



## Research

# Monitoring the Governance Dimension of Natural Resource Co-management

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**ABSTRACT.** The governance outcomes of natural resource co-management have been neither systematically monitored nor rigorously assessed. We identified system attributes and key variables that could form the basis for monitoring the governance dimension of adaptive co-management. A methodology for collaboratively monitoring these system attributes and key variables was tested in four localities in South Africa. Our results suggest that creating the conditions that facilitate self-organization, and particularly cross-scale institutional linkages, is the major challenge facing attempts to initiate adaptive co-management. Factors requiring greater attention include community perceptions of support from outside agencies, access to long-term funding for adaptive decision making, and access to reliable information about changes in natural resources and legal options for the formation of decision-making bodies. Long-term and well-funded social facilitation is key to achieving this.

**Key Words:** *adaptive capacity; adaptive co-management; governance; monitoring; self-organization; social capital*

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## INTRODUCTION

Governance provides the social context that allows collective action, rule making, and institutions for social coordination (Dietz et al. 2003). The term governance refers to the interactions among structures, processes, rules, and traditions that determine how people in societies make decisions and share power, exercise responsibility, and ensure accountability, and how stakeholders have a say in the management of natural resources (Lebel et al. 2006, Raik and Decker 2007; Abrams et al. *unpublished report* [http://www.ramsar.org/doc/outreach\\_methodologies\\_evaluating-governance-handbook.doc](http://www.ramsar.org/doc/outreach_methodologies_evaluating-governance-handbook.doc)). Adaptive co-management is increasingly seen as a governance-based approach to managing complex adaptive systems (Ruitenbeek and Cartier 2001, Olsson et al. 2004a, Rammel et al. 2007). The approach is expected to achieve this by marrying the strengths of adaptive and collaborative (co-) management through a focus on adaptive learning and linkages between actors and organizations operating at multiple levels (Armitage et al. 2007, Olsson et al. 2007). A change in governance is therefore often one of the key outcomes of transitions toward adaptive co-management.

Although the rhetoric of adaptive co-management has arrived after two decades of ambiguous experiences with community-based conservation (Hulme and Murphree 1999, Blaikie 2006), it is gaining increasing leverage among international funding agencies and government departments in their quest for lasting solutions to the management of ecosystem services. There is indeed growing skepticism that the adaptive co-management of complex systems has not progressed beyond mere philosophy and that the concepts and processes involved are poorly understood. There are a number of reasons for this skepticism. First, although the need to evaluate the processes and outcomes of adaptive co-management is recognized (Plummer and Armitage 2007), approaches to achieving this have not been tested on the ground. Second, although a descriptive analysis of transformations in local governance has been provided by Olsson et al. (2006) based on case study comparisons, the mechanisms that drive transformations in social-ecological systems are not well understood (Walker et al. 2006). Third, although the need to understand the ways in which such transformations might be initiated and monitored is considered critical (van

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der Brugge and van Raak 2007), appropriate methods to measure and monitor change in complex systems have not been systematically developed or tested (Lynam and Stafford Smith 2004, Western 2004), and the tools for evaluating co-management in general have been described as surprisingly blunt (Carlsson and Berkes 2005). Monitoring governance is particularly challenging, however, because of the variety of perspectives that have a bearing on what is considered to be good governance (Abrams et al. *unpublished report* [http://www.ramsar.org/doc/outreach\\_methodologies\\_evaluating-governance-handbook.doc](http://www.ramsar.org/doc/outreach_methodologies_evaluating-governance-handbook.doc)), the dynamic nature of the drivers of governance, and the ease and rapidity with which governance can undergo a regime shift when a change in leadership occurs.

We address these three gaps in the literature by putting forward a monitoring system that can be used to track change in the governance dimension of adaptive co-management. In particular, we address two key questions: How can governance be monitored in adaptive co-management, and what new insights can be gained through monitoring? Although the predominant focus is at the community scale, we strove to include a consideration of multi-scale linkages by including indicators that were explicit about the multi-scale characteristics of governance.

### **Theoretical basis for monitoring governance**

Analysts have argued that a small set of key variables tends to be dominant when systems change or transform (Walker et al. 2006). We evaluated this hypothesis by developing a conceptual map for monitoring change in governance (see Ostrom 2007). The process begins by identifying four system attributes: social capital (Pretty 2003), adaptive capacity (Armitage 2005), self-organization (Olsson et al. 2004a), and operational preconditions for the emergence of adaptive governance (Dietz et al. 2003). Thereafter, a set of key variables is identified for each attribute to enable measurement.

