Stakeholder participation, learning and ecosystem management

A global study of 146 Biosphere Reserves in 55 countries

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Abstract

Theories of natural resource management and conservation, such as adaptive management and adaptive co-management, are based on strong but mostly untested assumptions about the importance of engaging local stakeholders in conservation and management efforts. The aim of this project is to analyse the effect *of stakeholder participation* in natural resource management programs on 1) outcomes in ecosystems, and 2) learning processes. Through a powerful combination of a transdisciplinary research team, a cross-national panel survey of 144 BR-areas in 55 countries, longitudinal biodiversity mapping using satellite imagery, and context-sensitive field work in 10 strategically selected cases studies, the contested role of stakeholder participation in natural resource management will be examined in with a much higher degree of precision and generalizability than previously possible. The significance of the proposed project consists in its unique ability to subject key theoretical assumptions to rigours testing against several different types of empirical data. In addition, the proposed project will compile and make publicly available a data set consisting of estimates of interlinked social and ecological systems situated in 55 different political contexts. This will enable researchers to analyze long term interaction patterns between social and ecological systems, as well as generate new research questions that go beyond current theories of environmental management.

Purpose and aim

Does stakeholder participation and learning processes lead to better management of ecosystems? During the last few decades there has been a strong trend towards increasing stakeholder participation in biodiversity conservation and protected area management (Dearden et al. 2002). A parallel shift is occurring among the objectives of conservation programs, from a focus on protecting red listed species, towards a focus on managing ecosystem services for human wellbeing and supporting learning about ecological systems. The combined effects of these trends are to a large extent unknown and heavily debated (eg. Wilshusen et al. 2002), but a key assumption in the scientific literature is that stakeholder involvement and processes of learning are essential components in achieving better management of ecosystems.

The purpose of this project is to analyze the interactions between stakeholder participation, learning processes and outcomes in management of ecosystems with regards to three main research questions:

1. Does stakeholder participation lead to better management of ecosystems?
2. Does stakeholder participation lead to processes of learning among stakeholders about ecosystems?

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3. What types of learning processes are effective for improving management of ecosystems?

Through a novel combination of survey data, remote sensing analysis, and strategically selected case studies, the project is in a unique position to assess the validity of fundamental theoretical assertions about the effects of local stakeholder participation on management outcomes in natural systems, with regards to biodiversity as well as to other management goals. Serving this overall purpose, the project rests on three aims:

1. Creating a longitudinal cross-national panel data set of management practices and patterns of stakeholder participation in 146 UNESCO Biosphere Reserves (BRs) in 55 countries. An initial survey was conducted in 2008 and an important aim of the project is to conduct a follow-up survey in 2013 of those BRs that were surveyed in 2008. The resulting panel data set will enable in-depth analyses of how changes in management practices and patterns of stakeholder participation and learning processes affect management outcomes over time.

2. Characterize BR-areas from satellite remote sensing regarding variability in different vegetation indices to ground based or map based measures of biodiversity and develop change trajectories from multi-temporal satellite data. This will create high-quality and extensive measures of management outcomes in the sample of BR ecosystems and landscapes. Field work validating remote sensing data interpretation will be conducted (see below).

3. Conducting field work in 10 selected BRs to 1) calibrate and triangulate the data captured in the survey and through remote sensing, 2) capture micro-level mechanisms of how the design and framing of participation affects management outcomes, and 3) study learning processes around ecosystem in local settings. Based on information from survey data and UNESCO archives, we will select five 'conventional BRs' (managed by National Park agencies etc), and five 'multi-stakeholder' BRs (managed in collaboration between officials and stakeholder groups from civil society). Through interviews with management bodies and stakeholders, document analysis and observation, we will map the various approaches to stakeholder participation (including who is participating, in what processes, for what purpose and with what kind of facilitation), as well as the results in relation to management goals, including effects on biodiversity.

Survey of the field

Over the last few decades, the participation-paradigm has grown in research, policy and practice of natural resource management, biodiversity conservation and stewardship of ecosystem services (Dearden et al. 2005, Reed 2008, Chapin et al. 2009). In short, the arguments put forward for involvement of stakeholders include increased efficiency (as people are more likely to support and implement decisions they have participated in making), improved accuracy (as a more diverse and broader knowledge base is utilized), and strengthened legitimacy (as people affected by decisions are invited into the process of making them) of management and conservation efforts (McCool and Guthrie 2001, Beierle and Konisky 2001, Colfer 2005). The focus on continuous learning as key to successful management of ecosystems is also increasing, both in terms of environmental education as a means to enhance support for ecosystem management among the public, and in terms of learning-based management as a means to enhance the accuracy of management practices (e.g. Schultz and Lundholm 2010).

