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SYNTHESIS

Involving society in restoration and conservation

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It is widely acknowledged that ecosystems often cannot be considered as separated from social systems, but that they should rather be seen as interacting, cross-scaled, coupled systems operating on multiple temporal and spatial scales. Humans have an increasing impact on ecosystems worldwide, while at the same time ecosystems are of critical importance for the functioning of human systems through ecosystems services. Often the term "social ecological systems" is used in approaches that consider ecological and social systems as integrated systems. This paper aims to contribute to clarification of the different relationships between social and ecological systems. The focus is on the social side of ecological restoration and conservation, in particular on participation, indigenous knowledge, governance, and ethics. It is concluded that in restoration and conservation of social ecological systems more attention should be paid to the role of social systems and conditions on which ecosystems depend. It implies awareness of the importance of engaging stakeholders and fostering public debate and deliberation.

Key words: eco-agricultural regimes, engagement, ethics, indigenous knowledge, participation, social ecological systems

Implications for Practice

- The concept of social ecological systems implies that besides communication and collaboration with stakeholders, also policy-making, political debates, putting down financial and legal barriers, and so on are often crucial for the success of ecological restoration projects.
- Giving a voice to society in the context of social ecological systems is not only important because restoration is dependent on social conditions, but also because restoration will affect society.

Introduction

As a consequence of agricultural intensification, unsustainable fisheries and other types of over-exploitation, habitat change (by e.g. urbanization, climate change, invasive species, and pollution), biodiversity loss, and disturbance of natural processes are taking place on a global scale (Millennium Ecosystem Assessment 2005). These developments not only reduce the quality of natural and semi-natural areas, but also have strong negative effects on people and human societies. Ecological restoration can be considered as a counter movement as it aims to restore or rehabilitate ecosystems that have been degraded, damaged, or destroyed with respect to its health, integrity, and sustainability (SER 2004).

Because many instances of natural degradation are related to human activities, ecosystem preservation, conservation, and restoration cannot be considered without taking into account the linkages with biophysical and social systems. Often the term social ecological systems (SESs) is used in approaches that consider ecological and social systems as integrated systems (Binder et al. 2013). This makes restoration and conservation rather complex as human or social systems have features that are not found in purely ecological systems, such as, e.g. planning and policy-making, intentionality, abstraction and reflexivity, science, and technology (Berkes & Folke 2002).

Several authors have emphasized the role of the SES perspective with respect to environmental and ecological management (e.g. Holling & Gunderson 2002; Walker & Salt 2006; Reynolds et al. 2007). Important considerations in these approaches are:

(1) Both social and ecological systems are far from being in equilibrium; the nonlinear dynamics of SESs are characterized by thresholds, multiple states, and surprising phenomena.
(2) Because of the connection between ecological and societal systems, cross-scale interactions happen. These interactions must be recognized and anticipated.

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(3) One should be aware of slowly evolving conditions and that short-term measures do not resolve persistent, chronic problems, nor can they deal with continuous change.
(4) Because ecological and social issues are strongly interwoven, both research and management need to adopt an integrated approach covering all sorts of disciplines.
(5) In addition to scientific knowledge, traditional, and indigenous knowledge, including experiential, multigenerational knowledge should seriously be considered in ecosystem management.

Thus, ecosystems cannot be considered as separated from social systems, but rather as cross-scaled coupled systems often operating on different and multiple temporal and spatial scales. The ecologists Holling and Gunderson use the term *panarchy* to describe such sets of connected, interacting systems, including social systems (Holling & Gunderson 2002). Ecological restoration and conservation, therefore, not only affect ecosystem functioning, they also impact human societies, e.g. by limiting or making possible certain forms of land use. Ecological restoration should therefore not ignore the societal side of restoration and may even have societal systems as a point of intervention. We should not forget that restoration is in itself a human enterprise and deeply rooted in social movements (Woodsworth 2013). How to deal with society and how to realize societal participation are therefore important issues. It is our opinion that these issues need to be given much more attention in ecological restoration circles than they currently do. One of the founders of the concept of SESs, the economist Elinor Ostrom, pays attention to the issue of societal participation, but in general terms and focusing on systems of governance or management of natural resources (Ostrom 2009). There is a strong need to specify the different relationships between social and ecological systems.

