The Role of Value Systems in Biodiversity Research

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Abstract
Landscape research needs to consider physical features and processes, as well as human preferences. Anthropocentric value systems rule the world of perception and valuation of landscape quality, but different stakeholders have different motivations for planning, managing or protecting landscapes. The potential for conceptual or practical conflicts arising from such differing value systems is illustrated by the diverse perception of biodiversity as a landscape quality of growing importance. Spending public money to conserve or enhance biodiversity in cultivated landscapes means different things to different people. Hence, it is crucial to select pertinent indicators for measuring the success or failure of environmental schemes. In biodiversity evaluation, the main value clash is between indicators for species conservation (rare and threatened species) and ecological resilience or ecosystem functions (species richness). Similar conflicts are discussed for ecological concepts and theories concerning landscape quality. In order to avoid the image of conflicting expert opinions, landscape research should be aware of the relevant underlying value systems and declare them while going public.

Keywords: evaluation, perception, indicators, biodiversity, stakeholders

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Introduction

In the context of landscape management, proponents of nature conservation often deplore the fact that their prime value system does not manifest itself in market prices and thus gets lower priority when conflicting with other anthropocentric values such as economic profits. This is just one example to illustrate how value systems may differ among stakeholders because each of them may use and value different properties within a landscape.

All people orient themselves by value systems. In the context of landscape ecology, the basic importance of value systems is reflected in the spectrum of motivations and convictions of stakeholders, be they politicians, landscape managers and scientists, or consumers and taxpayers. However, stakeholders leave their own normal motives unreflected and are in particular unaware of the motivations and value systems of their conflict partners. They are inclined to project their own value systems onto others, or, even further, to assign to their individual values system a general prescriptive meaning. Similarly, researchers are often not conscious about their motivations and the extent to which they are influenced in their daily work by their own individual value system. Altogether, this can lead to misunderstandings and conflicts.

The objectives of this chapter are to discuss the role of value systems in landscape research by means of illustrative examples, and to draw conclusions on how to develop future directives, explicitly taking into account the importance of value systems. We think this to be an important prerequisite to mitigate misunderstandings and conflicts concerning subjects and results of landscape research.

The Role of Value Systems in Human Interactions

Value systems offer the individual a point of orientation to interpret life's meanings (Joas 1997). Shared value systems allow people to co-operate and to build collective identities. In multi-fractioned societies, building a consensus requires a mutual understanding of the various value systems involved (Godschalk and Paterson 1999). Value systems are hierarchical and cultural, but also individually specific (Taylor 1989). Hypergoods, such as cultural concepts of individual identity or of what makes a good life, also influence the hierarchy of value systems. Value systems are not static; they develop during an individual's life as well as with societal changes (Breakwell 1986; Klages 1999). To add to the complexity, single individuals as well as interest groups can simultaneously have competing value systems. Value systems are important, but they are not sufficient to understand and explain decision making. The latter are also influenced by extrinsic factors such as financial perspectives or reputation. In the economic view of human behaviour, action is determined by expected benefits and costs, as well as preferences and constraints (Frey 1992). While preferences relate to value systems, which could also be interpreted as intrinsic incentives, constraints apply to extrinsic incentives, but also social values and norms (Fishbein and Ajzen, 1975). Thus, to understand and explain human behaviour, both have to be considered, intrinsic motivations and value systems as well as extrinsic incentives. Together with extrinsic incentives, value systems motivate and regulate actions and social interactions. Extrinsic incentives may have the strongest influence on decisions and practical measures affecting a landscape, both at an individual or political level. In practice, ethical values tend to be overruled by economic considerations. Consequently, the amount of financial support for the investigation and enhancement of non-vital values in landscapes is low in comparison to other economically more promising fields. As the economic perspectives, and societal perspectives in general, are inherently anthropocentric, we should also take into account anthropocentric

value systems in landscape research as well as for conservation or restoration planning and management schemes. Most important seems to be collaborative planning that strives for activating the potential of local cooperation and, in particular, for integrating all the values of the local society into the planning process (Godschalk and Paterson 1999).

In a tentative classification of the value systems in landscape ecology, we distinguish between primary values (essential or vital needs) and secondary values (non-essential or non-vital needs), whereby primary values are in general rated higher than secondary ones. Examples of vital values are health, security, or food supply, while we consider ecological integrity, nature conservation, cultural heritage, mobility, and recreation to be important, but not of vital importance. Biologically speaking, a decrease in primary, vital values would negatively affect individual Darwinian fitness, while many people deprived of secondary, non-vital values seem to do quite well.

Value Systems and Paradigms in Landscape Research

When theories and concepts seem to be corroborated by empirical results or numerous observations, they tend to become paradigms among stakeholders and practitioners. It is an important scientific task, also in landscape ecology, to rigorously question these paradigms (Kuhn 1970).

