

# Chapter 6

## Resources, Use Potential, and Basic Needs: A Methodological Framework for Landscape Archaeology

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Landscape archaeology as an analytical concept is not really new. Compilations of publications on this issue list several hundred references. Although they are far from being unanimous in their understanding of landscape archaeology, there is a common theme among almost all approaches, that is, the use of the term “landscape” as an analytical concept for a comprehensive understanding of the relation of prehistoric people to their environs, how they acted upon it, and, for a lesser number of papers, how they were cognizant of it. To clarify its full potential the term “landscape” is defined here and an epistemological frame developed for its implementation. The aim is to grasp the complex network of relations between resources, use of resources, and basic human needs in one comprehensive representation. This approach helps to work through all relevant issues in a checklist and facilitates comparisons between different case studies. Case studies from northern and southern Africa demonstrate the value of such an approach.

## 6.1. INTRODUCTION

This chapter discusses a method to systematically record the archaeological remains of a certain landscape at a certain time in its full range. The aim of this approach is to present a checklist of possible human–environment interactions and to propose a procedure for making these interactions comparable across different case studies.

Another innovation of this method is its strict deduction from a definition of the concept “landscape.” This definition results from pertinent investigations in archaeology as well as in other disciplines. The authors understand the concept of landscape as a notion that develops at the interface of natural assets and human agency, use as well as cognition. These four columns have to be translated into categories that can be investigated by archaeological means. A “natural asset” is a resource such as water, food, or raw materials and “human agency” subsumes all traces of how humans shape their surroundings (*Gestaltung*). To investigate the relations between the parameters all usable resources are listed and their use potential discussed. Additionally, all human needs from nourishment up to spirituality are accounted for. The way in which these needs are satisfied on the basis of which resources are available shows the complexity of human land use at a certain point in time and space. Finally, cognition would seem to be an ephemeral phenomenon in the archaeological record but through the occurrence of rock art in a region we find stable, symbolically loaded markers of locations of relevance for the prehistoric people in the landscape and with indicators for the linkages of empirical and imaginary space.

### **The archaeology of landscapes—the landscape of archaeologies: a brief overview**

Concepts of landscape archaeology are usually more clearly discernible in the archaeological practice than being the demonstration of a previously defined body of procedures, working concepts, rules, and postulates. A short scan of the relevant literature shows the different foci which can be the basis for approaches in this vein (cf. Anschuetz et al., 2001, pp. 164ff.). The scale reaches from unabridged positivist concepts to fully fledged hermeneutic narratives, which also express the discrepancies between processual and post-processual approaches. There are, however, further conceptual positions along this continuum, such as the pragmatic position, the position giving priority to emic views or the position trying to consolidate the benefits of processual and postprocessual approaches.

The *empirical approach* is rooted in the 1960s and 1970s (e.g., Hodder & Orton, 1976; Vita-Finzi, 1978) being very close to the natural sciences and trying to grasp the complex information of the human existence in a landscape

through empirical verification, quantifiable and measurable in artefacts and other material evidence. Very clearly in this approach the landscape is mainly seen as a resource apt for human exploitation, being a set of assets conditioning human livelihoods.

The *pragmatic approach* to a landscape grows out of a rather intense preoccupation with an archaeological corpus inseparably linked to a spatial environment. It is in rock art studies where the link between artefacts and the natural surroundings is particularly stable (e.g., Bradley, 1994; Bradley et al., 1994; Swartz & Hurlbutt, 1994) because the sites and the landscape setting in most cases remain more or less unchanged in their large-scale properties such as geology or topography.

Of course *emic views* depend on indigenous voices which still have a chance to be heard. They can help to challenge the western conceptualization of landscape in which often pristine nature plays an important role (e.g., Schama, 1995; Luig & von Oppen, 1997). It has long been known that landscapes can be perceived in very different ways (e.g., Littlejohn, 1963; see also Rössler as well as Dieckmann, this volume) and this realization has led to concepts that move away from the Western bias when using the term landscape. In order to emphasize this shift, new concepts have been introduced, such as “taskscape” (Ingold, 1993) or “mindscape” (Ouzman, 1998a,b, 2002). Taskscape sets the focus on activities and consequently on time which is inseparably linked to action (Ingold, 1993, pp. 157ff.; see also Widlok, this volume). Backed by the views of nineteenth century San hunter-gatherers and their relation to rock art, the mindscape approach emphasizes the cultural specificity of every individual mind in landscape perception (Ouzman, 2002, p. 101).

The *postmodern* turn archaeology has recently taken is clearly visible in a lot of papers which are exercises in writing up histories in the sense of ever-new stories that lie behind the perceived (e.g., Tilley, 1994). Postmodern researchers expressly link up with a phenomenological approach (e.g., Bender, 2002, p. 108) and Tilley’s study is based entirely on a phenomenology founded on Heidegger and Merleau-Ponty (Tilley, 1994, p. 14), providing a highly theoretical and abstract background. In its essence this approach is based on the notion that experiencing a landscape—if it is only intensive enough—bears some trustworthiness even if today we are the ones who want to understand a Mesolithic landscape (ibid.: 74f.).

The attempts of consolidating processual and postprocessual approaches in archaeology obviously grew from the opinion that neither of these approaches is completely obsolete and that relevant information can be gathered either way. Thus R. Layton and P. Ucko concede that it “has become impossible to deny that our explanations are culturally constructed; even if they refer to an independent reality, they enable knowledge of the world not as it is, but merely as we represent it to ourselves” (Layton & Ucko, 1999, p. 3). But they also see that “Reading the landscape as an expression of meanings negotiated in past or

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present cultures will depend on identifying a community's reference to external features that we also perceive" (ibid., 11). At this juncture they bring into play the more pragmatic phenomenology of A. Schütz (following E. Husserl). In its essence this phenomenology is an approach that focuses on those issues in a perceived environment which are liable to intersubjective understanding because this environment, which he termed *Lebenswelt* (= life-world, cf. "lifeworld" in Hodder et al., 1995, p. 239), comprises components that are undisputed and unproblematic, belonging to a world of common experience and interpretation (Schütz & Luckmann, 1975).

Another consolidating strand is manifest in the teaching of landscape archaeology at universities. A short survey on the Internet (e.g., [www.bristol.ac.uk](http://www.bristol.ac.uk) 2007, [www.exeter.ac.uk](http://www.exeter.ac.uk) 2007, [www.oxford.ac.uk](http://www.oxford.ac.uk) 2007, [www.sheffield.ac.uk](http://www.sheffield.ac.uk) 2007) reveals that the aim is the reconstruction of human interaction with a landscape through time, encompassing the earliest hunter-gatherers as well as recent historical times. What makes this understanding of landscape archaeology new and establishes its broadness is the search for analogies in human geography, anthropology, and art history, as well as in philosophy. On the other hand, these studies embrace an interpretative framework that links this kind of landscape archaeology to postprocessual archaeology by looking at emotional and political values. The interpretive framework includes issues such as ritual and cognitive landscapes, sacred geography and the political dimension of the past in the present.

### Landscape archaeology in Germany

Landscape archaeology in Germany is rooted mainly in the concept of settlement archaeology. A detailed discussion of the history of the term and of the sources and methods of settlement archaeology can be found in Jahnkuhn (1977). He defines settlement archaeology as a field of research that, first of all, strives to study questions relating to settlements on the basis of archaeologically comprehensible and explainable material sources without considering phylogenetic or ethnic aspects. Jahnkuhn emphasizes the closeness of settlement archaeology to settlement geography and its two branches, physiogeography and anthropogeography. In this context he applies the term settlement archaeology not only to the examination of the records of a settlement but encloses the economic units pertaining to the settlement as well as raw materials and burial sites (Jahnkuhn, 1977, p. 6ff.; cf. Schade, 2000, p. 140).

Shortly after Jahnkuhn's paper had appeared the term "landscape" was used in the German archaeological literature. In his article of 1982, "Siedlung in bandkeramischer und Rössener Zeit," J. Lüning remarks that one should preferably speak of an archaeology of prehistoric cultural landscape if the

archaeology of settlement is combined with the examination of agricultural areas, cult, political, and military works and networks of traffic (Lüning, 1982, p. 9). His paper, "Landschaftsarchäologie in Deutschland – Ein Programm," (Lüning, 1997) deals explicitly with the concept of landscape archaeology, defining it on an abstract theoretical level:

The term landscape archaeology . . . describes mainly an overarching view. With the help of this view older approaches of research, namely settlement-, economic-, social-, and eco-archaeology, each with its own focus, can be combined to form a strand of questionings. The classical settlement archaeology is closest to the term landscape archaeology. . . . (Lüning, 1997, p. 277, translation by J.L.)

Another German publication that tries to substantiate the concept of landscape archaeology is C. Schade's Masters thesis: "Landschaftsarchäologie – eine inhaltliche Begriffsbestimmung" (Schade, 2000). Although he does not contradict Lüning's position he suggests a definition of landscape archaeology that is closer to practice:

The term landscape archaeology denotes the systematic examination of regions settled in prehistoric times (Leser, 1997, p. 690), which usually aims at the reconstruction of settlement structures and diachronic settlement processes. The structure of a settlement system and of economic areas provides clues for the type and extent of land use and via this strand also for the communal system of a concrete historic and cultural-spatial section of a landscape. Changes in society and economic conditions can be discerned in the choice of different locations and also in number, size, and function of settlements. (Schade; 2000, p. 182, translation by J.L.)

Based on this definition a synthesis of different archaeologies is emphasized, thus stressing an intradisciplinary interlacing in addition to the interdisciplinary teamwork with the natural sciences.

In general the reconstruction of the cultural landscape and its mutual effects with the surrounding natural sphere is the objective of landscape archaeology. Therefore the archaeological sites of the area under investigation have to be recorded as comprehensively as other elements of the landscape (Lüning, 1997, p. 227f.; Schade, 2000, p. 184). The core thought of this concept is that, in a given landscape, there is no isolated site but every trace of human activity is part of a settlement system that has to be recorded (Schade, 2000, p. 160). Because it is impossible and also of little use to dig up whole landscapes, apart from excavation, surveys combining natural scientific and archaeological methods are indispensable (Lüning, 1997, p. 281f.; Schade, 2000, p. 172ff.).

With the help of statistical methods the representativity of the surveyed and excavated areas (Zimmermann, 2001) and of the examined random samples of the inventories (Linstädter et al., 2002) can be checked. Mappings with geographic information systems (GIS) show the distribution of sites in space

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and on a timescale as well as the relationship between the archaeological sources and the natural factors. Apart from a two- or three-dimensional representation of the information, GIS also enables their statistical interpretation.

An excellent example of landscape archaeological work is the examination of the Linearband-ceramic settlements of the Aldenhovener Platte (North Rhine-Westphalia, Germany). In the project, Settlement Archaeology of the Aldenhovener Platte (SAP), five settlements were almost entirely excavated during the years 1972–1973. On the basis of this record the area became a main focus of research. The SAP project continued into the 1980s. In the meantime in an area of approximately 300 km<sup>2</sup>, 34 sites are known and all the work concerning the structure of settlements (Boelicke, 1982), ceramic typology (Stehli, 1973), and the supply of raw materials (Zimmermann, 1995) have formed the basis for further archaeological research. In addition the settlement archaeological examinations were always connected to palaeo-ecological and especially palaeobotanical research (Kalis, 1988; Kalis & Zimmermann, 1988). Thus evidence was presented concerning vegetation history, agriculture, and anthropogenic environment change in the settlement's surroundings.

Since 1998 settlement and environmental archaeological work has been continued in the project Landschaftsarchäologie des Neolithikums im Rheinischen Braunkohlerevier (LAN). This project is based on an explicit landscape archaeological concept. The objective of the project is to investigate the settlement corridors of the Rhenish Lössbörde in representative sectors (small regions). Both the internal structure of single settlement clusters and the connecting economic and social networks are the focus of this project (Frank & Wendt, 2003). To compare or complete data from these different levels of scale, methods of upscaling and downscaling have been developed (Zimmermann et al., 2004). All in all, empirical approaches dominate German landscape archaeology.

## 6.2. LANDSCAPE-ARCHAEOLOGICAL DEFINITIONS AND METHODOLOGY

### 6.2.1. Definition of the Term “Landscape”

Different scientific disciplines foster their own definitions of the term “landscape,” as the articles of this volume show, and within archaeology itself there is no consistent definition. Archaeologists often make use of the dichotomy of “cultural landscape”

versus “natural landscape” (Schade, 2000, p. 156). The term “cultural landscape” is used to describe the human impact on the environment. Opposed to that, “natural landscape” is used for a system which is barely or not influenced by humans at all, which is the state people encounter when first colonizing an area.

In landscape ecology the term landscape is synonymous to the concept of “landscape ecosystem.” This system is characterized as part of the earth’s biogeosphere (ecosphere), realized as a highly complex, substantial, and energetic system of natural influences to which anthropogenic factors and processes stand in direct or indirect relation (Leser, 1997, p. 187). The relationship of natural and anthropogenic factors builds the center of this definition, termed the society-milieu relationship (Hirsch, 1995, p. 9). Even geographical definitions of the term “landscape” such as Sauer’s (1963, p. 343) follow this understanding: “The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium[:] the cultural landscape is the result.”