### **Social capital**

Social capital refers to the features of social life such as networks, bonds, norms, and trust, which enable participants to act together to pursue shared objectives (Coleman 1988, Putnam 1995). Social

capital is particularly important in understanding the ways in which collective action is achieved (Ostrom and Ahn 2003) and is therefore central to self-organization within social systems (Folke et al. 2005). However, this definition of social capital has been criticized for being vague (Mansuri and Rao 2004) and it might therefore be more informative to focus on the means by which social capital can be built, rather than on social capital itself. Pretty (2003) identifies four features of social capital that are important for collective action. These provide a starting point for identifying key variables for monitoring social capital and include relations of trust, reciprocity, common rules, norms and sanctions, and connectedness in networks and groups. Trust is a core feature of social capital because it enables cooperation. Pretty (2003) also identifies economic incentives as a means to change behavior and encourage collective action, although this may not result in a change in attitudes. Vertical connectedness and linkages to external agencies must also be considered (Pretty and Ward 2001). We regarded these features of social capital as key variables that will influence the governance outcomes of adaptive co-management.

### **Adaptive capacity**

Adaptive capacity is a core system attribute necessary during transitions toward adaptive co-management (Folke et al. 2003, Plummer and Armitage 2007). Adaptive capacity refers to the ability of a system to adapt to change and respond to disturbances (Armitage 2005) or to expand the range of variability within which it can cope (Adger 2003). Adaptive capacity is closely related to the concept of social capital (Adger 2003) because social capital influences the ability of groups to act collectively during a crisis or surprise (see Gunderson and Holling 2002). In the context of governance, a distinction can be drawn between adaptations that reinforce existing organizations and adaptation that creates flexible institutions, thereby increasing resilience (Pelling and High 2005, Fabricius et al. 2007). In transforming systems, attributes of systems that support innovation should be favored over attributes that maintain the status quo (Armitage 2005). Armitage (2005) suggests that adaptive capacity depends on the characteristics of individuals, institutions, and organizations that foster learning in the context of change and uncertainty. These characteristics, which we regard as key variables for assessing

adaptive capacity, include the willingness to learn from mistakes, the willingness to engage in collaborative decision making, and the extent to which institutional diversity and redundancy is encouraged or accepted.

### **Self-organization**

Adaptive co-management is often described as a self-organising process for problem solving (Olsson et al. 2004a). The key variables necessary for the emergence of self-organisation in adaptive co-management include: (1) enabling legislation that creates social space for ecosystem management, (2) funds for responding to environmental feedback and for remedial action, (3) the ability to monitor and respond to environmental feedbacks, (4) information flow and social networks, (5) combining various sources of information for sense making, and (6) arenas of collaborative learning (Olsson et al. 2004a). Leadership also appears to be essential for self-organizing processes (Olsson et al. 2004a, 2007, Cash et al. 2006).

### **Operational preconditions for adaptive governance**

Adaptive governance is frequently identified as one of the objectives of adaptive co-management (Olsson et al. 2004b, 2006, 2007). Dietz et al. (2003) identified five operational requirements necessary for successful adaptive governance of common-pool resources within complex systems that are not overtly captured in the variables identified for social capital, adaptive capacity, and self-organization. First, there should be access to information about the resource being managed. The information must be trustworthy and at an appropriate scale for the level of management. The flow of this information must meet decision makers' needs in terms of timing, content, and form of presentation. Second, conflict-resolution mechanisms must be in place to deal with power inequalities and differences in values, interests, and perspectives. Third, rule compliance and enforcement must be effective. Rules and enforcement may be either formal or informal, but those in charge of enforcement must be seen as legitimate by the resource users. Fourth, sufficient infrastructure must be in place, as this determines the degree to which resources can be exploited or managed. Infrastructure might include fences for grazing land and roads for transporting

goods, or technology necessary to monitor natural resources. Fifth, Dietz et al. (2003) identified the need for people and organizations to be prepared for change, in the same way that Olsson et al. (2006) described that as understanding of conditions change, so might the rules governing resource use and even the design of institutions change.

These requirements are regarded as the key variables that are necessary for adaptive governance to operate. This leads to the question: How can these system attributes, i.e., social capital, adaptive capacity, self-organization, and operational conditions for adaptive governance, as well as the key variables that underpin these attributes, be converted into a practicable monitoring program?