One of the aims of this special issue is to contribute to this through elaboration, especially on the human or social side of ecological restoration and conservation. The concepts of participation, indigenous knowledge, governance, and ethics are addressed with empirical and theoretical contributions. They are based on presentations during a workshop on desertification held at the University of Groningen, the Netherlands, in 2014. However, the scope of this issue extends beyond drylands and deserts, as many of the social issues are observable in many types of natural and semi-natural ecosystems.

Contributions

Mark Reed, Steven Vella, and coworkers present a typology of participation, which is characterized by two dimensions: agency and engagement. Agency refers to the issue of who is leading or initiating the process of participation. Engagement refers to how participants are actually involved. This results in four ideal-typical types of participation, ranging from consultation to deliberation, and from bottom-up to top-down processes. However, a typology does not say so much on what will make participation effective or successful. In the remaining part of their paper the authors present a theory of participation in order to understand why participation is successful or not. Four factors are put forward: context, design, power, and scalar fit. Context refers to the need of a facilitating and stimulating a particular societal surrounding. Design means that stakeholder and public interests and values should be made transparent and representative. The issues of power means that all the participants should have an equal voice to deal with conflicts, while scalar fit refers to taking into account temporal and spatial conditions of jurisdictions and institutions. The proposed theory may help to understand, given a certain type of engagement and agency, the outcome of a participation process.

Mchich Derak, Jordi Cortina, and coworkers present a concrete example of bottom-up engagement. They have developed a procedural framework for participatory processes over the full range of a restoration project, covering conceptual planning, preparation, implementation, evaluation, and monitoring. The framework was applied to a forest landscape restoration project in North Morocco, an area that suffers from long-lasting land degradation. During the project local citizens got involved in the design and implementation of the restoration process. The study is especially interesting because participatory approaches for conservation and restoration are scarce in Maghreb countries. Restoration projects in this region often meet public resistance because of local interests and the use of unpopular forest species. Moreover, similar to most North African countries, Morocco has to cope with demographic growth and enduring poverty. In terms of the model by Reed, Vella, and coworkers the Morocco case illustrates a bottom-up, coproductive type of participation.

The involvement of local people, as an example of bottom-up participation described by Derak and coworkers, is in complete contrast to the approaches often applied in China, where overgrazing has led to the degradation and desertification of the ubiquitous grasslands. In recent decades, the Chinese government has applied top-down measures as pasture lease contracts and grazing bans, accompanied by monetary compensation and sanctions to restore rangelands. Heng Zhao, Guiying Goa, and Peter Ho aim to assess the long-term effectiveness of these "Hardinian" approaches (after Garrett Hardin's) top-down approach to the "Tragedy of the Commons" (Hardin 1968)). Using a mixed methods approach based on surveys and interviews among affected herders in the Ningxia Hui autonomous region, they question if this top-down approach is successful, taking into account its efficiency (as social-economic costs) and effectivity (in terms of realized vegetation types). The paper by Zhao and coworkers indicates that local, informed, and voluntary participation with regard to the design of a restoration project could be an alternative approach in the Chinese context.

The story of Lake Nasser in South Egypt since the mid 1960s, described by Hoda Yacoub, is an example how new infrastructure may affect a SES. Not only did the new lake lead to a completely new desert wetland ecosystem, it also radically changed the livelihoods of the Bedouin community in that area. The pastoralist nomadic lifestyle mostly disappeared when shepherds settled along the shores of Lake Nasser. These settlements, in turn, negatively impacted the surrounding rangelands by increasing grazing pressure, since

periods of non-grazing disappeared. However, Bedouin people have learned to use aquatic *Najas* species growing in the lake as an alternative fodder. That practice became part of a new grazing strategy which reduced the pressure on rangelands and promoted their recovery. Interestingly, the development of the new grazing strategy also leaned upon the use of old experience by the elderly. The Lake Nasser case may be considered a form of passive restoration (van Andel & Aronson 2012: p. 27), demonstrating that social systems as part of SESs may function as targets for ecological restoration.