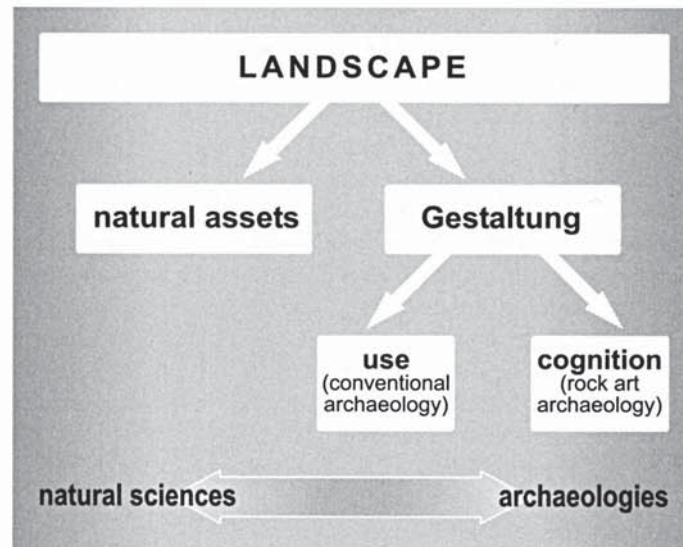
According to these landscape-ecological and geographical definitions and in synthesizing the terms cultural and natural landscape frequently used in an archaeological context, we apply landscape as a concept in between human cognition and action (subsuming both as *Gestaltung*) on the one hand and independently existing material resources. We postulate that there is an independent natural complement to human agency. It is well established in the humanities that a distinction of nature versus culture does not correspond to the views of non-Western societies (e.g., Heyd, 2002; Dowson, 2007). However, in a Western scholarly context there are useful aspects in the existence and use of these terms if the incongruence with emic categories is always kept in mind. But the denial of such distinguishing categorization inevitably leads to an unsystematic mingling of two epistemologically different corpora.

In order to avoid getting caught up in a lasting discussion on the validity of these two categories we suggest the analyzing of landscape with a categorization which is not particularly biased, although the analogy to other concepts is evident (Figure 6.1).

### 6.2.2. A General Procedure for Landscape-Archaeological Practice

According to our understanding of the term landscape it incorporates methodological properties that enhance the strength of landscape archaeology as an integrative tool. Natural resources, subdivided according to their parameters, are correlated with basic human needs. Both are linked by the use potential that transforms a resource into an asset.

Through the configuration of both antipodes a lot of possible relationships between use potential and the satisfaction of human needs can be generated. The pattern that emerges through the satisfaction of a specific need by making use of particular options produces the individual fingerprint of a community utilizing a certain landscape at a certain time. This fingerprint is termed in the following the general pattern of use.



**Figure 6.1.** Categorization of landscape relevant for landscape archaeology

Although resources of a prehistoric landscape are often still detectable today, the former needs can only be assumed. However, these assumptions are founded on an empirical base. According to the landscape-archaeological concept no isolated site exists without being part of a settlement or use system. Likewise no isolated human action exists beyond the common human behavior of nourishment, settling, tool production, mobility, or interaction with the environment and his or her own species (identity, communication, symbolism).

A general procedure for landscape-archaeological projects has already been described elsewhere (Schade, 2000, p. 184ff.). Modified to our methodological approach, the procedure is divided into six steps (Figure 6.2). The first step is the generation of archaeological data. This includes the definition of the research goal as well as the research area, followed by surveys, excavation, and documentation of all sites and finds. The second step follows the determination and the ranking of human needs (a step which has to be done only once, unlike the generation of archaeological data). Step number three in our *chaîne opératoire* is the identification and mapping of all potential resources. The resource survey takes place most appropriately with the search for the materials recorded on the sites. Moreover, the knowledge and understanding of resources that were not used provide interesting insights as well. Step four results automatically from step three, that is, the definition of the use potential of all resources and the qualitative assessment of the raw materials. Finally this step shows what the landscape actually offers to its inhabitants. In the fifth step the sites are analyzed and combined to temporal and spatial units. Here archaeological entities are evaluated with their natural resources and



STEPS	METHODS
1 archaeological data	research goals & area surveying, excavation, documentation
2 basic needs	determination of personal needs, ranking of personal needs
3 resources	identifying natural resources, mapping natural resources
4 use potential & raw material	defining their use potential, qualifying raw materials
5 analysis	multifactorial site analysis, classification of sites, record-resource relations, resource-needs relations
6 pattern	generalized pattern of land use cognitive map modelling

Figure 6.2. *Chaîne opératoire* for landscape-archaeological research

their use potential for the consequential comparison. At the final step generalized patterns of land use can be formulated, land use maps or cognitive maps can be produced, and particular questions can be investigated by modeling methods.

### 6.2.3. Concepts of Landscape Description: More Definitions and their Methodological Implications

#### 6.2.3.1. Nature and Natural Assets

Nature, we maintain, is the empirical landscape that can be examined by the natural sciences in order to supply evidence that provides explanations and

understanding for us but may not do so for indigenous people. The advantage of describing nature in natural scientific categories lies in the possibility of developing comparisons and analogies between different landscapes, procedures that do not lie in the scope of emic knowledge systems. Accordingly nature retains relevant information for outsiders without indigenous insights. We may yet be potentially able to communicate parts of our notion of nature to indigenous people because it refers to that part of the world (following Schütz' understanding of phenomenology) where they can meet us physically, we, who are not cultural insiders of their world. Nature holds the resources of interest for human exploitation or symbolization; it is the arena where natural assets are available or negotiable. The choice of the term "natural assets" is based on the aspect that through its connotation of being useful or beneficial to someone, it implies human involvement, thus strengthening the view that a landscape concept is futile without the human role in it, even if it were manifest only in perception. Moreover, the term natural assets should be understood as a heuristic descriptive tool by which the resources that help to satisfy human needs can be registered.

#### 6.2.3.2. *Gestaltung*

The complementary second component in this approach to landscape is termed *Gestaltung*, which means giving a *gestalt* to something. More specifically it denotes the process by which a structure or configuration is given to physical, biological, or psychological phenomena so integrated as to constitute a functional unit with properties not derivable from its parts in summation (after Webster's, 1993, p. 952). In part this refers to the physical act of shaping or processing given assets (e.g., fitting a stone tool or seeding crops) and using the resources whereas another part of the concept *Gestaltung* refers to cognition, that is, the "knowledge, purposes, practices, and skills of the people" (Segal, 1994, p. 22) who have interacted with the landscape. These two broad aspects of *Gestaltung* are grasped here with the terms "use" (see below), for which field archaeology is the relevant research tool, and "cognition" where cognitive archaeology is the appropriate instrument.

*Cognition* is listed here as a means of *Gestaltung* because it denotes an active procedure by which perception is processed in the mind in order eventually to be uttered as behavior and action. Among the cognitive means of *Gestaltung* rock art takes a salient position inasmuch as it is a sign system often with universally readable elements. They may become understandable to a certain extent even without indigenous comments through the employment of information of intercultural knowledge, such as animal behavior (e.g., Lenssen-Erz, 1997, 2000; Hollmann, 2003). Further advantages of rock art are the restrictedness of taphonomic processes (usually weathering, erosion, and/or repatination only) and, as a consequence thereof, the reliability of the spatial context in which rock art is found which, better than in any other artefact class, enables considerations as to the original, intended spatial arrangement.

### 6.2.3.3. *Basic Needs*

Use of resources is a behavior that is inseparably linked to the basic needs which people must satisfy if they want to lead a decent human life. Our list of basic needs follows conventional needs after Abraham Maslow (Figure 6.3, left; Maslow, 1970, 1981; see also Lenssen-Erz, forthcoming, for a detailed discussion) such as food, protection, and so on. The hierarchy established with this pyramid was subdivided by Maslow into the four lower D-needs = deficiency needs and the three higher B-needs = being needs, indicating that the lower needs necessarily have to be satisfied whereas higher needs may not even turn up in every person (Maslow, 1981, pp. 102, 128f.). Once someone has reached the upper levels, he or she may—at least temporarily—dispose of the satisfaction of the lower ones (ibid., 79, 102). This model of needs should therefore be understood as flexible with permeable levels that provide a framework for the motivations under which people may act in any given situation.<sup>1</sup>

As with Maslow's model, needs are ranked differently according to their priority. Our list includes issues that are normally not registered in the many variations of Maslow's pyramid of needs, such as tool production or mobility (Figure 6.3, right). The reason for including such needs lies in the fact that, first, they are means and sometimes preconditions for satisfying the more basic needs and, second, the ubiquity of the respective items (e.g., tools) indicates that people everywhere and at any time display the behavior of producing these traces. Tool production defines humanness and is the major diagnostic evidence of human activity. There is a cogent link of human life with tool production that consequentially is conceptualized here as one of the more or less basic needs.

In order to adapt Maslow's understanding of needs and its psychology-loaded terminology to the conventions of archaeology, Figure 6.3 provides a correlation of Maslow's levels with terms which are current in archaeology.

### 6.2.3.4. *Resources*

According to the dictionary, "resource may refer to any asset or means benefiting or assisting one, often to an additional, new, previously unused, or reserve asset" (Webster's, 1993, p. 1934). On purpose there is little specification in this definition but there are characteristics that can still be contextualized archaeologically. Accordingly resources are those assets which:

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<sup>1</sup>Recently Maslow's model has been developed into a paradigm based upon another metaphor, i.e. that is, the "spiral dynamics" model (Beck & Cowan, 1996). This, however, does not invalidate the Maslow pyramid which would seem to be more down to earth and therefore more adequate for archaeological appropriation even though the spiral dynamics model has been put into political practice.

LEVEL	NEED	EXPRESSIVE FORM	HUMAN NEEDS CORRELATED WITH MASLOWS LEVELS						
			nourishment	dwelling	tool production	mobility	identity	exchange & communication	religion & symbolism
7	Aesthetic	- ? -							●
6	Knowing and understanding	curiosity, learning, philosophizing, experimenting						●	●
5	Self-actualisation	individuality, righteousness, altruism..					●	●	●
4	Esteem	internal: respect, autonomy.. external: status, recognition..			●		●	●	●
3	Social belongings	love, sense of community, acceptance..		●		●	●	●	●
2	Safety	protection, order, security..	●	●	●	●			
1	Physiological	thirst, hunger, warmth, shelter..	●	●	●				

Figure 6.3. Human needs as defined in the present study, correlated with the levels of Maslow's pyramid of human needs (Maslow, 1970)

- Cover all human needs (cf. Figure 6.3)
- Have always been used by humans since the early hominids
- Are accessible to and can be made use of by every able person
- Can be grasped empirically to a large extent, thus being described in formats that enable comparisons and analogies

Such a holistic view on resources sets up a close connection with the concept of lifeworld as established by Schütz (Schütz & Luckmann, 1975).<sup>2</sup> The purpose of linking lifeworld to resources is to establish a descriptive unit that could be an autarkic entity in which the entire life of a population could possibly take place without the necessity to leave this territory in order to gain access to vital outlying resources.

In the context of landscape archaeology, as it is suggested here, five main resources can be established: water, abiotic raw materials, plants, animals, and space but the inclusion of further resources may be possible in future, for example, time or human.<sup>3</sup> The first four resources follow a universal rationality and underlie universal causalities. Here the forces of physical laws, evolution, or geology are at work and restrict the options for human intervention. They are therefore prone to be dealt with by natural sciences if a general first overview of the availability and richness of these resources is needed in a case study. Space, by contrast, is a resource that, to a large extent, underlies culture-specific rationality and causalities (e.g., Dünne & Günzel, 2006) with use being guided by cognition to a much higher degree than that of the other resources.

Each resource is apportioned into several parameters. These parameters define the resource precisely and have to be checked as to whether they are available in the research area. The resource “water,” for example, is characterized by

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<sup>2</sup>Hannah Arendt, following A. Schütz, developed and summarized his concept for a modern world context, but nonetheless her interpretation matches all premodern lifeworlds very well because “the world of common experiences and interpretation (*Lebenswelt*) is taken to be primary and theoretical knowledge is dependent on that common experience in the form of a thematization or extrapolation from what is primordially and pre-reflectively present in everyday experience” (after Yar, 2001).

<sup>3</sup>The parameters of time range from day/night over seasons and lifetime to generations and also past and future may be listed here. Time has a potential to be used for labor, leisure, recreation, or movement, as well as social and religious management. Traces of these kinds of use are either too ephemeral or too variant to be analyzed systematically. The human resource certainly awaits a clear definition but it may comprise parameters such as ratio, language, symbolic thinking, reproduction control, and skilled movements. These specific abilities can potentially be used for working power, *Gestaltung*, innovation, abstraction, imagination, communication, or social differentiation, and the like. Finally, it is only through the human resource that the satisfaction of a basic need can be accommodated which undoubtedly is of universal character, namely sexual activity. Although the relevance of time in landscape archaeology has been emphasized recently by, for example, Ingold and Bender (Ingold, 1993; Bender, 2002), the human as a resource has not received similar attention.

the parameters surface or groundwater (in addition to rain). Of special interest are, in this case, questions such as how much water is available (annual precipitation or groundwater) and at what distance. Furthermore it should be clarified whether water is available permanently or just temporarily. The other parameters are listed in Figure 6.4 in the column “resources.”

#### 6.2.3.5. *Use and Use Potential*

For the interaction with resources one may resort to a rather simple, everyday term, namely “use” (German: *Nutzung*). It encompasses exploitation, consumption, curation, nurture, development, occupation, and symbolization. Usually the use of resources leaves traces in the ground. As a rule of thumb one might say that, to a large extent, in the physicality of the findings of field archaeology one has to deal with the results of productive targeted activities—mainly aimed at tangible addressees—that are based on a cognitive spectrum of everyday with the causalities and rationalities of the physical world. Such issues have always been dealt with by conventional archaeology concerned with settlements, economy, social structure, or ecology.