### **STUDY AREAS AND METHODS**

We examined four case studies from locations in South Africa: Machubeni, Mkhuze, Nqabara, and Riemvasmaak (Fig. 1 and Table 1). Funding was received from the national Department of Environmental Affairs and Tourism (DEAT) between 2005 and 2008 to initiate co-management activities centered on ecosystem services and poverty alleviation. All of the case studies had the same international agency acting as implementing agent on behalf of DEAT. The projects were designed to consist of six components that ran concurrently: conceptualization, administration, and management; the creation of partnerships and knowledge networks; training and capacity building; marketing of local products; conflict management, and; monitoring and evaluation (D. Mitchell, L. Coelho, J. Baumgart, and H. Snel *unpublished report* to GTZ South Africa: Lessons Learnt from Implementing Community-based Natural Resource Management Projects in South Africa). This common design played a critical role in the selection of the case studies because the creation of partnerships, knowledge networks, capacity building and monitoring, and evaluation resonate strongly with the goals of adaptive co-management. Indeed, the design of these interventions was influenced by resilience theory through the influence of Christo Fabricius, who acted as a part-time technical advisor to the implementation agent (C. Fabricius, B. Matsiliza, and J. Buckle *unpublished report* to GTZ South Africa: Community-based Natural Resource Management in Rural Livelihoods – Eastern Cape Planning Process).

The case studies were also selected to provide the maximum contextual variation among sites so that general conclusions could be drawn about the significance of observed trends in the processes and outcomes (Flyvbjerg 2006). The sites were selected for their distribution across the country, their representativeness of different cultural groupings, and their different population sizes, histories, climates, and landscapes (Fig. 1 and Table 1).

The prevailing governance context and the co-management implementation processes followed in each site are important. All sites shared three contextual aspects. First, project advisory and steering committees (PASCs) had been set up in all four sites as a means to improve communication among the multiple stakeholders involved. The PASCs included representatives from the implementing agent and contractors, provincial and local government, nongovernmental organizations, community institutions, and a representative from each of the villages that made up each community. The community components of these PASCs were elected by each of the villages that made up each community and generally emphasized equal representation of women, men, youth, and elderly. The sizes of the PASCs varied depending on the number of villages requiring a representative; size ranged from 15 to 30 representatives. Second, governance and management capacity at all four sites had been negatively affected by separate development policies associated with a pre-democratic South Africa, which had weakened local institutional capacity for rule making and enforcement. Third, all four sites were on communally managed land. Despite these commonalities, the initiatives were faced with very different decision-making contexts and were implemented in different ways, depending largely on who was contracted to manage the project. These differences are described next.

In Machubeni, governance prior to the intervention was characterized by weak links between traditional decision-making structures and contemporary local government. There were no effective local structures for decision making about natural resource use, and the enforcement capabilities of traditional leadership were weak. The implementation process for the initiative was run by consultants who were contracted on behalf of the implementing agent. Investment was made in consultants specializing in social facilitation. The goals of the project itself were informed by a participatory land

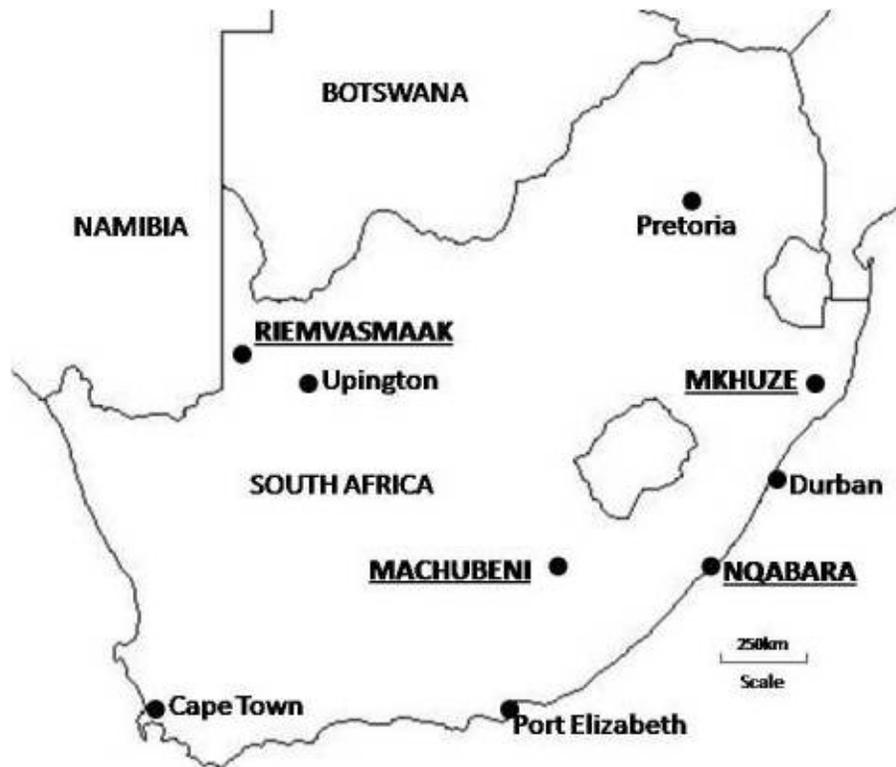
use planning and visioning process that took place before the initiative began, and specialist training was given to a core group of local people identified by the community as experts in various aspects of land use and management. Training included land management, mapping, management planning, and monitoring, and the core group reported to a representative of the PASC.