Overgrazing as described in the case of Lake Nasser is an example of a collective action problem, which means that the problem is caused by the collective impact of many damaging individual contributors. Measures aiming to reduce individual negative impacts on the system must therefore be implemented by a sufficient number of people to be effective. One strategy is to enforce top-down measures as in the Chinese case. However, an alternative is to focus on voluntary change of behavior. In this context, Jac. Swart and Jorien Zevenberg consider the willingness to limit one's impact on nature, despite a loss of profits. Through game theory analysis, the authors show theoretically and experimentally that someone's willingness to abstain from maximizing his or her profits (inclusive enjoyment) is contingent on what other people choose. This results in a tipping point of the number of people willing to lower their utilization of resources: above that point more and more people will tend to restrain their use, but below that point maximizing use becomes the dominant trend. The paper illustrates the complex linkage between human values and SESs and stresses that ethical considerations are relevant in participative approaches.

As mentioned in the introduction, modern agriculture often has devastating effects on natural areas and some authors argue therefore for a sharp divide between high-productive agriculture and nonproductive natural areas. However, this strategy of "land sparing" ignores the fact that many agricultural landscapes in many parts of the world are highly valued semi-natural landscapes. Henny van der Windt and Jac. Swart argue in their contribution that it is possible to integrate conservation and restoration measures with agriculture. However, this so-called "land sharing" approach implies the creation and innovative design of quite new eco-agricultural regimes that integrate and connect economic, ecological, and cultural values and knowledge systems. Making use of a transition model on the social dynamics of technological innovation, the authors analyze two Dutch transition experiments in which farmers, ecologists, NGOs, governments, universities, and local entrepreneurs and retailers participated and collaborated. The study demonstrates such a type of restoration and conservation turns out to be strongly dependent on the management of social-economic and governance processes.

Conclusions

More than 20 years ago, Eric Higgs (1997) advocated for an "expanded concept of restoration" in which historical, social, moral, and aesthetic issues are taken into account. More recently, Gosnell and Kelly (2010) used the term *social-ecological system restoration* in a case of river restoration to stress that besides ecology, economic and social factors should also be included in restoration of social ecological systems.

The papers in this issue add to this tradition as they consider restoration and conservation from a social point of view referring to issues as participation, values, knowledge, and governance regimes. For example, Derak and coworkers consider the involvement of local citizens in all phases of a reforestation project, whereas Zhao and coworkers examine the effects of a top-down token political measure, that is the ban on grazing, meant to guide or push ecological succession in a preferred direction. The paper by van der Windt and Swart focuses on attempts to enhance biodiversity and reduce environmental footprints of agricultural systems. Yacoub describes a social-ecological desert system in which both the ecological and the societal subsystems coevolved after a strong destructive period.

The recognition of the role of local communities, politics, values, and indigenous knowledge implies that restoration and conservation of SESs should more focus on the role of planning, intentionality, and reflexivity. In that context, Reed and coworkers clarify that we have to make choices in restoration and conservation on how to organize and implement the process of participation. Swart and Zevenberg demonstrate that public support for restoration and conservation also depends on the number of people—as a threshold—that agree on that, making the issue of communication and deliberation even more important.

Dealing with social issues is unavoidable in many conservation and restoration projects, blurring the boundary between nature and society. The concept of social ecological systems implies that besides communication and collaboration with stakeholders, policy-making, political debates, putting down financial and legal barriers, and so on, are often crucial for the success of ecological restoration projects (Wiens & Hobbs 2015). To be effective, restorationists and conservationists should pay much more attention to the role of social systems and conditions on which ecosystems depend. It implies awareness of the importance of engaging stakeholders and fostering public debate and deliberation. Giving a voice to society in the context of SESs is not only important because restoration is dependent on social conditions, it also affects society. Restoration or conservation of SESs merge the ecological and the social, turning ecology into a kind of sociology and sociology into a kind of ecology.

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