In contrast, the cognitive elements are rather tokens of symbolic actions whose cognitive spectrum may not be linked to our real world thus having its own causalities and rationalities. They are not necessarily derivable by logic reasoning and may partially be aimed at intangible addressees. Yet, cognition is not entirely arbitrary and retains many elements that are accessible from the inevitably etic perspective of a prehistorian (Zubrow, 1994a, b, p. 110f.).

For each resource parameter there is a potential for use. The potential is the maximum of what can be extracted as an asset from a resource but may never have been managed to the full extent in prehistoric small-scale societies (such as gaining energy from water). In this potential there are options of use that are dependent on temporal and spatial circumstances inasmuch as not every landscape will inevitably provide the full range of resource parameters. Therefore, from the options available, every society makes its choices thus producing patterns of use. It may, however, happen that a society does not exploit the full use potential at its availability and in such a case it should be worked out why this is so. Maybe it was conscious choice, inadequate technology or knowledge, and so on, or maybe relevant needs could be satisfied with another resource or access to the respective resource was blocked by a competitor.

The three strands of resources, use potential, and basic needs form the pillars of any livelihood and pattern of land use. It is the archaeological data that hold the information for the understanding of how one pillar is connected to the other with use potential attaining a central position (Figure 6.4). This scheme enables the researcher to make valid statements concerning the way of living for any society and to format the knowledge about it in a layout that enables comparison to any other society.

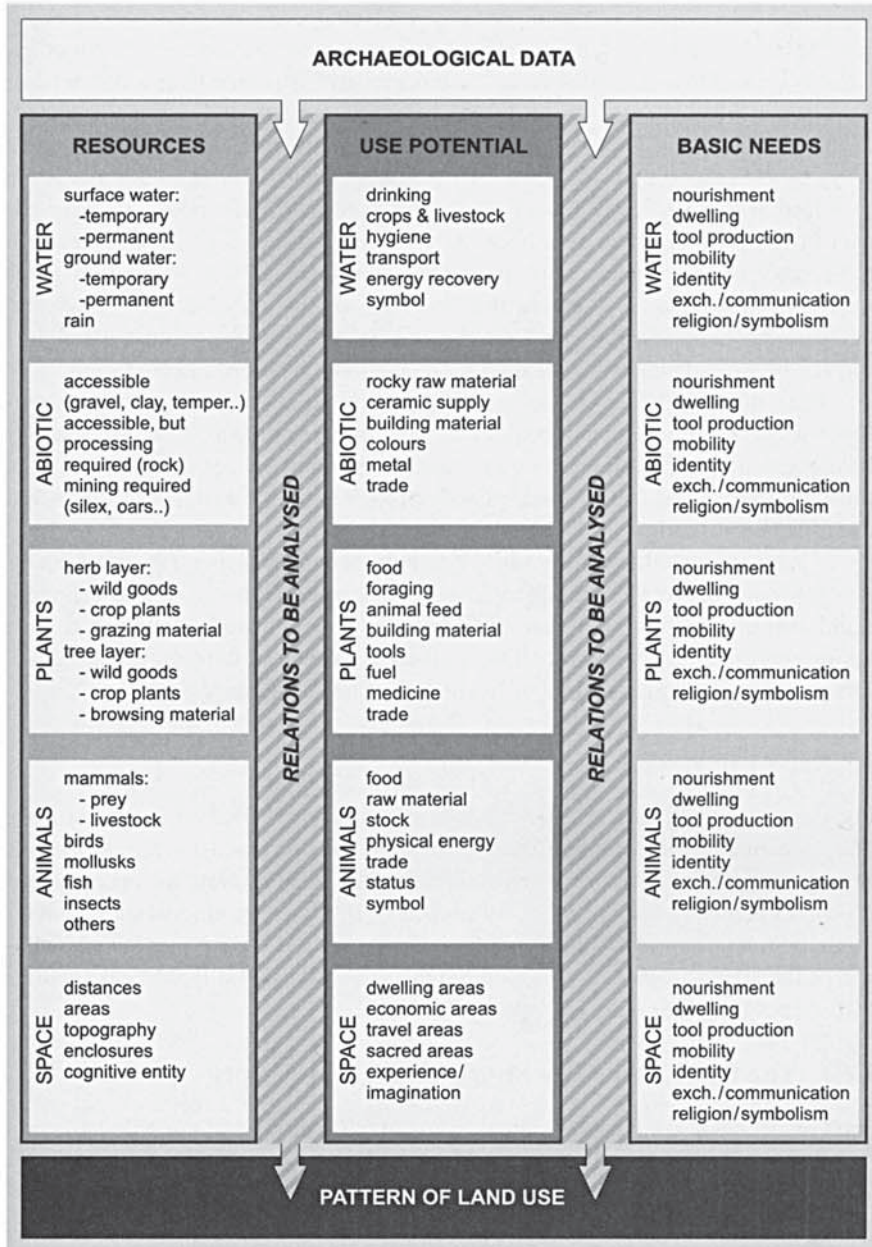


Figure 6.4. Analytical scheme of the relationship among resources, use potential, and human needs

The Millennium Ecosystem Assessment (2005, p. 28) has presented a comparable matrix of relationships working with two basic poles: First “ecosystem services”, encompassing “life on earth – biodiversity” which combines components that our model lists under resources but on the other hand are clearly culturally embedded needs. This pole is complemented in the Millennium Ecosystem Assessment (MA) by the second pole of “constituents of well-being” in which basic needs are combined with qualified resources (e.g., “sufficient nutritious food”). Because the use of this model is aimed at political decision making it also contains issues such as “freedom of choice and action” among the constituents of well-being. Both poles are linked with arrows assessing the “intensity of linkages between ecosystem services and human well-being” on the one hand and—here again the political purpose becomes tangible—“potential for mediation by socioeconomic factors.”

Both models, the MA as well as ours, are attempts at finding a representation for the complex social–ecological systems’ relationships. The necessary differences between both are based on the dissimilar purposes, where our model aims at bringing together all kinds of archaeological finds and data in a consistent empirical framework.

Three case studies presenting archaeological landscapes (the Gilf Kebir in southwest Egypt, the Brandberg/Daureb in central Namibia, and the Ennedi Highlands in eastern Chad) exemplify how the two poles of resource and need can be represented in a matrix showing their interrelation with the use potential thus producing the fingerprints of livelihood of these cultures.

#### 6.2.3.6. Case Studies

The case studies in this chapter serve to exemplify the method proposed here. They are not at all complete descriptions of the discussed sites, cultures, or phenomena. Each of the presented studies is able to fill monographs (Linstädter, 2005) or even book series (Pager, 1989–2006). But the case studies show that by using the relation module of resource/use/basic needs as a guideline the presentation of land use studies can be structured in such a way that different case studies become comparable.

#### 6.2.4. The Gilf Kebir Case Study (Southwest Egypt)<sup>4</sup>

The Gilf Kebir is a sandstone plateau situated 650 km west of the Nile valley on the same geographical latitude as the Aswan Lake. In the north it disappears under the Great Sand Sea, and in the southeast its cliffs rise about 150 m above the surrounding plains. Here the plateau is intersected by broad wadis. Some of them, such as the Wadi Bakht, the Wadi Maftuh, or the Wadi el Akhdar, are of special interest for geographers and archaeologists because of their unique geomorphological

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<sup>4</sup>The Gilf Kebir case study is based on fieldwork carried out in the framework of several DFG-sponsored projects at the University of Cologne. The Great Sand Sea case study (Riemer, this volume) was undertaken with the same background.



situations: the so-called barrier dunes or terraces (Kröpelin, 1989). Over a period of several millennia, the sediments of playas accumulated behind these barriers. These sediments are the result of seasonal or episodic rainfall which has produced temporary water reservoirs used by prehistoric inhabitants.<sup>5</sup>

Comparable to the SAP-project in Germany described above, in the Gilf Kebir stone tool and ceramic technologies, settlement structures, and subsistence strategies were investigated according to the settlement-archaeological approach. At the end of the twentieth century many of the excavated sites were published and a chronological sequence was established (Figure 6.5) (Hallier, 1996; Schön, 1996; Linstädter, 1999; Gehlen et al., 2002).

The investigation of the archaeological sites close to the playa lakes formed the basis of a conceptual model on settlement activities in the upper reaches of the valleys. Crucial questions of research were the extent of the economic area used by the prehistoric population and the source of raw material supply for the production of lithic tools found in the valleys. It was obvious that the area inside the

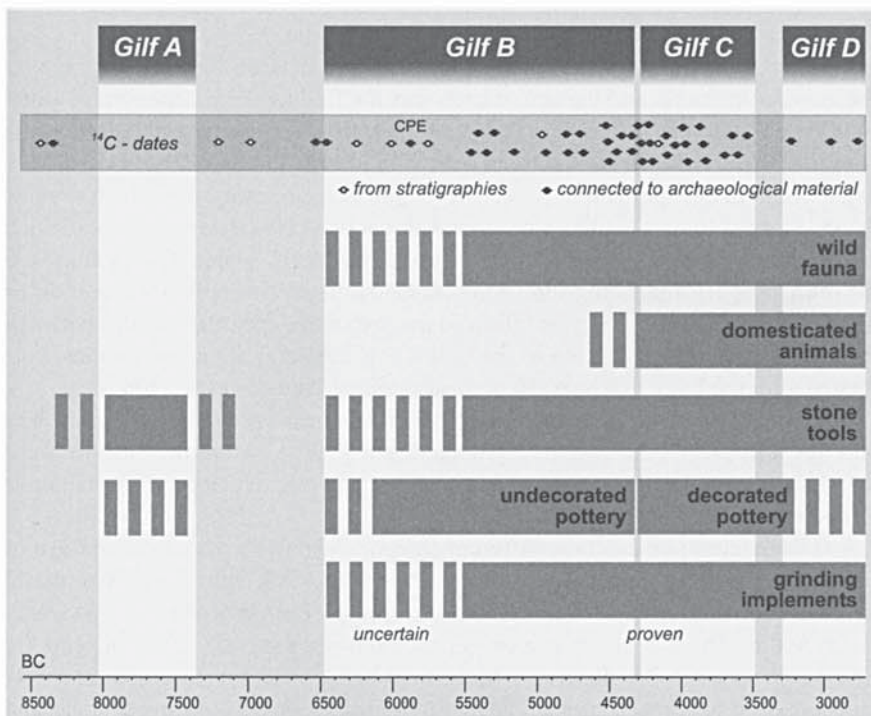


Fig. 6.5. Chronological sequence of the Gilf Kebir

<sup>5</sup>The upper reaches of Wadi Bakht, Wadi Maftuh, and Wadi el Akhdar have been subject to archaeological investigation by researchers of the University of Cologne during the past 20 years (Kuper, 1995; Schön, 1994).

wadis and close to the dwelling sites could not have sufficed either for the needs of hunter-gatherers nor for a pastoral-nomadic way of life. Moreover, no quartzite or chalcedony deposits were found close to the barrier dunes. There was also only little evidence of material or cultural exchange with other occupation areas investigated in the Eastern Sahara.

As a first step a research area in the southeastern Gilf Kebir was selected (Step 1). The research area extends from the upper reaches of the Wadi Maftuh and the Wadi Bakht in the west to the eastern plains of the Gilf Kebir in the east and has an extension of about 450 km<sup>2</sup>. It includes three different landforms: plains, valleys, and the plateau surface (Figure 6.7). The vast forelands were surveyed by car, the barely accessible plateau area by foot. As a result 134 sites were documented and parts of them were excavated.

After defining the human needs (Step 2) the natural resources had to be checked (Step 3). In the research area these are mainly surface water behind the barrier dunes, and the quartzite outcrops on top of the plateau. These two resources have a high use potential (Step 4). As a water source there is no alternative to the water reserve of the wadis anywhere in the entire region. Of the stone tools more than 90% are made from the local quartzite.

After standardized analyses in order to obtain data on the material culture, the internal structure, and the age of each site, the findings were categorized (Step 5). One of these categories relates to raw material deposits (so-called outcrops) with diameters between 10 and 60 m, which in almost all cases show evidence of extensive human exploitation. A second category covers campsites which suggest extended stays due to evidence of stone hearths or stone circles or material such as grinding stones, pottery, bones, or ostrich egg shells. Isolated workshops are the third category, indicating short-term stays to renew the supply of stone tools or blanks. In the next step analysis followed that examined the relationships between the natural resources available in the Gilf Kebir including their use options, correlated with the basic needs of the prehistoric inhabitants of the region.

In order to investigate the general land use patterns of the research area all sites were mapped and their relations defined (Step 6). On the base of these data land use models on a local and regional scale were developed (Linstädter & Kröpelin, 2004; Linstädter, 2007).

The mapping of the three different categories shows a very different use of the landforms plain and plateau. Only 12% of the plain sites are raw material deposits and were used for raw material supply. About 88% of the sites (workshops and campsites) indicate short- or medium-term stays. On the plateau the reverse pattern is to be observed. More than half of the sites are quartzite outcrops, used in prehistoric times. The research area appears as a cultural landscape in which special land use systems developed as a function of raw material occurrences and geomorphologic factors.

One of the main aims of the landscape-archaeological concept is to show the change in land use practices at different times. In contrast to the Brandberg/Daureb case study (see below) where land use patterns of a single phase were examined, two phases with different patterns were compared in the Gilf Kebir

case study. The determination of a specific phase is achieved by radiocarbon dates or typological investigations. However, not every site provides datable material because of heavy erosion and deflation in most of the desert landforms. The area with the most dated sites is the plateau region. Here the different patterns of land use in the two main phases, Gilf B (6500–4300 bc) and Gilf C (4300–3500 bc; Figure 6.6) can be clearly distinguished.