In Mkuze, governance prior to and during the intervention was dominated by strong, multi-tiered traditional leadership structures that were responsible for land management. These traditional structures had deeply entrenched norms governing decision making. The implementation process for the initiative was run by consultants who were contracted on behalf of the implementing agent. Strong emphasis was placed on creating links with private sector partners and on ongoing interaction with a small set of individuals selected by traditional leaders to serve on the PASC.

In Nqabara, prior to the intervention, the community had a legally recognized land management body in place, with conflict-resolution training and experience in working with government in participatory forest management initiatives. Members of this body had long-term experience working together on land management issues. The implementation process for the initiative was run by the local office of the implementing agent, rather than consultants, and was characterized by long-term facilitation and close contact between the implementation agent and the decision-making body.

In Riemvasmaak, the community had successfully reclaimed their land from the South African Defence Force in the early 1990s and had moved back onto the land following 30 years of separation (McKenzie 1995). Since then, the community has experienced a number of difficulties, including conflicts within the community and distrust of outsiders. Nevertheless, prior to implementation, Riemvasmaak already had a legally recognized decision-making body in place, membership of which rotated every two years during democratic elections within the community. Implementation of the initiative was contracted to a local community member and was characterised by a lack of third-party social facilitation or conflict resolution.

**Fig. 1.** Location of the four study sites in South Africa. Study sites are indicated by underscoring.



### Field methods and data collection

Participatory learning and action has been widely used in agriculture, natural resource management, and community development (see Abbot 1999 for review) and has been shown to develop the capacity for self-governance in rural communities, especially those challenged by low literacy levels and poverty (Blackstock et al. 2007). Participatory monitoring is appropriate to adaptive co-management because the monitoring process supports knowledge-sharing, learning, and capacity development (Danielsen et al. 2005). The methodology we used was informed by social theories of learning and has been described in detail elsewhere (Cundill and Fabricius 2009). Here, we provide only a brief description of the methods and process. Monitoring activities took place over the course of 18 months, between June 2006 and December 2007, and involved the community component of the PASCs in each of the four study sites.

The respective PASCs, together with the researcher, evaluated the relevance of pre-identified indicators to their context and also used the monitoring tools to assess periodically their own progress toward improved governance. The methodology was thus one of triangulation, collaboration, and mutual learning in which scientific knowledge was shared and its applicability debated, rather than purely participatory research in which communities design and monitor their own governance outcomes (Reed et al. 2006; Abrams et al. *unpublished report* [http://www.ramsar.org/doc/outreach\\_methodologies\\_evaluating-governance-handbook.doc](http://www.ramsar.org/doc/outreach_methodologies_evaluating-governance-handbook.doc)). Monitoring events took place every four months and were repeated four times in each community, except in Riemvasmaak, where one event had to be canceled.

Changes in governance should be understood within their given historical and geographical context (Fairhead and Leach 1996, Walker and Abel 2002, Beinart and McGregor 2003). To gather this information, focus group discussions (Borrini-

**Table 1.** Summary of the four case studies.

Characteristic	Community			
	Machubeni	Mkhuze	Nqabara	Riemvasmaak
Province	Eastern Cape	Kwa Zulu Natal	Eastern Cape	Northern Cape
Land tenure	Communal	Communal	Communal	Communal
Population	7344	360,000	3369	780
Land area affected (ha)	16,150	8500	1500	75,000
Land use	Crop cultivation, livestock farming, brick making, grass harvesting	Conservation	Crop cultivation, livestock farming, harvesting of forest products	Limited livestock farming, tourism
Timeframe of intervention	March 2005 to September 2007	April 2005 to February 2008	February 2005 to March 2008	April 2005 to January 2008
Objectives of intervention	<ul style="list-style-type: none"> <li>- Design a model for integrated catchment and natural resources management by communities;</li> <li>- Reverse the process of land degradation;</li> <li>- Create income from catchment management;</li> <li>- Reinstate community access to high-quality drinking and irrigation water;</li> <li>- Improve agricultural production systems</li> </ul>	<ul style="list-style-type: none"> <li>- Create an economic partnership among communities, traditional leadership structures, private land owners, and nongovernmental organizations;</li> <li>- Establish economic incentives for sustainable resource use;</li> <li>- Develop the active and effective involvement of supporting institutions</li> </ul>	<ul style="list-style-type: none"> <li>- Support the establishment of a community conservancy through the rehabilitation and restoration of the natural landscape;</li> <li>- Upgrade and construct facilities for the conservancy;</li> <li>- Incorporate a craft production centre, office, and meeting venue and workplace;</li> <li>- Identify, rehabilitate, and prepare a site for lodge development</li> </ul>	<ul style="list-style-type: none"> <li>- Create a community conservancy on land formerly owned by the National Parks Board;</li> <li>- Develop conservation and tourism services capacity;</li> <li>- Create jobs in the conservation and tourism sectors;</li> <li>- Involve communities in combating desertification and managing land</li> </ul>