The landscape can be seen from different perspectives, and its quality can therefore be evaluated in different ways. Value systems – either independent or competing – are involved when indicators measure structural diversity, connectivity, rareness, wilderness, or cultural heritage. Similarly, insider and outsider perspectives will have different motivations and goals. The appreciation of a landscape changes with individual knowledge and experience. Specific values apply for individuals, groups, and cultures. A top-down scientific approach will yield different results than a bottom-up approach to valuation with a focus on social aspects or economic willingness-to-pay for a special landscape quality. For social scientists, landscape quality refers mainly to people's perception, which is only one aspect of the quality of life. In the natural sciences, the focus is on the quality of life for plants and animals, including human inhabitants or temporary users.

Many strongly debated issues in landscape research and planning can be interpreted in view of competing or questioned paradigms, based on different value systems. There is a broad spectrum of value-based conflicts, ranging from differing personal interests of stakeholders to differing interpretations among experts on the applicability of ecological concepts and theories.

Conflicting Value Systems and Indicators for Biodiversity

In this paragraph, we aim at demonstrating the difficulties to develop quantitative indicators of landscape quality. Thereby we focus on biodiversity, a landscape quality, which today is of principal importance in landscape research (Nobis and Wohlgemuth 2004).

Gaston and Spicer (2004) distinguish, with respect to biodiversity, between direct-use values (e.g. food, medicine, industrial materials, biological control), indirect-use values (e.g. ecosystem functions), and non-use values (e.g. option value, intrinsic value). Here we use the term "value" in a strictly anthropocentric way: Even with so-called intrinsic or biocentric values, it is basically the people who want to prevent species from going extinct, not the organisms themselves. The various stakeholders in a landscape have different motivations for preserving or enhancing biodiversity. Their value systems are tuned to different aspects

or entities of biodiversity. The dilemma with conflicting value systems becomes apparent when quantifiable indicators are to be defined for monitoring and assessing states and trends of biodiversity (Duelli and Obrist 2003b). Today, the most urgent and most important indicators of biodiversity are those needed by administrators for agriculture, forestry, and nature conservation. But given the various value systems among stakeholders, what are the pertinent biodiversity indicators at a national or international level? How could we ever prove that, e.g. the European goal of "halting the loss of biodiversity by the year 2010" (EC 2001) has been met or not?

With the following examples we show in which sense contradictory concepts of biodiversity are based on differing value systems, and we illustrate the need for a strong appreciation of anthropocentric value systems in landscape research.

Agriculture: In the European Union, about 2.4 billion Euros are spent yearly for agri-environmental schemes to promote ecological compensation in agricultural regions (Kleijn and Sutherland 2003). These schemes more or less explicitly include the goal to increase biodiversity in depleted landscapes. But what aspect of biodiversity are these schemes referring to? It is a revealing experience to ask stakeholders in agriculture, nature conservation, landscape planning, or tourism about their motivations to protect or enhance biodiversity. For agricultural ecosystems in industrialised countries, the motivations can be roughly grouped into three major value systems (Duelli and Obrist 2003a):

1. Species conservation: The motivation here is primarily ethical and socio-cultural. The fascination for all things that are rare or endangered is a basic human trait. Biodiversity can also be compared with art: many people suffer emotionally and intellectually if deprived of any form of art. The same is true when people are faced with the loss of an enigmatic plant or animal species threatened by extinction.
2. Ecological resilience: The motivation is primarily ecological, based on the paradigm of the "balance of nature" (Pimm 1991). It is linked to the concept of sustainability, stating that more species can fill more ecological niches, and that more genetic variation provides a better insurance against extinctions due to rapid environmental change. The fervent debate on biodiversity and ecosystem functioning (Naeem and Li 1997; Cropp and Gabric 2002; Loreau 2004) will go on, as long as the conflicting value systems of species conservation and ecological resilience are not disentangled.
3. Ecosystem services: The motivation is both ecological and economic. The basic ecological reasoning is the same as with ecological resilience, but clearly focused on the economic benefit of particular ecosystem functions. Examples are biological control (preventing pest outbreaks and the use of pesticides in agriculture and forestry) or pollination. Rare and threatened species have high appeal in conservation politics, but they are usually of negligible ecological importance. The idea of species redundancy (a species can take over the "role" of another one) is relevant for the value of ecosystem functioning (Janzen 1998) but unthinkable for conservationists.

Other motivations for safegarding agricultural biodiversity are prospecting for genetic resources for medicine, pharmacology, cosmetics, protecting and promoting cultural heritage and cultivated breeds, or the sense of place (Hampicke 1991; Gustafson 2000). In cultivated landscapes, many stakeholders are mainly interested in generating income for farmers when dealing with biodiversity and agri-environmental schemes (Baur 2003). However, when justifying their claim they rely on the value systems of others.