The different resources yielded the following evidence.

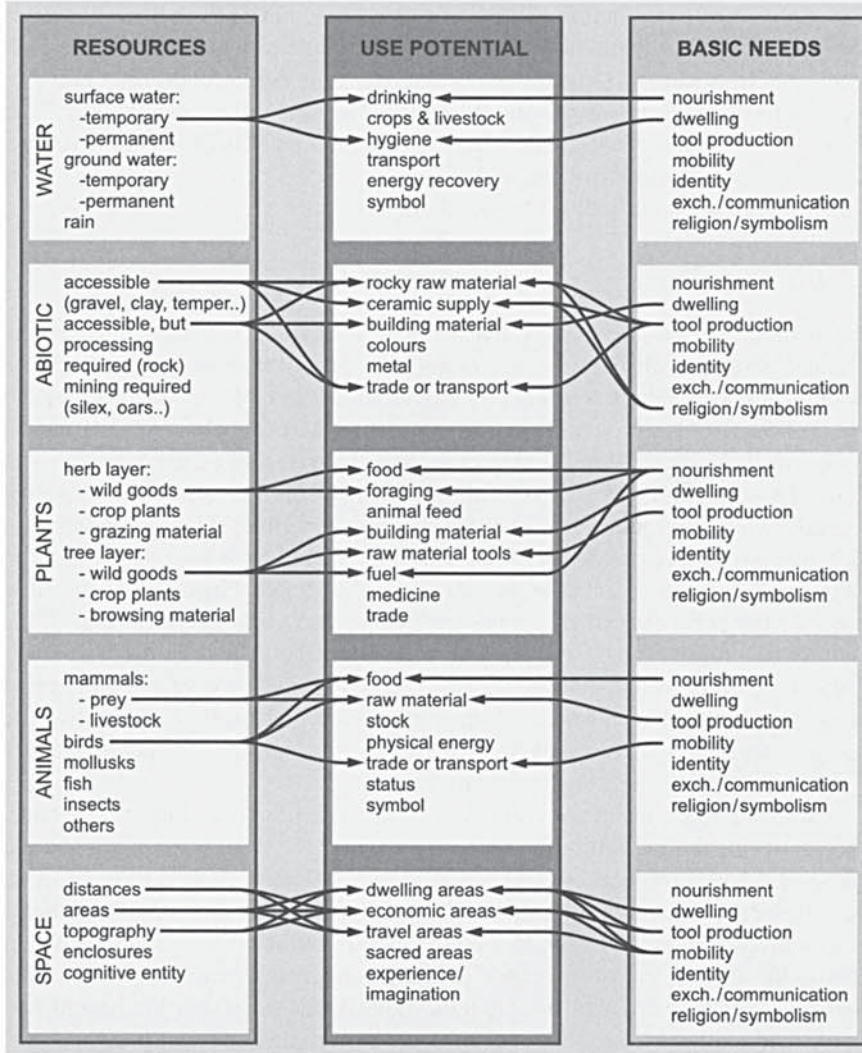
#### 6.2.4.1. *Water*

The availability of the resource water is the most likely factor that influenced the land use pattern at all times. According to our current knowledge there was no groundwater available in Neolithic time (Kröpelin, 1989, p. 232). Geological and archaeobotanical research show that precipitation was probably lower than 150 (Kröpelin, 1989, p. 286) or 200 mm/a for the entire period of the Neolithic wet phase. These rainfalls were episodic. In which season they were to be expected depended on the influence of the prevailing climate regime. It is assumed that for the time up till approximately 4300 bc summer rain and from 4300 on winter rain influence was predominant (Linstädter & Kröpelin, 2004). Phase Gilf B therefore falls into the period in which the eastern Sahara was under the influence of the summer rain regime. The wadi barriers in some of the valleys of the Gilf Kebir enabled the water from the brief rainfalls to remain available over a longer period during the entire phase of occupation (Figure 6.6). Because a large part of the heavy summer rains in phase B drained away on the surface, the locations close to the wadi barriers were of special importance.

Settlements during phase Gilf C were under the influence of the winter rains. The change of the rainfall regime had an effect on the water supply but also on flora and fauna, as well as on the economic and settlement system of the people. Despite the same quantity of rainfall as before, species were detected that indicate a more favorable water supply. Moderate rainfalls are better suited to the vegetation on the spot. From time to time it likely generated a grass covering on the plateau, which then could be used as a meadow. At the same time the run-off was diminished so that the settlement sites at the barriers became less attractive and campsites on the plateau confirm its usability.

#### 6.2.4.2. *Abiotic Raw Material*

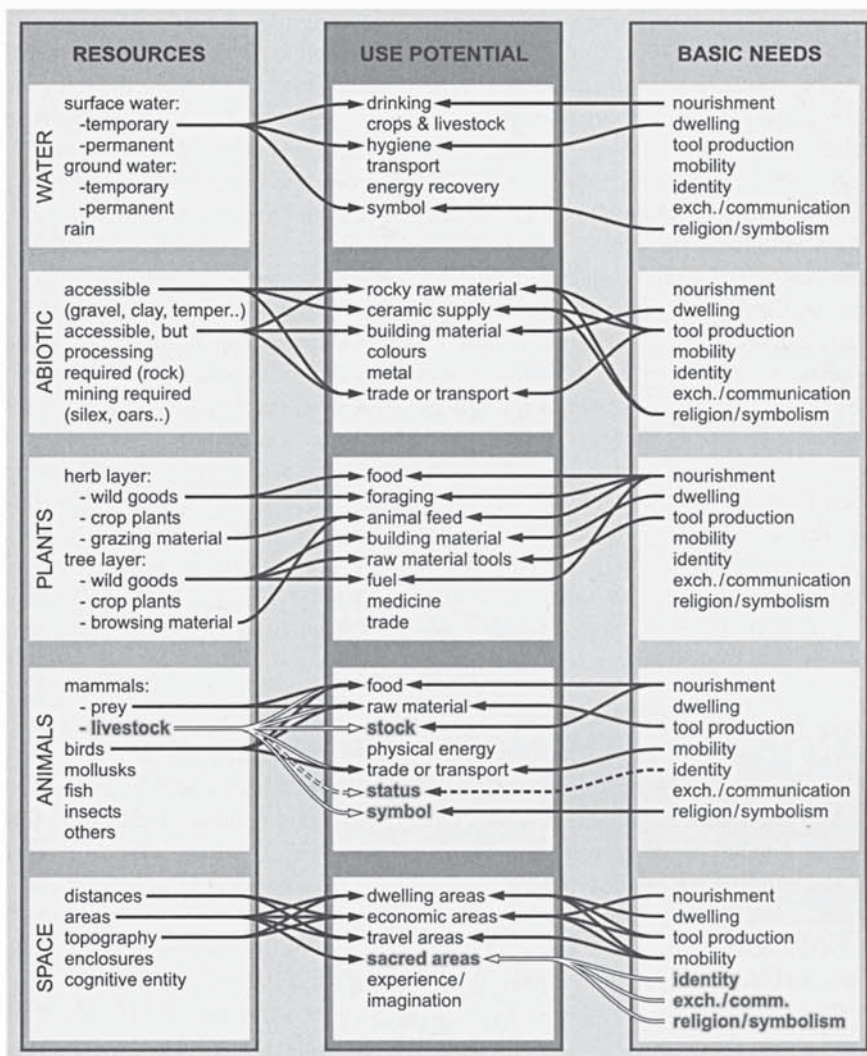
The most important aspect for stone tool production is the question concerning raw materials. Through surveys (Linstädter, 2003, p. 385), information on rich deposits of different quartzite varieties on the Gilf Kebir Plateau was gathered. The quartzites occur in outcrops in the vicinity of the valleys and are easily accessible. Eighty to ninety percent of all stone artefacts are made of this material (Schön, 1996; Linstädter, 1999). A *chaîne opératoire* reconstructs the quartzite quarrying on the plateau and its working in the valleys in this phase (Linstädter, 2003, Figure 2). The other artefacts were made of sand- or siltstone,



a

**Figure 6.6.** Analysis of relations between use of resources and human needs for the archaeological phases Gilf B (Figure 6.6a) and Gilf C (Figure 6.6b)

several chalcedony varieties, quartz, basalt, or desert glass (Schön, 1996, p. 353). The source of the quartz and chalcedony have not yet been identified, whereas the origin of the desert glass is precisely known. It originates in the southeastern Sand Sea, directly to the north of the Gilf Kebir and clearly proves contact with this region. Apart from the raw material for the stone tool production, raw material for ceramic production such as clay (playa sediments) or temper material (sand)



b

Figure 6.6. (continued) white arrows indicate new relations after livestock and rock art were introduced

is available although there has been no indication of local ceramic production in the eastern Sahara up till now.

### 6.2.4.3. Flora

Information on the tree structure is provided by the research of Neumann (1989, pp. 116ff.) and Nußbaum (Linstädter & Kröpelin, 2004). The identified species

(*Tamarix* sp., *Acacia* sp., *Maerua crassifolia*, *Balanitis aegyptiaca*, *Faidherbia albida*—in the case of Neumann still *Acacia albida*—and *Ziziphus* sp.) are still existent in the Sahara and indicate an arid to semiarid climate. For the early Holocene before 6500 bc only *Tamarix* sp. was detected. This species forms the so-called gallery forests and requires 50–100 mm/a precipitation. From 6500 BC (Gilf B) *Acacia* sp., *Ziziphus* sp., and *Faidherbia albia* can be found, where at least for *Ziziphus* sp. more favorable conditions must be assumed (Neumann, 1989, p. 123). The occurrence of *F. albida*, which is only present for a period around 5000 BC, indicates a monsoonal influenced summer rain regime for it is clearly a savanna species. Evidence of *Ziziphus* sp. lasts until 3500 BC and includes the phase Gilf C. Therefore it can be assumed that at least the species *Ziziphus* sp. indicates favorable conditions with annual rainfalls from 150 or 200 mm in the phases Gilf B and C. The influence of the summer rain (*F. albida*), however, is only to be expected for the Phase Gilf B. From 3500 BC on again only *Tamarix* sp. can be detected.

*Tamarix* sp. as well as *Acacia* sp., *M. crassifolia*, and *B. aegyptiaca* provide good firewood and are therefore possibly rather frequent in charcoals. With certain restrictions they can also be used for constructing simple housings.

Evidence of the herb structure is far more complicated to obtain. On the shores of open water *Phragmitis communis*, as well as *Typha* and *Juncus* sp. can be assumed. From the tree structure *Acacia*–*Panicum* societies can be reconstructed for depressions, wadis, and alluvial plains.

#### 6.2.4.4. Fauna

The different faunal inventories from the Gilf Kebir area have been published by Van Neer and Uerpman (1989), Peters (1987), and Gautier (1982). The following species were identified: *Giraffa camelopardalis*, *Oryx damah*, *Addax nasomaculatus*, *Gazella dorcas*, *Gazelle dama*, *Canis vulpes*, *Crocuta crocuta*, *Struthio camelius*, smaller birds, larger bovids (possibly *Bos primigenius* f. *taurus*), as well as *Ovis aries* and *Capra hircus*. On the site Wadi Bakht 82/21, H. Berke (personal communication, 2004) further identified *Lepus* sp., *Rana perezi* (a frog), turtle, and a bird species. For the phase Gilf A no identifications of fauna are available whereas phase Gilf B only yielded wild animals. In this phase the resource fauna only supplied the potential meat and material such as bones and leather. In the following phases Gilf C and also to a lesser degree phase D in addition to wild animals there are also domestic animals (cattle, sheep, goats) present. In what way their occurrence is connected with the changed climatic conditions or whether it is due to cultural development cannot be decided thus far. But it highly increases the usable potential of the resource fauna. In addition to meat, blood, and milk also the physical energy of the animals, for example, as pack animals, may have been used. Furthermore there is the possibility of animal husbandry offering not only the accumulation of food reserves but also a trade and status potential. The symbolic potential that wild and domestic animals had for settlers of the Gilf Kebir are demonstrated by the rock art sites, as, for example, Mogharet el Kantara (Shaw's Cave, Shaw, 1936). Rock art as well as open-air sites at the Gilf Kebir show that the resource animal did not only fulfill

diet and tool production needs. Likewise it served to conceptualize the surroundings (symbolism) and the keeper's own role (identity).

#### 6.2.4.5. *Space*

The spatial extension of the phenomena typical for the prehistoric settlements of the Gilf Kebir is hard to determine. The thoroughly investigated and, in the sense of style and technique, fully comparable sites of the Wadi Bakht and the Wadi el Akhdar are separated by roughly 25 km. If the sites in closer vicinity (predominantly raw material sources) are included they cover an area of about 2000 km<sup>2</sup>.

The epipalaeolithic microliths of the phase Gilf A are spread throughout the entire Eastern Sahara, a region of about 1,500,000 km<sup>2</sup>. Typical for the phase Gilf B are likewise special microlithic forms but also mostly undecorated pottery, which occasionally exhibits notched rims. The microlithic forms (Linstädter, 1999, Figure 5, no. 1–7) can also be found in the south of the Great Sand Sea (Wilmanns Camp), and the pottery (Linstädter, 1999, Figure 5, no. 20–21) is dispersed as far as the northern Sudan (Wadi Shaw). Therefore the area under consideration in this phase probably extends over 300,000 km<sup>2</sup>. Phase Gilf C does not consist of any significant stone technology and tool types. The mostly impressed pottery has hardly any parallels outside the Gilf Kebir (Hallier, 1996, p. 107). In view of the fact that, as mentioned above, domestic animals first occur in phase Gilf C, all rock art with cattle depictions can be dated in this phase. The cattle depictions of the Gilf Kebir and the Gebel Uweinat are stylistically similar. Although Shaw's cave is close to the Wadi el Akhdar, the area under consideration expands to about 15,000 km<sup>2</sup> when including the rock art sites of the Wadi Sura and the Wadi Hamra, and to about 40,000 km<sup>2</sup> when including those of the Gebel Uweinat as well. Therefore a reduction of the coverage areas can be detected from the early to the later phases, apparently in a process of regionalization.

