 2002: V. Winiwarter, Disziplinäre (Um-)weltbilder. Zur Verständigung zwischen Biologie und Geschichtswissenschaften. In: V. Winiwarter/H. Wilfing (eds.), Historische Humanökologie. Interdisziplinäre Zugänge zu Menschen und ihrer Umwelt (Wien 2002) 197–221.

Zadora-Rio 2003: E. Zadora-Rio, The Making of Churchyards and Parish Territories in the Early-Medieval Landscape of France and England in the 7th–12th Centuries. A Reconsideration. Medieval Archaeology 47.1, 2003, 1–19.

Zimmermann et al. 2004: A. Zimmermann/J. Richter/T. Frank/K. P. Wendt, Landschaftsarchäologie II – Überlegungen zu Prinzipien einer Landschaftsarchäologie. Berichte der Römisch-Germanischen Kommission des Deutschen Archäologischen Instituts 85 (Mainz am Rhein 2004) 37–95.

RESSOURCENKULTUREN 15

HUMAN-MADE ENVIRONMENTS

Landscapes bear traces of the use of resources over long periods. These reflect not only ways of using, shaping, organising, controlling and exchanging resources, but also knowledge, perceptions, motivations for actions and related social dynamics. Resources can be material as well as immaterial and constitute the basis for the development and decline of societies. They are usually not exploited in isolation, but as parts of complexes whose specific constellation in time and space can be best described as assemblages.

This topic was the subject of the session 'Human-Made Environments: The Development of Landscapes as Resource Assemblages' held at the 24th Annual Meeting of the European Association of Archaeologists (Barcelona, 5–8 September 2018) and forms the basis of this volume. The general purpose is a debate on new concepts of the interrelation of social dynamics and resource use and a discussion of case studies in which landscapes were shaped to facilitate the utilisation of resources. The identification of what has been considered to be a resource is discussed as well as the means through which the corresponding landscapes were transformed and the results of these transformations. This implies not only material, but also spiritual aspects linked to the exploitation of resources. Since ResourceAssemblages are products of historical evolution and mutual relations the mechanisms of these processes are of great significance. Supreme aspects comprise the detection of a conscious human formation of landscapes in order to suit the exploitation of resources, the connected social practices as well as socio-cultural dynamics linked to the use of resources.

rk SFB 1070 RessourcenKulturen

ISBN 978-3-947251-46-9

TÜBINGEN UNIVERSITY PRESS