The pragmatic reasons for stakeholder participation and learning have gained importance with the growing perception that ecosystems and societies are interdependent, forming social-ecological systems that are complex, adaptive and nested across

scales (e.g. Berkes and Folke 1998, Holling 2001). The interdependence between ecosystems and society implies that people-oriented management and conservation of ecosystems is more likely to succeed than "strict protectionism based on government-led, authoritarian practices" (Wilshusen et al. 2002). For example, many conservation values in cultural landscapes result from a long history of human use and management (Nabhan 1997). The complexity and the cross-scale interactions of social-ecological systems imply that any management body is dependent on collaboration with others in order to detect, interpret and respond accurately to feedback from dynamic ecosystems (Folke et al. 2005). Adaptive co-management has been put forward as a way of dealing with this complexity in social-ecological systems (Olsson et al. 2004a, Armitage et al. 2007), as it combines the learning-by-doing approach of adaptive management with the collaborative approach of co-management. Adaptive co-management emphasizes two types of stakeholders: actors with different types of ecosystem knowledge (both scientific knowledge and experiential, e.g. local, traditional and indigenous knowledge) and actors working at different ecological scales and levels of decision-making (e.g. managers of certain habitats and policy-makers at local and national levels) (Olsson et al 2004a, Charles 2007). Recent studies on adaptive co-management have highlighted the need for bridging organizations that can coordinate and facilitate such adaptive collaboration across organizational levels and knowledge systems (Hahn et al. 2006, Berkes 2009).

Several studies suggest that participation of stakeholders has the positive effects suggested above (e.g. Sandersen and Koester 2000, Mugisha and Jacobson 2004, Stringer et al. 2006, Sudtongkong and Webb 2008). Participation of key stakeholders was found to be the single most important factor in determining project outcomes in a survey of ecosystem management in the United States (Yaffee et al. 1996). In a synthesis of four case studies, Lebel et al. (2006) found support for the proposition that participation and deliberation in decision-making around natural resource management enhances society's ability to innovate and respond to crises, suggesting that involvement of non-state actors is a fruitful approach for dealing with complexity. In a case study of Kristianstads Vattenrike Biosphere Reserve, Hahn et al. (2006) showed how a bridging organization was able to identify win-win situations between biodiversity conservation and societal development through adaptive co-management processes focused on strengthening the generation of ecosystem services. Positive side-effects of participatory and collaborative approaches have also been described, such as empowerment and increased social capital, which in turn can lubricate future collaboration (Pretty and Ward 2001, Ansell and Gash 2006, Duit et al. 2009).

However, critique against the participation-paradigm has increased. Brody (2003) discusses the risk that the participation of conflicting interests slows down decision-making and results in unfortunate compromises between biodiversity conservation and economic development. Galaz (2005) shows how decision-making in a Swedish water common-pool-resource institution was blocked by strategic behavior among participating resource users that wanted to avoid costly measures. Such outcomes might erode social capital rather than building it (Conley and Moote 2003). Several scholars have argued that in a human dominated world, the goals of biodiversity conservation and economic development are competing, and therefore the participation of economic interests in decision-making on biodiversity conservation will have negative consequences for biodiversity (Kramer et al. 1997, Brandon et al. 1998, Terborgh 1999, Oates 1999 [cited and discussed in Wilshusen et al 2002]). In addition, local participation might decrease accuracy of management because it dilutes

the impact of scientific knowledge on conservation decisions (du Toit et al. 2004). Similarly, it has been questioned whether local and traditional knowledge really has a role to play in today's rapidly changing world (Briggs and Sharp 2004). The assumption that local participation automatically improves legitimacy of decisions has also been questioned Powerless and poor people may lack the capacity to participate fully, and so the decisions made in participatory processes might become more biased towards enforcing existing power structures than would decisions made by democratically elected and representative bodies. This process, labeled 'elite capture', has been described several times in the development literature (e.g. Platteau and Abraham 2002).

Studies that evaluate the effects of stakeholder participation on conservation outcomes and sustainable use of ecosystem services empirically are rare (Kleiman et al 2000, Conley and Moote 2003). The ambiguity in the results from case studies calls for larger studies where hypotheses on the effects of participation in general and adaptive co-management in particular can be tested systematically in different settings (Carpenter et al. 2009). The data-sets available to perform such tests are few (e.g. Poteete and Ostrom 2007), but the World Network of Biosphere Reserves as part of UNESCO's Man and the Biosphere Program provides a potentially useful example.