#### 6.2.5. The Brandberg/Daureb Case Study (Namibia)

The Brandberg/Daureb in Namibia is an inselberg of 30 km diameter located on the fringes of the Namib Desert to the sparse shrubland at a distance of 80 km from the Atlantic coast. As an area that receives an annual precipitation of about 100 mm it is submitted to a desert climate but the vegetation of the mountain is much richer than the precipitation would suggest. Because the southern subcontinent has not suffered from climatic changes during the Holocene in the same way as the north, conditions of today do not differ drastically from that phase in the Later Stone Age between 2000 and 4000 years ago, when the bulk of the rock art in the area was created.

The Brandberg/Daureb is among the best-studied rock art areas worldwide (Pager, 1989–2006) with research aimed at the link between rock art and space from the onset. In fulfillment of general postulates of landscape archaeology the sites as well as their immediate and wider surroundings have experienced very close attention with systematic recording of contextual data (Lenssen-Erz, 2004).

These data together with the whole body of rock art that has been recorded in the area, enabled a classification of sites and, derived thereof, a pattern of use of the whole prehistoric lifeworld (Lenssen-Erz, 2001, pp. 254ff.; 2004).

Proceeding from recording to analysis and to interpretation the *chaîne opératoire* as laid out in Figure 6.2 was implemented: all sites in the area were recorded, surveyed, and documented (first step).

In the second step the basic needs were identified, largely by extrapolating from the vast ethnography on southern African hunter-gatherers (e.g., Marshall, 1976; Tanaka, 1980; Silberbauer, 1981; Guenther, 1986). Here mobility and settlement patterns in relation to the natural resources and carrying capacity play an important role (Lenssen-Erz, 2001, pp. 267–270).

The structure of the landscape with its most prolific and most important resources has to be recorded as a third step. Also features focusing on space such as passes, passages, gorges, or natural travel routes are phenomena that were frequently landmarked by prehistoric people (cf. Bradley, 1994; Swartz & Hurlbutt, 1994) and therefore are part of the comprehensive record.

Step four (Figure 6.2) defines the use potential, that is, which were the actual options for the prehistoric hunter-gatherers in the area for their livelihood and which use could they have made of the given assets. With this background seven types of sites were defined (see below; cf. Lenssen-Erz, 2001, p. 285ff., 2004) in a hypothetico-deductive procedure (Bernbeck, 1997, pp. 58ff.) which accommodate all patterns of behavior that are known from the ethnography of southern African hunter-gatherers.

The detailed analysis (Step 5 in Figure 6.2) looks at rock art as the main cognitive source and at the special features of the sites where also aspects of use play a role. Cognitive phenomena such as specifications of motifs, complexity of depictions at a site, as well as patterns of depicted behavior were all included in the analysis (cf. Lenssen-Erz, 2001, pp. 301ff., 2004). Additionally, the physical features such as distribution of pictures, their visibility, or the interrelations with other sites are part of this analysis.

This complex array of data together with the classification of the sites in seven classes (Step 4 in Figure 6.2) produced first of all a pattern of the frequency of sites (Step 6 in Figure 6.2): (class A) waymark/landmark site (13% of all sites are in this class), (class B) short-term living site (14%), (class C) long-term living site (2%), (class D) aggregation camp (2%), (class E) casual ritual site (34%), (class F) planned ritual site (22%), and (class G) sanctuary, hermitage (14%).

In addition to being the basis for a distributional map, the classification with its patterned features for each site class also served to establish an Idealized Elementary Site (IES). This is a hypothetical site comprising those features of size, location, space, natural infrastructure, artefacts, and rock art which are most common among all sites, being the statistical average site, as it were. Such a site is characterized as follows.

- A small shelter comprising two large boulders, roofing five sleeping places under a rather low ceiling.
- The site is located on the side of a minimum 20 × 20 m level open area.



- Two further sites can be reached over the level area within a 3–6 min walking distance.
- A seasonally filled waterhole lies at a distance of about 300 m, yet being farther away than the nearest neighboring sites.
- The site is located within a few minutes' walk from a natural travel route.
- There are unambiguous signs of occupation: an amount of several dozen artefacts, mainly of LSA origin, is scattered in front of the site, comprising stone tools and some ostrich eggshell, but also some pottery shards from later periods are present.
- Paintings are low on the ceiling of the shelter, but not in a hidden location.
- There are some 50 figures, comprising 80% humans and 20% animals; among the human Figures 11% are clearly marked male, 8% are marked female, the remaining human figures are zero-marked; animals are mainly springbok, giraffe, and gemsbok.
- The scenes mainly show humans commonly moving in one direction; there are only very few superimpositions but variations in the states of preservation suggest the practice of a long-lasting painting tradition.

Obviously this average site also mirrors part of the most common patterns of use and behavior. With this information at hand it is possible to analyze the relation between natural assets and *Gestaltung* thus providing a picture that illustrates the degree to which the society of a given case study made use of the options and coped with the restrictions of their lifeworld (Step 6 in Figure 6.2; see also Figure 6.7).

#### 6.2.5.1. *Water*

In the Brandberg/Daureb, water is an ambiguous resource that may be available in drastically variable quantities. Although the average precipitation is around 100 mm per annum (Breunig, 1990, 2003, pp. 31ff.; Lenssen-Erz, 2001, pp. 27ff.), in a year when the rainy season fails (as occurred repeatedly in the beginning of the 1980s) vast areas of the mountain are without any accessible surface water. In years with neither a marked shortage nor abundance the Brandberg/Daureb would seem to have been an area of retreat in prehistoric times when months after the rains water resources became scarce in the savannas and shrubland extending north- and eastwards from the mountain (Lenssen-Erz, 2001).

But direct proximity to water was not an important criterion for the choice of a place to become a rock art site. For those sites near to reliable waterholes no cogent correlation with a certain painted motif could be established.

#### 6.2.5.2. *Abiotic Material*

Abiotic material is virtually absent from rock art, with the exception that the pigments used in the art are abiotic by nature and therefore there is an obvious symbolic value to minerals such as hematite, ochre, or manganese which are the basis

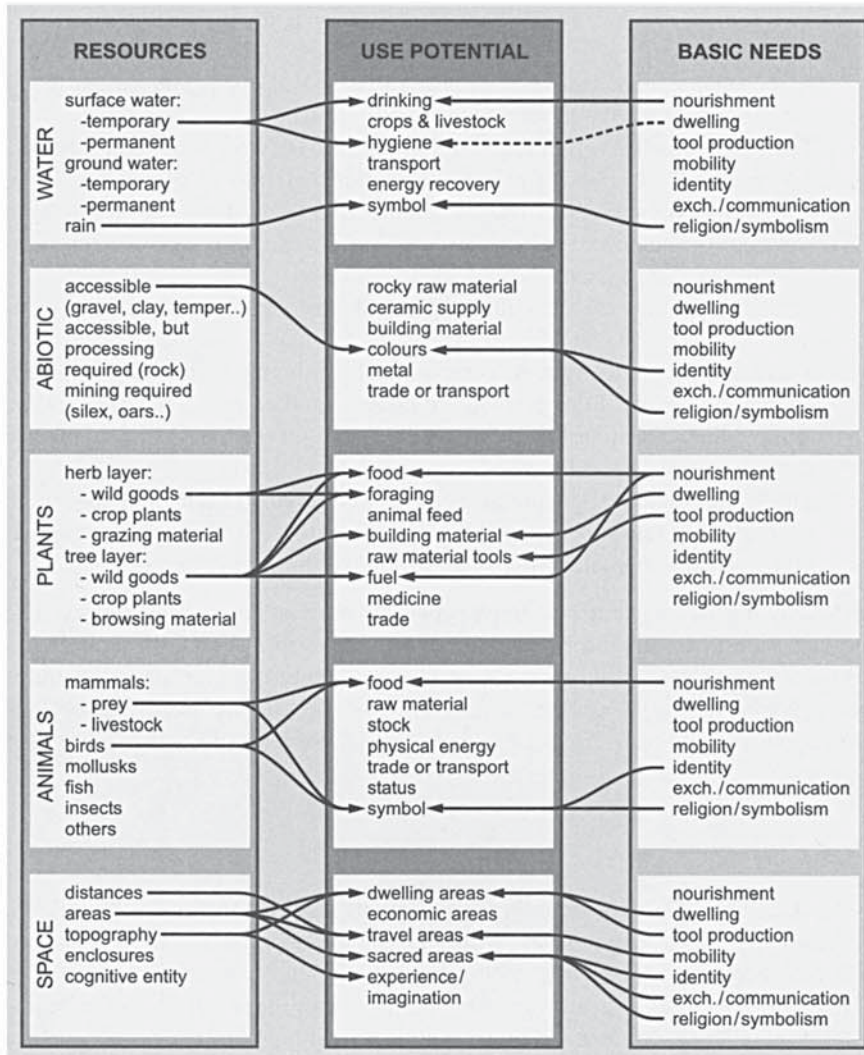


Figure 6.7. Specific matrix of relationships between use of resources and human needs of the prehistoric painters of the Brandberg/Daureb

for red, yellow, and black, respectively. The sources for these materials seem to be restricted to some valley outlets on the southern fringe of the mountain. Raw material for stone tools, on the other hand, is more commonly scattered around the mountain, only the availability of crystal, which was used for tool making, is restricted to a few outcrops in the otherwise relatively homogeneous granite of the Brandberg/Daureb.

### 6.2.5.3. *Plants*

Research among the hunter-gatherers of the Kalahari has shown that, besides water, plants are the resource which mainly guides the mobility patterns of nomadic hunter-gatherers (Tanaka, 1980, p. 79; Silberbauer, 1981, p. 202), hence their paramount importance for nourishment as opposed to the unreliable resource of meat. The plant cover of the mountain is rather rich and relatively evenly distributed in the upper regions, thus providing more or less equal conditions for the use of this resource everywhere. In its rich flora the Brandberg/Daureb provides a number of edible plants (Breunig, 1988) but plants play an absolutely negligible role in rock art (less than 0.3% of the motifs). Plant sap may, however, have been used as liquid or binder for colors but there is no evidence of this.

### 6.2.5.4. *Animal Resources*

The animal resources of the mountain ranges were of course important as food resources (Van Neer & Breunig, 1999) but they only play a subordinate role in the art (Lenssen-Erz, 2001, pp. 30f.). The bulk of animals on the mountain are small, such as hyrax (*Procavia capensis*) or rabbits (*Pronolagus redensis*). By contrast, the large game animals of the surrounding savannas were a central issue in the symbolic and religious practice of the prehistoric painters thus constituting rather a mental resource during the times people stayed in the mountain area. The focus on large hunting game in the rock art indicates that the mountain area, although it may have had the potential to sustain an autarkic life, did not constitute the entire lifeworld of the people who painted here.

### 6.2.5.5. *Space*

Space as such is only in exceptional cases an art motif, for example, in depictions of housings, be they huts or shelters (0.15% of the motifs). But through the spatial relations expressed in the locations and distribution of art the use of this resource is well manifested in the Brandberg/Daureb (Lenssen-Erz, 2001, pp. 254ff., 2003, 2004; Lenssen-Erz & Neubig, 2003) and provides the data that allow us to hypothesize about a cognitive map. The mountain's salient position, which is also supported by being a particularly advantageous biotope, made it the focus of human activities especially during the Later Stone Age (c. 4000–2000 bp).

The matrix of relationships (Figure 6.7) provides clues for the significance of rock art for the early inhabitants of the region. Moreover, it contains clues for the potential of information we can glean from the art. The pattern of relations in Figure 6.7 makes it obvious that space is the resource which can satisfy most basic needs and all resources (except vegetation) share the potential to satisfy the needs of religion and symbolism. It thus appears that vegetation may have been the resource which is nearest to our understanding of nature as the lower needs

(corresponding to Maslow's D-needs, Maslow, 1981, pp. 127–130), which have little "other world" connections, are all covered here. Moreover, the use potential of space is best exploited whereas, for example, the faunal resources are less comprehensively utilized.

The combined interpretation of the site distribution map, the idealized elementary site, and the patterns of use of the resources form the basis for a generalized pattern of use for the entire mountain area (Step 6 in Figure 6.2). This again combined with the specialized local patterns of use permits a reconstruction of the cognitive map of the prehistoric people (Figure 6.10; in order not to become too complex the cognitive map outlined below does not take much account of the specialized local patterns of use). What can be gleaned from a cognitive map are most obviously patterns of behavior that to a large extent leave their traces in material remains. Further patterns, like those of perception, are more difficult to grasp, and if so, only by plausible derivations from behavior. Yet, in a framework where comprehensive aspects are taken into consideration even patterns of thought—such as conceiving a certain situation as a crisis—seem to be in reach of our interpretation.