Sustainable development: The goal of nature conservation is to maintain nature (natural or cultural) as such, independent of their utilitarian aspects and use values (Pfister 1997). In contrast, sustainable development can be viewed as a social project and a regulative idea that aims at integrating ecological, economic and social dimensions of human development

(Minsch 1997). Positive tradeoffs between conflicting goals, e.g. between nature conservation and economic development, are judged to be necessary in order to promote an integral and enduring human well-being, including ecological responsibility (WCED 1987). From the point of view of sustainable development, conserving nature is not a goal in itself but a means for ensuring opportunities of human development, today and tomorrow. From this perspective, it follows, however, that in a poor country an ecologically valuable landscape might be sacrificed to economic development, similarly to what had happened in most industrial countries.

Wilderness: The term wilderness today means different things to different people, but it is always linked with naturalness (allowing natural processes), unmanaged nature (no visible human interference), and "authenticity" (Schnitzler and Borlea 1998). Whether secondary nature in formerly cultivated areas can be called wilderness is a matter of debate (Crist 2004). Wilderness areas have a very high appeal for eco-tourism and adventurous recreational activities (Bennett 1994; Bauer 2005). Wilderness can be seen as one aspect of biodiversity, but it may neither correlate with other aspects of biodiversity such as species richness, nor with other values such as ecosystem services or species conservation. Depending on the aim of a nature reserve, it should either remain untouched (wilderness, natural dynamics), or managed according to a specific goal and reserved for public use (education, recreation, tourism).

In addition to the above examples of obvious differences between stakeholder interests, there are examples where value systems and goals seem to match, but the means and ways cause disagreement. Ecological or sociological concepts and theories are often at the base of these conflicts. Furthermore, most of the arguments on biodiversity values are influenced by spatial scale: A species threatened in one country may be common in another; a high local species richness (alpha-diversity) has a different value than a high regional or national diversity (beta- or gamma-diversity).

Fragmentation: The theory of island biogeography (MacArthur and Wilson 1967) has been used to explain the negative effects of fragmentation (Simberloff 1982; Jedicke 1994), Accordingly, a fragmented landscape looses species because the individual habitat islands are small and isolated from each other. On the other hand, according to the mosaic concept (Duelli 1997), a fragmented landscape harbours more species because of higher diversity of habitat types and more habitat heterogeneity, often due to increasing human influence (Korneck *et al.* 1998; Wohlgemuth *et al.* 2002). Depending on the value systems of the stakeholders it might be more important to maintain or enhance local species richness (ecological resilience) than to prevent the loss of a few particularly fragmentation-sensitive species (species conservation). In abundant habitats, where ecological considerations prevail, species richness might be more important, while in rare habitats, such as raised bogs in central Europe, the protection of a characteristic though poor species composition is a prime motivation.

Restoration ecology: In many countries and particular regions, planting new hedgerows or restoring rivers is subsidized with public money because it helps a variety of threatened species to survive in ecologically depleted landscapes (conservation value; Jedicke 1994) and enhances e.g. beneficial insects (biological control value; Zwölfer and Stechmann 1989). However, in the case of planting hedgerows in areas where hedgerows never constituted a traditional landscape element it is refused (value of cultural heritage; Marschall and Bruns 2002). In addition, planting hedgerows can be detrimental for curlews or skylarks that depend on open areas, but they may offer new nesting sites for other bird species (species conservation value).

Is More Always Better?

The term biodiversity as a concept has a positive connotation in the public, whereas in natural sciences biodiversity is treated as a value-free environmental quality, where the components and aspects can be quantified in a way similar to temperature or humidity for describing the climate. With climatic factors, however, we are aware that some like it hot, others cold, while with biodiversity we tend to focus on those value-specific aspects, where more is always better. To take up the above example of the notoriously species-poor raised bogs: Protecting biodiversity here means the conservation of the few species characteristic for raised bogs. In this case, more biodiversity equals more specialist species. Similarly, a higher species richness of lichens in natural forests (high naturalness value) goes along with a lower species richness of carabid beetles, which are predators and thrive in moderately disturbed cultivated areas (low biocontrol value). For biodiversity evaluation, the declared choice of a value-specific indicator allows to keep up the positive connotation of "more is always better".

Conclusions

The above examples illustrate the importance of clarifying the value systems of different stakeholders, including researchers. Value systems are fundamental when it comes to applying scientific knowledge to practice, but also much earlier, when research questions are formulated. The science of landscape ecology should consider and analyse value systems much more carefully. Subconscious value systems must be made explicit, because they also influence the results of scientific research, e.g. the choice of indicators to measure landscape quality. Therefore, we need to develop scientific tools to assess value systems. We must endeavour to learn how values evolve and expand, and what hinders their integration. For instance, differences between urban and rural attitudes can be explained by different value systems. Future research should further provide methods for assigning all indicators proposed for measuring the qualitative and quantitative landscape properties to one or several value systems. In any case, the resulting compromises will, in practice, depend on political and economic interests rather then on scientific grounds – which again is a matter of value systems.

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