Project description

UNITS OF ANALYSIS: THE WORLD NETWORK OF BIOSPHERE RESERVES

Biosphere Reserves are sites designated by UNESCO with the mission of "maintaining and developing ecological and cultural diversity and securing ecosystem services for human wellbeing" (UNESCO, 2008, p. 8) in collaboration with a suitable range of actors, often including local communities and scientists. They are promoted as "sites of excellence" and "learning sites" in this regard (UNESCO, 1996). The legal status varies between countries, but all biosphere reserves include core zones where biodiversity is protected and buffer zones, where activities that foster development without deteriorating biodiversity are promoted.

Since the program was initiated in 1976, 564 Biosphere Reserves have been designated in 109 countries (UNESCO Official Website, 2011). In the 1970s and 1980s the sites were mainly designated based on their biodiversity values and their capacity to support research and monitoring (Ishwaran, Persic, & Tri, 2008), but since 1995, all Biosphere Reserves are expected to fulfill three functions, stated in the Statutory Framework and the Seville Strategy (UNESCO, 1996): (1) conserving biodiversity, (2) fostering sustainable social and economic development, and (3) supporting research, monitoring, and education. As many of the older Biosphere Reserves have not yet transformed, the network now includes examples of "conventional" biodiversity conservation as well as sites with an integrated approach to conservation and development. Management bodies range from national park authorities to communities and networks of multiple state and non-state actors.

The three functions and several of the criteria of Biosphere Reserves correspond to features of adaptive co-management: there is a focus on monitoring, an integrated approach to conservation and development, and recommendations of adaptive management and participation of a suitable range of actors (Schultz & Lundholm, 2010; UNESCO, 1996). Based on the mission, functions, and criteria of Biosphere Reserves, and the results of a case study in one Biosphere Reserve (Hahn et al., 2006; Olsson et al. 2004; Schultz et al. 2007), we propose that Biosphere Reserves constitute potential sites for testing the effectiveness of participation in general and adaptive co-management in particular.

REMOTE SENSING TO ASSESS CHANGES IN BR ECOSYSTEMS AND LANDSCAPES

In order to assess to what extent the different BR areas have been able to affect ecological processes on the ground, we will gather and analyze remote sensing data (satellite imagery, aerial photos, etc) in a GIS framework. In order to explicitly assess changes in land uses we will collect (when available) and analyze temporal remote sensing data gathered in a consecutive manner. We will use a two-stage process in analyzing the data. First we will use the NVDI (Normalized Difference Vegetation Index) indicator to assess significant changes in the vegetation cover within the different zones of all the MAB areas. This analysis will help us to reveal general trends in terms of overall level of vegetation both within and among the different MAB areas. These analysis will be accompanied for a carefully selected set of MAB areas where either: (1) the changes in vegetation covers measured through the NVDI seems to be significant, or (2) where we would expect ongoing management activities to have resulted in land use changes. These more in-depth analyses will elaborate what types of vegetation (e.g. tree species) that are present in the landscape, and it will also elaborate how the spatial configuration of these different types of vegetation covers might affect possibilities for species persistence. Here, both the amount of suitable cover/habitat and the level of connectivity (Taylor et al 1993) will be taken into account; both variables being of crucial for any species long-term persistence in a landscape (e.g. Hanski & Ovaskainen 2000). For the connectivity analyses we will apply the recently developed graph-theoretical framework (Urban et al 2009, Bodin and Saura 2010)

CASE STUDIES AND FIELD WORK: STAKEHOLDER PARTICIPATION "ON THE GROUND".

A core component of the project is a set of case studies based on field work in a total of 10 different BR-areas. Information from survey data and UNESCO archives enables us to choose cases strategically based on the level of stakeholder participation.1 We will select five 'conventional BRs' (typically managed by National Park agencies) with low degree of stakeholder participation, and five 'co-management' BRs (managed in collaboration between officials, NGOs, volunteers, local inhabitants and resource users, and interest organisations) with high levels of stakeholder participation. In addition, case selection can also be made with controls for background variables such as resource characteristic, landscape varieties, and ecosystem types.

The purpose of the case studies is to validate satellite imagery interpretations as well as survey estimates of participatory processes and management regimes, and to gain a better understanding of how stakeholder participation and learning processes play out "on the ground". The case studies will provide an opportunity for identifying micro-level causal mechanisms that are underlying macro-level patterns of correlations that can be found in the in the large-N analysis of survey and remote sensing data.