Based on the analysis of the whole rock art corpus from a 135 km<sup>2</sup> segment of the mountain, encompassing all landscape zones from the foot over the slopes up to the high plateau, the mental map of the prehistoric painters was modeled as follows (cf. Lenssen-Erz, 2001, 2003). By reconstructing the use of the resources as listed in Figure 6.4, this mental map evokes a lifeworld where all aspects of human life are accommodated (Figure 6.10). Accordingly the Brandberg/Daureb and its surroundings, about 3000 years ago, were the lifeworld of hunter-gatherers who could rather safely satisfy their basic needs because it provided all resources necessary for an autarkic life. However, these resources were not abundant everywhere in the mountain and in many places could sustain small groups only for a few days. According to the locations where paintings were placed on the rock faces, production as well as consumption of rock art was a public issue enabling all members of the groups to participate in whatever process took place in connection with the art. Consequently, also the reasons for the ritual activities out of which rock art was produced afflicted the whole community. It appears that the ubiquity of rock art is an indicator of a certain critical state of mind in which people repeatedly needed the security and stabilization that can be evoked through communal rituals.

From the characteristics and distribution of 300 rock art sites in the research area one can glean the strategies that were chosen to cope with the crisis, which was probably initially an ecological crisis, such as drought, but with the risk of turning into a social crisis: people limited the size of the groups to about a dozen members and kept up a high level of mobility, changing places every few days. They increased their ritual activities beyond the ordinary frequency of crisis-free times in order to achieve a stabilizing effect through the liturgical repetition of their three major values being community, equality, and mobility. This dominant pattern is superimposed over many other patterns that are expressed in sites that do not fit into the crisis-hypothesis, such as large aggregation camps or sanctuaries.

### 6.2.6. The Chad Case Study

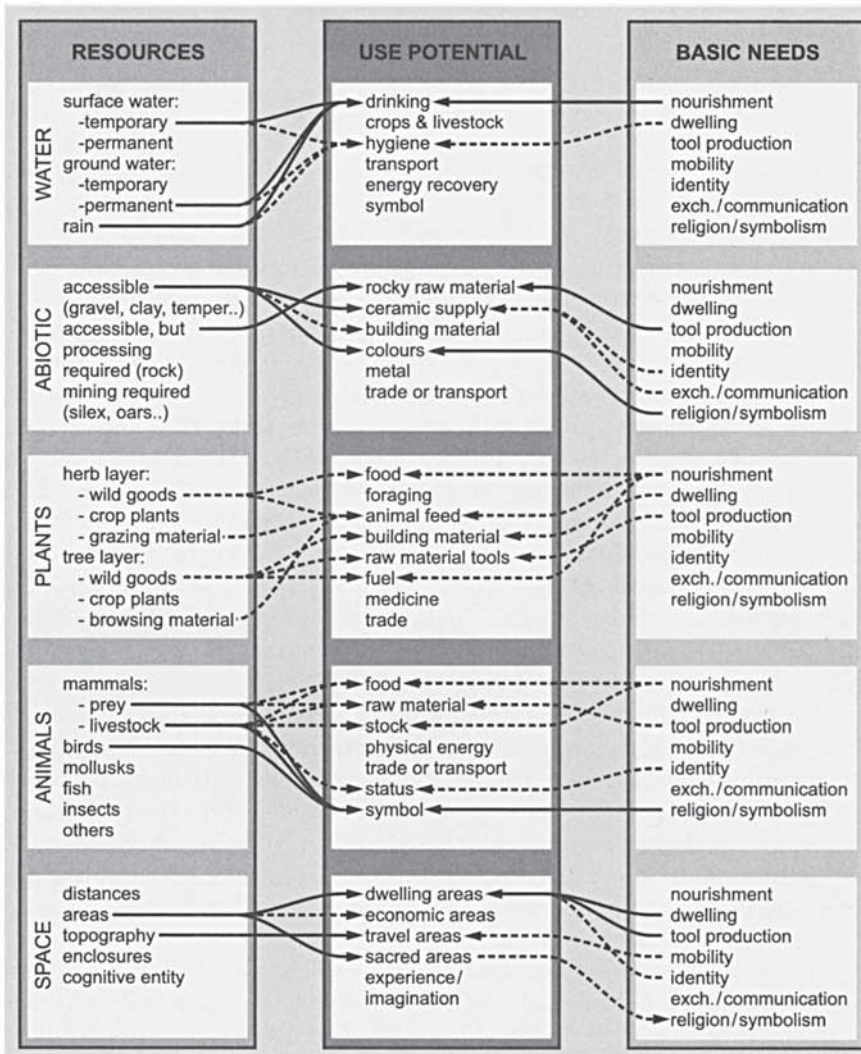
The third case study also focuses on the rock art of a salient landscape, the Ennedi Highlands in northeastern Chad with the highest peak at 1450 m a.s.l. The Ennedi Highlands is a retreat area on the southern margin of the Sahara that is still today settled by camel nomads (Keding et al., 2007). Archaeological research is rudimentary here (Bailloud, 1997) and it is only within recent years that research within the ACACIA project of the University of Cologne has started to unveil the archaeology of the inner highlands (Lenssen-Erz & Czerniewicz, 2005; Lenssen-Erz, 2007; Keding et al., 2007). First intense settlement activities have become archaeologically visible at the time of roughly 3000 bce with the first cattle and small stock being introduced into the region. According to Bailloud (1997) horses and camels simultaneously arrived in the area around the beginning of the ce. Rock art, painted and engraved, is a ubiquitous phenomenon of the region and spans the period from the few early hunter-gatherers through the times of all herders to the present. At a given time subsistence patterns seem to have been rather homogeneous throughout the highlands (Keding et al., 2007), yet stylistic differences and idiosyncrasies of the rock art suggest a rather strong cultural diversity. Research still remains in the early stages, particularly in view of the analysis of the archaeological finds. Yet the investigation of the 148 rock art sites recorded during the research enables interpretations of the use of the prehistoric landscape.

For the demonstration of the landscape archaeological method the focus is on the differences of painted and engraved sites. Between these two groups of sites more divergences seem to manifest than in other selections of sites inasmuch as most of the main motifs turn up in pictures of both techniques. However, because all social groups appear to have shared the same subsistence patterns at a given time, the resource/use/basic need model is unable to detect differences among the various groups of herders. But the model helps to sort out the potential and limitations of the sources at hand.

It is possible to design a network of relations between the three domains of resource/use/basic need but many of the relations are necessarily insinuations based on general knowledge of the livelihood of herders and to some extent on rock art. The latter is particularly true concerning the horse keepers of the Ennedi of whom no archaeological record has been excavated so far but which are very present in the art. In order to exemplify the method on this particular case study, Figure 6.8 shows the matrix of the resource/use/basic needs model for the Neolithic herders of the Ennedi (disregarding Iron Age cattle herders, camel herders of the last 2000 years, and horse keepers probably from the first millennium ce).

#### 6.2.6.1. *Water, Plants, Animals*

Use of these main resources will have been the same irrespective of whether the people produced paintings or engravings. All shared the same landscape and have produced their art almost equally in all periods. Accordingly painters as well as



**Figure 6.8.** Analysis of relations between use of resources and human needs for the Chad case study

engravers had to face the gradual shrinking of the water resources and as a consequence thereof a change in plant and animal resources, all of which left no choice other than a nomadic lifestyle with its consequential expansion of the lifeworld.

#### 6.2.6.2. Abiotic Raw Material

The choice of producing either a painting or an engraving was made according to social and/or cultural values because it is the same bedrock on which both techniques can be found thus evincing that it was not a particular texture that

attracted either painters or engravers. Yet there is an indirect significance of abiotic material for paintings and engravings because the artists required either pigments or hard stones to produce their artwork. The geological formation of the Ennedi enables rather easy access to both because in particular hematite can be found strewn over wide areas with some interspersed ochre. Also, white mineral pigment can be found in many places. For the engravers it would not have been problematic to collect quartz all over the highlands which is one of the handy raw materials that can produce tools hard and sharp enough to engrave the sandstone of the Ennedi. Accordingly it is hard to determine the sources for these main technical media and to draw conclusions from it because they could be attained in many places in the highlands.

#### 6.2.6.3. *Space*

In the use of space the most manifest differences between painters and engravers can be detected if taking their art sites as points of reference. Whereas painting sites through their location in shelters and through the constant association with other artefacts indicate the use of the sites as dwelling places, engravings are hardly ever in shelters and are less frequently associated with other artefacts. Accordingly, paintings are found in dwelling or economic areas whereas engravings seem to be located in sacred or in travel areas. Another difference between the two bodies of art is the significantly larger distance between the engraved sites as compared to painted sites. Engravings are scattered more widely without generally allowing visual or acoustic contact between two sites which is frequent among painted sites. Finally, there is a more cogent dependency on topography of the location of engraving sites than can be found among painted sites inasmuch as a large percentage of the engravings are located, for example, at the foot of elevations (42% as opposed to 24% of the paintings).

In view of the fact that there are little material differences between the groups in the Ennedi because they shared equal subsistence patterns, the existence of paintings and engravings indicates that cognitive differences may have prevailed between these groups on the side of manifestations of particular identities. In order to grasp these differences the *chaîne opératoire* (Figure 6.2) can be implemented and an idealized elementary site can be established, both for the painters and the engravers by taking the whole landscape setting into account and by drawing as much information as possible from the resource/use/basic needs model. Again the caveat has to be emphasized here that much of this information is based on the readings of rock art and has not yet been supported by the results of archaeological excavations.

#### 6.2.6.4. *The Mental Map of the Painters' and the Engravers' Landscapes*

The IES of the painters is a small roofed shelter that lies in a group of sites. The next water source is several hundred meters away but an open area of at least 20 × 20 m is just nearby. The site is not located at a particular point of accent in

the landscape and it can be easily reached. The sites face either north or south (rarely east or west), providing limited outlook. The relatively high number of paintings (55) is mainly on the ceiling of the shelter and becomes visible only when nearing the site; some pictures are even hidden in “private” locations. Sometimes the surface structure of the rock is incorporated into the paintings.

By contrast, the IES of the engravers is a vertical rockface at the foot of an elevation without a roof and other features of a dwelling site. The next water source and also the next engraving site are many hundred meters away but there is an open field just nearby. The site can be reached easily and it faces either north or south, providing limited outlook. A few of the pictures (14 on average) are occasionally made to achieve far-ranging visibility.

Without going into details on the specific types of sites, these IESs allow us to hypothesize about the use of the landscape by the painters and the engravers.

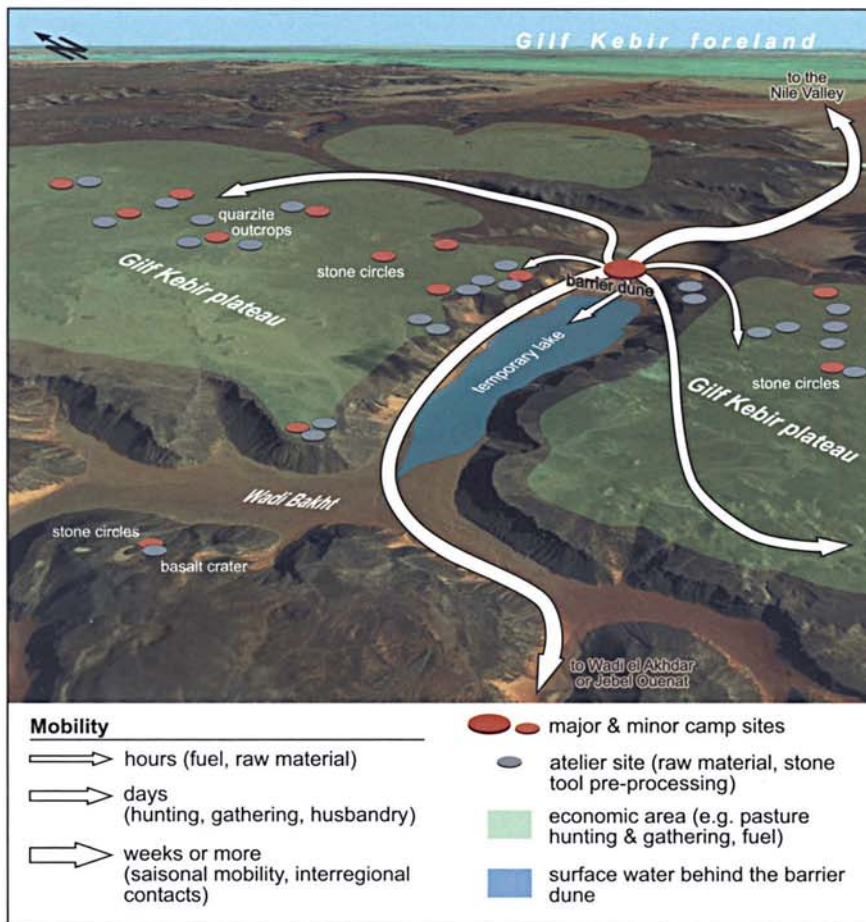
The painters traveled the land in small groups and accepted almost every upcoming shelter as a place to stay. Even though normally they would not stay for long at a given site, they would rather quickly turn to producing pictures, the comparatively large number of pictures in part also owed to the fact that they would repeatedly visit such a place. Obviously in the same sense as people of the area today stow away their gear in such shelters, in prehistory people would also “stow” their symbolic capital (which were mainly cattle and later camels; pictures of these animals consequently being metasymbolic capital). The painted shelters were part of the everyday lifeworld and the pictures were components of everyday activities (arguably in production and consumption). These characteristics together with the relative density of sites and paintings per site show that the *Gestaltung* of the landscape and its appropriation happened in an everyday context of use of the natural infrastructure (although being ritual activity) and may hence be termed an active approach to the landscape because the painters did not have a particular configuration and symbolism of the landscape in mind for the choice of a site, but rather properties of a place with its suitability for dwelling purposes. If these were fulfilled paintings could be attributed in order to complete the appropriation of the place with ritual means.

The engravers, on the other hand, seem to have had a certain model of the landscape in mind and searched for particular topographical configurations for their engravings. These were independent of the natural infrastructure so that sites were not necessarily linked to everyday life and were more or less unconnected among themselves. Consequently sites were mainly, if not exclusively, used for art production so that the pictures as parts of ritual activities were less connected to everyday activities than the paintings. The entire landscape was symbolically loaded and the marked places remained part of a sacred landscape and did not become part of the everyday lifeworld through mundane activities. This approach to landscape may be termed passive as it is not the people who establish the symbolically charged places through their use of the natural infrastructure, but these places are predetermined by the landscape and the engravings (in part a single picture suffices) are a means to set this sacred status free by making it visible.

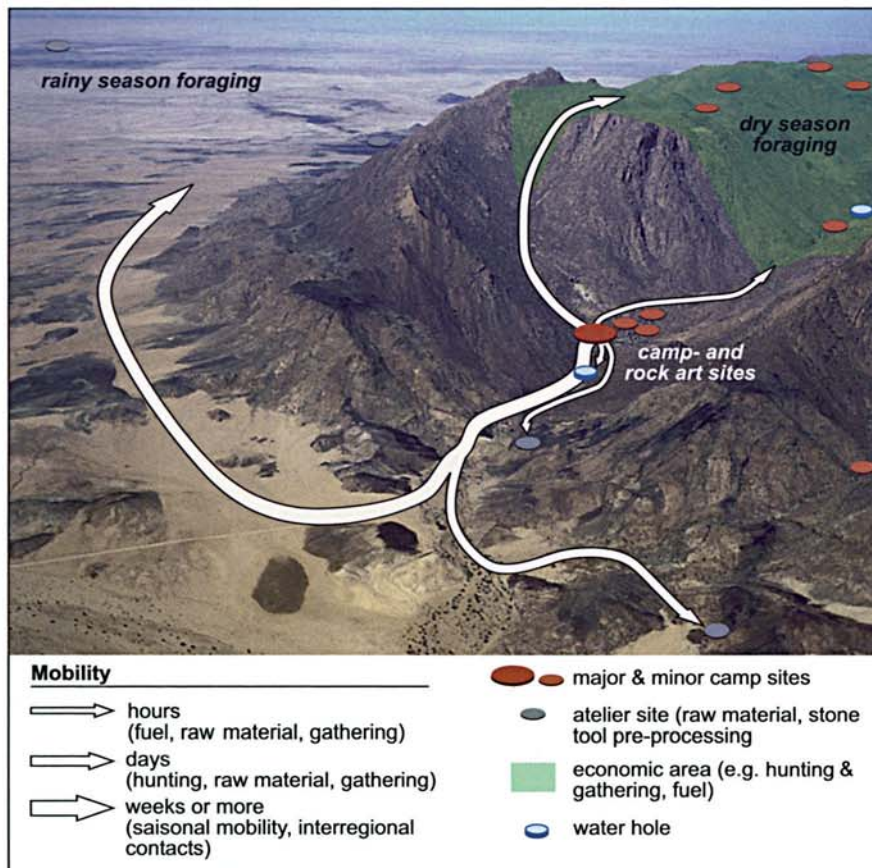


**Landscape-archaeological reconstructions**

Based on the comprehensive mapping and analysis of the archaeological data of a given region the patterns of use and behavior at a certain time become discernible. These two examples demonstrate the complexity of early herder and of hunter-gatherer livelihood in the Gilf Kebir (Figure 6.9) and the Brandberg/Daureb, (Figure 6.10). Based on the given resources, that is, the natural component, it is shown how they are interrelated with culture, that is, the use people made of this landscape.



**Figure 6.9.** Reconstruction of the Wadi Bakht landscape focusing on resources and use patterns during the phase Gilf B (c. 6500–4500 bce) (See also Color Plates)



**Figure 6.10.** A section of the Later Stone Age Brandberg/Daureb landscape indicating resources and reconstructing the use patterns in a schematic representation. Note that the ecotope did not undergo a change comparable to that of the Sahara (Photo: courtesy of H. Mooser) (See also Color Plates)

The framework presented here aims at the reconciliation of two extremes of archaeological work, that is, pragmatism of fieldwork and theoretical foundations. This apart, it is also designed to express any conceivable case study in an all-inclusive format that allows the comparison of it to other case studies. The methodology is founded on a concept of landscape that puts equal emphasis on the empirical landscape as on the culturally mediated landscape by implementing the subconcepts of infrastructure and *Gestaltung*.

The three case studies presented here focus on the resources of water, abiotic material, vegetation, fauna, and space thus following a strict systematization which is further strengthened through *chaînes opératoires* (Figures 6.2, 6.6, 6.7, and 6.8) that were implemented in both studies. Their origins lie in two rather

different archaeologies, namely the cognitive archaeology of two African rock art traditions and the conventional field archaeology of the Eastern Sahara where only relatively few indicators of symbolic behavior were found. Nevertheless both projects had independently developed analogous working procedures. The resource/use/basic needs model, by contrast, grew out of intense discussions on how the everyday terms of resource, use, or needs could be forged into concepts with methodological substance. This chapter is an attempt to provide working procedures for intradisciplinary cooperation of different archaeologies.

The methodological approach of landscape archaeology forwarded here cannot completely annul differences in the corpora of data that are collected by cognitive and field archaeology. However, it opens a road to analyze data, from whatever origin, in a basic scheme that is concerned with a comprehensive view of a lifeworld wherein, by means of the checklist character of the scheme, all aspects receive the same attention and are being assessed within the same frame of understanding.

In comparing the case studies from Gilf Kebir and the Ennedi Highlands with the Brandberg/Daureb it becomes evident that through domestic animals there seem to be more possibilities to exploit the use potential of the resources. This is manifest in the more numerous arrows of relation (between the two left columns) for the phase Gilf C in Figure 6.6b and the herders of the Ennedi. There is little surprise in the fact that through the innovation of domestication more complexity is added to a society. However, as can be seen from the comparison with the predomesticated animals phase of Gilf B and particularly with the pure hunter-gatherers of the Brandberg/Daureb (Figure 6.7), this growth of use potential does not go together with a likewise significant growth in relations of use potential and human needs; in other words, the novel exploitation does not open many more options for the satisfaction of needs.

Even the evidence from Brandberg/Daureb rock art—which is only peripherally supported by data from excavations (e.g., Breunig, 1989, 2003) and which is therefore scarce in terms of material finds—shows a rather complete coverage of needs through the different resources for this society of comparatively little complexity. This may hypothetically be seen to indicate that, assuming general conditions do not change, the introduction of domesticated animals is not a factor that makes life easier because it might enhance the satisfaction of human needs. Rather the introduction of livestock may be understood as a diversification of use options when general conditions deteriorate, notwithstanding the potential to advertise status and wealth through livestock.

Admittedly, the present form of this approach is not yet a complete method. It still suffers from shortcomings such as that it is unable to accommodate the resource of time adequately and therefore lacks a tool to systematically grasp the phenomenon of change in its dynamics. For the time being the scheme requires us to study two sequential phases (such as the Gilf B and C phases) as two more or less static events. The same counts for the various keepers of domestic animals in the Ennedi Highlands.

Further development of the method will have to make it more flexible and also to mitigate its deterministic character towards the inclusion of a module

that accommodates human agency even better without disposing of its universal applicability. The acceptance of this newly proposed method will depend on its capability to serve as a reconciling procedure that provides useful aspects for all views of a landscape, be they empirical, pragmatic, emic, or postmodern.

## REFERENCES

- Anschuetz, K.F., Wilshusen, R.H. & Scheick, C.L. (2001). An archaeology of landscapes: Perspectives and directions. *Journal of Archaeological Research*, 9(2), 157–211.
- Bailloud, G. (1997). *Art rupestre en Enedi*. Saint-Maur: Éditions Sèpia.
- Beck, D.E. & Cowan, C.C. (1996). *Spiral Dynamics: Mastering Values, Leadership and Chance*. Cambridge, MA: Blackwell.
- Bender, B. (2002). Time and landscape. *Current Anthropology*, 43, 103–112.
- Bernbeck, R. (1997). *Theorien in der Archäologie*. Tübingen, Basel: A. Francke Verlag.
- Boelicke, U. (1982). Gruben und Häuser: Untersuchungen zur Struktur bandkeramischer Hofplätze. In E. Bakels (Ed.), *Siedlungen der Kultur mit Linearkeramik in Europa* (pp. 17–28). Internationales Kolloquium Nové Vozokany.
- Bradley, R. (1994). Symbols and signposts – Understanding the prehistoric petroglyphs of the British Isles. In C. Renfrew & Ezra B.W. Zubrow (Eds.), *The Ancient Mind – Elements of Cognitive Archaeology* (pp. 95–106). Cambridge: Cambridge University Press.
- Bradley, R., Criado Boado, F. & Fábregas Valcarce, R. (1994). Rock art research as landscape archaeology: A pilot study in Galicia, north-west Spain. *World Archaeology*, 25(3), 374–390.
- Breunig, P. (1988). Botanisch-archäologische Beobachtungen in einem afrikanischen Hochgebirge. Aspekte zur prähistorischen Besiedlung eines ariden Gunstraumes. *Archäologische Informationen* (11)1, 53–73.
- Breunig, P. (1989). Archäologische Untersuchungen zur Besiedlungsgeschichte des Brandbergs – Archaeological investigations into the settlement history of the Brandberg. In H. Pager. *The Rock Paintings of the Upper Brandberg, Part I – Amis Gorge* (pp. 17–45). Köln: Heinrich-Barth-Institut.
- Breunig, P. (1990). Temperaturen und Niederschläge im Hohen Brandberg. *Journal Namibia Wissenschaftliche Gesellschaft*, 42, 7–24.
- Breunig, P. (2003). *Der Brandberg. Untersuchungen zur Besiedlungsgeschichte eines Hochgebirges in Namibia*. Köln: Heinrich-Barth-Institut.
- Dowson, T.A. (2007). Debating shamanism in southern African rock art: Time to move on... *South African Archaeological Bulletin*, 62, 185, 46–61.
- Dünne, J. & Günzel, S. (Eds.) (2006). *Raumtheorie – Grundlagen aus Philosophie und Kulturwissenschaft*. Frankfurt: Suhrkamp.
- Frank, T. & Wendt, K.P. (2003). Up & down. Scaling archaeological data provided by GIS based procedures. Paper presented at the congress *Enter the Past*, Vienna, 8–12 April 2003.
- Gautier, A. (1982). Neolithic faunal remains in the Gilf Kebir and the Abu Hussein Dune field, Western Desert, Egypt. In F. El-Baz & M.A. Maxwell (Eds.), *Desert Landforms in Southwest-Egypt: A Basis for Comparison with Mars* (pp. 335–339). Washington, DC: NASA.
- Gehlen, B., Kindermann, K., Linstädter, J. & Riemer, H. (2002). The Holocene occupation of the Eastern Sahara: Regional chronologies and supra-regional developments in four areas in the absolute desert. In Jennerstrasse 8 (Ed.) *Tides of the Desert – Gezeiten der Wüste* (pp. 85–116). Köln: Heinrich-Barth-Institut.
- Guenther, M. (1986). *The Nharo Bushmen of Botswana – Tradition and Change*. Hamburg: Helmut Buske.
- Hallier, M. (1996). Zwei keramische Fundplätze am Übergang vom 5. zum 4. Jahrtausend vor Christi Geburt in Südwest-Ägypten: Wadi Bakht 82/15 und 82/24. Unpubl. Masters Thesis, Kö.
- Heyd, T. (2002). Natural heritage: Culture in nature. In German Commission for UNESCO/Brandenburg University of Technology at Cottbus (Eds.), *Natur und Kultur – Ambivalente Dimensionen unseres Erbes – Perspektivenwechsel/Nature and culture – Ambivalent dimensions of our heritage – Change of perspective*. Deutsche UNESCO-Kommission (pp. 85–95). Cottbus: UNESCO.