A set of key questions will be addressed,

1 Due to a lack of a widely accepted definition of stakeholders, it is not uncommon in studies of eosystem management for stakeholders to be identified on an ad hoc basis (Reed et al. 2009), often by simply defining a stakeholder as an individual or group that visibly is interacting with the resource or the resource governance system. This approach to identifying stakeholder runs the obvious risk of biasing the analysis to place uneven emphasis on salient and resourceful groups that are highly visible in the interaction with the resource, while underestimating less resourceful actor groups. In designing our survey we therefore opted for a strategy which focused on determining the presence of a larger number (10) of predetermined categories of stakeholders in different functions within the BR. This approach does not eliminate the problem with identifying stakeholders mentioned above, but by using a relative detailed (and therefore reasonably exhaustive) list of stakeholder categories the problem is nevertheless brought under a degree of control

as in the 'who, what, where, and how' (cf. Krasny, Lundholm and Plummer, 2011; Lundholm & Plummer, 2011; Rickinson, Lundholm and Hopwood, 2009; Schultz & Lundholm, 2010). Does it matter *who* possesses knowledge of biodiversity and ecosystems in the BRs? Is there a positive influence on learning depending on *content*, i.e. is understanding systems and complexity important? Does *place-based* education on biodiversity and ecosystems improve management? What is the influence of *different means* of communication and *cognitive tools* on learning (i.e. dialogues vs. scenario planning, vs. one-way communication)? Participatory processes and patterns of management regimes will be mapped through interviews with key informants among managers and stakeholders, direct observation of management practices, and analysis of policy documents and performance reviews.

SURVEY: GENERAL PATTERNS OF STAKEHOLDER PARTICIPATION AND MANAGEMENT REGIMES.

In a previous research effort a survey questionnaire was distributed to all 531 BR areas. The first BR-survey was carried out using an online questionnaire, which proved to be a highly effective way of distributing and collecting surveys in a population consisting to a large part of respondents situated in remote areas. In order to get comparable information from a large set of cases a self-administered questionnaire was developed, targeting coordinators, directors and managers of Biosphere Reserves. The questionnaire was tested, revised, and uploaded for on-line access in English, French, Spanish and Chinese. In addition, hard copies were distributed extensively at the 3rd World Congress of Biosphere Reserves held in Madrid in February 2008 to compensate for the fact that 124 of the 531 Biosphere Reserves could not be reached via e-mail. We therefore plan to use the same approach of a combined internet survey and directly distributed questionnaires for the repeated survey which is to be carried out in 2013, five years after the first survey and also the year for the next World Congress of Biosphere Reserves. The questionnaire was designed to gather information about three main aspects of the Biospheres. The first aspect is patterns of stakeholder involvement, defined as the number of different stakeholder categories (e.g. local famers, indigenous people, resource users) participating in various Biosphere functions (e.g. decision making, monitoring, implementation). The second aspect is management regimes, and this section of the survey sought to estimate the extent to which the BR employed a style of management that could be classified as either adaptive management or conventional conservation, as well as whether the BR was pursuing local development objectives in parallel with conservation efforts or not. The third aspect measured by the survey was self-assessed effectiveness in reaching development and biodiversity conservation goals, as well at its perceived readiness for dealing with surprises and external shocks. The survey worked well for assessing participation patterns and management regimes, but using self-assessments as the chief tool for measuring performance effectiveness in biodiversity conservation is likely to generate a certain extent of bias. Combining the survey approach with remotes sensing data on changes in habitats and biodiversity is an attempt at overcoming this bias, while still retaining a large-N cross-national research design. In addition, the survey panel will enable us to address crucial questions about changes over time, including the effect of external shocks and surprises.

TIMELINE

Due to its longitudinal approach, the proposed project is scheduled to run over a period of five years. This extended time is partly motivated by the need for sufficient amount of time to elapse between measurements using surveys and satellite data, but

also by the ambitious but time-consuming plan for conducting field work in 10 different BRs. The overall project timeline is planned as follows: In 2012-2016, field work in about three BRs per year will be conducted. Satellite data processing and interpretation will begin in 2012, and a preliminary round of publications based on survey and satellite data is planned for early 2013 and 2014. A follow up survey is to be issued in 2013, and some early results from combined panel survey and longitudinal satellite data is scheduled for publication in late 2013 and early 2014. The remainder of 2015 and 2016 will be used to summarize and disseminate the results from case studies and large-N data in leading journals, a co-authored monograph, and a dissertation, bringing the project to completion.

Preliminary findings

Results and analysis from the first round of BR-surveys have been reported in papers Duit and Hall 2011, Schultz and Lundholm 2010, Schultz et al 2010. Preliminary findings indicate that participation of local stakeholders neither improves nor deteriorates conservation of biodiversity per se, but rather expands the focus of BR management so that local development is stimulated as well. It seems that win-win situations can indeed be identified between conservation and local development when local stakeholders are involved. Another finding is that the extent of stakeholder participation is influenced by the institutional context of the BR, especially protection of political rights (Duit and Hall 2011).

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