- Hirsch, E. (1995). Landscape: Between place and space. In E. Hirsch & M. O'Hanlon (Eds.), *The Anthropology of Landscape. Perspectives on Place and Space* (pp. 1–30). Oxford: Clarendon Press.
- Hodder, I., Shanks, M., Alexandri, A., Buchli, V., Carman, J., Last, J. & Lucas, G. (Eds.) (1995). *Interpreting Archaeology*. London/New York: Routledge.
- Hodder, I.R. & Orton, C. (1976). *Spatial Analysis in Archaeology*. London/New York: Cambridge University Press.
- Hollmann, J. (2003). Indigenous knowledge and paintings of human-animal combinations: Ostriches, swifts and religion in Bushman rock-art, Western Cape Province. Unpubl. Masters Thesis, Johannesburg.
- Ingold, T. (1993). The temporality of the landscape. *World Archaeology*, 25(2), 152–174.
- Jahnkuhn, H. (1977). *Einführung in die Siedlungsarchäologie*. Berlin/New York: Walter de Gruyter.
- Kalis, A.J. (1988). Zur Umwelt des frühneolithischen Menschen: Ein Beitrag der Pollenanalyse. *Forschungen und Berichte zur Vor- und Frühgeschichte Baden-Württembergs* 31: 125–137.
- Kalis, A.J. & Zimmermann, A. (1988). An integrative model for the use of different landscapes in Linearbandkeramik times. In J.L. Bintliff, D.A. Davidson & E.G. Grant (Eds.), *Conceptual Issues in Environmental Archaeology* (pp. 145–152). Edinburgh: Edinburgh University Press.
- Keding, B., Lenssen-Erz, T. & Pastoors, A. (2007). Pictures and pots from pastoralists – Investigations into the prehistory of the Ennedi Highlands, NE Tchad. *Sahara*, 18, 23–45.
- Kröpelin, S. (1989). Untersuchungen zum Sedimentationsmilieu von Playas im Gilf Kebir (Südwest-Ägypten). In R. Kuper (Ed.), *Forschungen zum Umweltgeschichte der Ostsahara* (pp. 183–305). Köln: Heinrich-Barth-Institut.
- Kuper, R. (1995). Prehistoric research in the Southern Libyan desert. A brief account and some conclusions of the B.O.S. project. *Cahier de Recherches de l'institut de Papyrologie et d'Égyptologie de Lille* 17, 123–140.
- Layton, R. & Ucko, P. (1999). Introduction: Gazing on the landscape and encountering the environment. In P. Ucko & R. Layton (Eds.), *The Archaeology and Anthropology of Landscape* (pp. 1–20). London/New York: Routledge.
- Lenssen-Erz, T. (1997). Metaphors of intactness of environment in Namibian rock paintings. In P. Faulstich (Ed.), *Rock Art as Visual Ecology* (pp. 43–54). Tucson, AZ: American Rock Art Research Association.
- Lenssen-Erz, T. (2001). *Gemeinschaft – Gleichheit – Mobilität. Felsbilder im Brandberg, Namibia, und ihre Bedeutung. Grundlagen einer textuellen Felsbildarchäologie*. Köln: Heinrich-Barth-Institut.
- Lenssen-Erz, T. (2003). Mental mapping of arid landscapes in Southern Africa: A cognitive ethnographic-archaeological approach. Paper presented to the session 'Glimpses of a Landscape's Past,' *Fifth World Archaeological Congress*, 21–26 June 2003. Washington, DC.
- Lenssen-Erz, T. (2004). The landscape setting of rock-painting sites in the Brandberg, Namibia: Infrastructure, Gestaltung, use and meaning. In C. Chippindale & G. Nash (Eds.): *The Figured Landscapes of Rock Art* (pp. 131–150). Cambridge: Cambridge University Press.
- Lenssen-Erz, T. (2007). Rock art in African Highlands: Ennedi Highlands, Chad – Artists and herders in a lifeworld on the Margins. In O. Bubenzer, A. Bolten & F. Darius (Eds.), *Atlas of Environmental Change and Human Adaptation in Arid Africa* (pp. 48–51). Africa Præhistorica 21. Köln: Heinrich-Barth-Institut.
- Lenssen-Erz, T. (forthcoming). Rock art in context – theoretical aspects of pragmatic data collections. To appear in: K. Helskog (ed.), *Working with rock art: International perspectives*. Papers from the SACRA Conference, Kimberley 2006.
- Lenssen-Erz, T. & Czerniewicz, M. von (2005). Résultats préliminaires des recherches archéologiques dans l'Ennedi. *Revue Scientifique du Tchad*, 7(2), 5–18.
- Lenssen-Erz, T. & Neubig, J. (2003). Augenblick und Ewigkeit, Raum und Diskurs. Artefakte der prähistorischen Kunst Namibias und die Arteplage in Murten, Expo.02 in der Schweiz. In A. Pastoors & G.-C. Weniger (Eds.), *Höhlenkunst und Raum: Archäologische und architektonische Perspektiven - Cave art and space: Archaeological and architectural perspectives*. (pp. 74–90) Mettmann: Neanderthal Museum.
- Leser, H. (1997). *Landschaftsökologie*, 4th edn. Stuttgart: UTB für Wissenschaft.

- Linstädter, J. (1999). Leben auf der Düne. Der mittelnolithische Fundplatz Wadi Bakht 82/21 im Gilf Kebir (Südwest-Ägypten). *Archäologische Informationen*, 22(1), 115–124.
- Linstädter, J. (2003). Neolithic land-use systems in the Gilf Kebir, South-West Egypt. In Z. Hawass & L. Pinch Brock (Eds.), *Egyptology at the Dawn of the 21st Century. Proceedings of the Eighth International Congress of Egyptologists in Cairo 2000* (pp. 381–389). Cairo: American University in Cairo Press.
- Linstädter, J. (Ed.) 2005. Wadi Bakht – *Landschaftsarchäologie einer Siedlungskammer im Gilf Kebir (SW-Ägypten)*. Africa Praehistorica, 18, Köln: Heinrich-Barth-Institut.
- Linstädter, J. (2007). Rocky islands within oceans of sand – Archaeology of the Jebel Ouenat/Gilf Kebir region, Eastern Sahara. In O. Bubbenzer, A. Bolten & F. Darius (Eds.), *Atlas of environmental and cultural change in arid Africa*. Africa Praehistorica, 21, (pp. 34–37) Köln: Heinrich-Barth-Institut.
- Linstädter, J. & Kröpelin, S. (2004). Wadi Bakht revisited: New data on Holocene climate and prehistoric occupation in the Gilf Kebir plateau (Central Eastern Sahara, SW Egypt). *Geoarchaeology* 19: 753–778.
- Linstädter, J., Richter, J. & Linstädter, A. (2002). Optimale Datenerhebung mit minimalem Aufwand. *Archäologische Informationen*, 25(1&2), 99–106.
- Littlejohn, J. (1963). Temne space. *Anthropological Quarterly*, 36(1), 1–17.
- Luig, U. & von Oppen, A. (1997). Landscape in Africa: Process and vision. *Paideuma*, 42, 7–45.
- Lüning, J. (1982). Siedlung und Siedlungslandschaft in bandkeramischer und Rössener Zeit. *Offa*, 39, 9–33.
- Lüning, J. (1997). Landschaftsarchäologie in Deutschland – Ein Programm. *Archäologisches Nachrichtenblatt*, 3, 277–285.
- Marshall, L. (1976). *The !Kung of Nyae Nyae*. Cambridge, MA: Harvard University Press.
- Maslow, A. (1970). *Motivation and Personality*, 2nd edn. New York: Harper.
- Maslow, A. (1981). *Motivation und Persönlichkeit*. Reinbek: rororo.
- Millennium Ecosystem Assessment (2005). *Ecosystem and Human Well-Being: Current State and Trends*. Washington, DC: Island Press.
- Neumann, K. (1989). Zur Vegetationsgeschichte der Ostsahara im Holozän. Holzkohlen aus prähistorischen Fundstellen. In R. Kuper (Ed.), *Forschungen zur Umweltgeschichte der Ostsahara* (pp. 13–181). Köln: Heinrich-Barth-Institut.
- Ouzman, S. (1998a). Mindscape. In P. Bouissac (Ed.), *Encyclopedia of Semiotics* (pp. 419–421). New York: Oxford University Press.
- Ouzman, S. (1998b). Towards a mindscape of landscape: Rock-art as expression of world-understanding. In C. Chippindale & P.S.C. Taçon (Eds.), *The Archaeology of Rock-Art*. Cambridge: Cambridge University Press.
- Ouzman, S. (2002). Encountering an encultured nature – Some edifying examples from indigenous Southern Africa. In German Commission for UNESCO/Brandenburg University of Technology at Cottbus (Eds.), *Natur und Kultur – Ambivalente Dimensionen unseres Erbes – Perspektivenwechsel/Nature and Culture – Ambivalent Dimensions of our Heritage – Change of Perspective. Deutsche UNESCO-Kommission* (pp. 99–117). Cottbus: UNESCO.
- Pager, H. (1989–2006). *The Rock Paintings of the Upper Brandberg, Part I – VI*. Köln: Heinrich-Barth-Institut.
- Peters, J. (1987). The faunal remains collected by the Bagnold-Mond Expedition in the Gilf Kebir and Gebel Uweinat in 1938. *Archéologie du Nil moyen*, 2, 251–264.
- Sauer, C. (1963). The morphology of landscape. In J. Leithly (Ed.), *Land and Life: A Selection of Writings of Carl Sauer*. Berkeley, CA: University of California Press.
- Schade, C.C.J. (2000). *Landschaftsarchäologie – eine inhaltliche Begriffsbestimmung. Studien zur Siedlungsarchäologie II*. Bonn: Rudolf Habelt.
- Schama, S. (1995). *Landscape and Memory*. London: Fontana.
- Schön, W. (1994). The late Neolithic of Wadi el Akhdar (Gilf Kebir) and the eastern Sahara. *Archéologie du Nil moyen*, 6, 131–175.
- Schön, W. (1996). *Ausgrabungen im Wadi el Akhdar, Gilf Kebir (SW-Ägypten)*. Köln: Heinrich-Barth-Institut.

- Schütz, A. & Luckmann, T. (1975). *Strukturen der Lebenswelt. Neuwied, Luchterhand. (Engl: The Structures of the Life-World. London: Heinemann).*
- Segal, E.M. (1994). Archaeology and cognitive science. In C. Renfrew & E.B.W. Zubrow (Eds.), *The Ancient Mind – Elements of Cognitive Archaeology* (pp. 22–28). Cambridge: Cambridge University Press.
- Shaw, W.B.K. (1936). An expedition to the Southern Libyan Desert. *The Geographical Journal*, 87, 193–221.
- Silberbauer, G.B. (1981). *Hunter and Habitat in the Central Kalahari Desert*. Cambridge: Cambridge University Press.
- Stehli, P. (1973). Keramik. In J.-P. Farruggia, R. Kuper, J. Lüning & P. Stehli Der (Eds.), *Bandkeramische Siedlungsplatz Langweiler* (pp. 57–105) (*Rheinische Ausgrabungen, Band 13*). Bonn: Rheinland Verlag Köln
- Swartz, B.K. Jr. & Hurlbutt, T.S. (1994). Space, place and territory in rock art interpretation. An integration of concepts of space and their application to an unusual petroglyph locality in the Great Basin, *USA Rock Art Research*, 11, 1, 13–22.
- Tanaka, J. (1980). *The San Hunter-Gatherers of the Kalahari*. Tokyo: University of Tokyo Press.
- Tilley, C. (1994). *A Phenomenology of Landscape: Places, Paths and Monuments*. Oxford: Berg.
- Van Neer, W. & Breunig, P. (1999). Contribution to the archaeozoology of the Brandberg, Namibia. *Cimbebasia*, 15, 127–140.
- Van Neer, W. & Uerpmann, H.-P. (1989). Palaeoecological significance of the Holocene faunal remains of the B.O.S. missions. In R. Kuper (Ed.), *Forschungen zur Umweltgeschichte der Ostsahara* (pp. 307–341). Köln: Heinrich-Barth-Institut.
- Vita-Finzi, C. (1978). *Archaeological Sites in Their Setting*. London: Thames and Hudson.
- Webster's Third New International Dictionary*. (1993). Cologne: Könemann.
- [www.bristol.ac.uk](http://www.bristol.ac.uk), 2007. MA Landscape Archaeology. URL: [www.bristol.ac.uk/archanth/postgrad/landscape.html](http://www.bristol.ac.uk/archanth/postgrad/landscape.html) Last update: 2007-05-10. Access date: 2007-09-02.
- [www.exeter.ac.uk](http://www.exeter.ac.uk), 2007. MA in Landscape Archaeology. URL: [www.exeter.ac.uk/postgraduate/degrees/archaeology/landscapema.shtml](http://www.exeter.ac.uk/postgraduate/degrees/archaeology/landscapema.shtml) Last update: 2007-04-25. Access date: 2007-09-02.
- [www.oxford.ac.uk](http://www.oxford.ac.uk), 2007. MSc in Applied Landscape Archaeology. URL: [www.awardbearing.conted.ox.ac.uk/archaeology/mscala.php](http://www.awardbearing.conted.ox.ac.uk/archaeology/mscala.php) Last update: 2007. Access date: 2007-09-02.
- [www.sheffield.ac.uk](http://www.sheffield.ac.uk), 2007. MA Landscape archaeology. URL: [www.shef.ac.uk/archaeology/prospectivpeg/masters/landscape.html](http://www.shef.ac.uk/archaeology/prospectivpeg/masters/landscape.html) Last update: 2007. Access date: 2007-09-02.
- Yar, M. (2001). Hannah Arendt 1906–1975. In J. Fieser & B. Dowden (Eds.), *The Internet Encyclopedia of Philosophy*. URL: [www.utm.edu/research/iep/a/arendt.htm](http://www.utm.edu/research/iep/a/arendt.htm). Access date: 2003-05-30.
- Zimmermann, A. (1995). *Austauschsysteme von Silexartefakten in der Bandkeramik Mitteleuropas*. Universitätsforschungen zur prähistorischen Archäologie 26. Bonn: Habelt.
- Zimmermann, A. (2001). Ist die politische Forderung nach der 'beispielhaften Ausgrabung' aus fachlicher Sicht immer unerfüllbar? Zum Aspekt der Repräsentativität von Ausgrabungsergebnissen. *Archäologisches Nachrichtenblatt*, 6, 131–137.
- Zimmermann, A., Richter, J., Frank, T. & Wendt, K.P. (2004) Landschaftsarchäologie II, Überlegungen zu Prinzipien einer Landschaftsarchäologie. *Bericht der RGK*, 85, 37–95.
- Zubrow, E.B.W. (1994a). Cognitive archaeology reconsidered. In C. Renfrew & E.B.W. Zubrow (Eds.), *The Ancient Mind – Elements of Cognitive Archaeology* (pp. 187–190). Cambridge: Cambridge University Press.
- Zubrow, E.B.W. (1994b). Knowledge representation and archaeology: A cognitive example using GIS. In C. Renfrew & E.B.W. Zubrow (Eds.), *The Ancient Mind – Elements of Cognitive Archaeology* (pp. 107–118). Cambridge: Cambridge University Press.