Feyerabend 1997) were combined with semi-structured interviews with key informants (Pretty et al. 1995).

Monitoring activities took the form of focus group discussions in which rating systems were administered interactively, facilitated by the researcher and an interpreter. The key variables identified for social capital, adaptive capacity, self-organization, and adaptive governance were converted into outcome indicators using simple statements about the optimal condition for each respective indicator in the language of each

community concerned (Table 2). Focus groups were then asked to assess the current condition of the system against the optimal condition on a scale of one to five, where one meant “strongly disagree”, and five meant “strongly agree”. In some cases, these outcome indicators inevitably incorporated outcomes for more than one attribute. For example, the statement “All actors, from outside and inside the community, listen to each other and are willing to change what they are doing in response” had implications for adaptive capacity, self-organization, and adaptive governance (Table 2). Decision-making bodies used the statements in Table 2 to

evaluate changes over the preceding months for the first monitoring event, and thereafter, changes since the previous monitoring event. The bodies split into smaller groups with mixed gender and age classes wherever possible. An action that could be taken by the participants to improve the situation, where necessary and if deemed appropriate, was then identified by participants. The smaller groups then reported back to the whole group on ratings applied to each statement and actions identified. Debates then ensued over the appropriate rating for a given statement within the larger group. An important goal of the monitoring exercises was to elicit and discuss points of contention and to grapple with differing interpretations of progress. The actions identified then became the way forward at the end of a meeting and were also presented to all stakeholders at the subsequent PASC meeting; these meetings were held monthly.

Interviews of 12 key informants served to highlight alternative interpretations of the reasons behind observed trends in governance at each site. This allowed an understanding of the broader political context within which adaptive co-management was being implemented. Key informants outside of the communities included municipal managers, private sector partners, local economic development officers, tourism officers, development and planning managers, members of farming co-operatives, community development officers, forestry officers, project managers, and consultants involved in the implementation of the initiatives.

All discussions arising from the formal monitoring events and key informant interviews were stored in a specially developed electronic database, along with information on the dates and places where discussions took place, to ensure that evidence could be traced. Field notes taken during or directly following interviews, workshops, and observations were dated and stored in site-specific files that stated the date, time, and place of the discussion, as well as the names of informants and their relationship to the initiative being discussed. A collaborative monitoring tool kit was developed out of this research process for community and local government participants. The tool kit was also provided to the lead government agency, who distributed it more widely.

## Data analysis

A key challenge was to develop data analysis techniques that would allow an assessment of the extent of change. The percentage change at each site was calculated by first defining the maximum possible score obtainable during a single monitoring exercise for a given system attribute ( $S_{\max}$ ). The four system attributes, i.e., social capital, adaptive capacity, self-organization, and adaptive governance, consisted of four to six variables each (Table 2). The  $S_{\max}$  for an attribute was calculated as

$$S_{\max} = N_v \times 5 \quad (1)$$
where  $N_v$  is the number ( $N$ ) of key variables ( $v$ ) relevant to each system attribute.

For example, the maximum rating for any variable was five, and if six variables were incorporated, e.g., for social capital, the  $S_{\max}$  for that attribute was therefore  $6 \times 5 = 30$ .

To compare change over time, the initial and final scores for each system attribute, as a percentage of the  $S_{\max}$ , was calculated as

$$S_{sa} = (\sum S_{v1} \dots S_{vn}) / S_{\max} \times 100 \quad (2)$$
where  $S_{sa}$  is the system attribute score, as a percentage of  $S_{\max}$ ;  $S_{v1}$  is the score for variable one;  $S_{vn}$  is the score for variable  $n$ ; and  $S_{\max}$  is the maximum possible score for an attribute.

Initial and follow-up system attribute scores were calculated in this way for each attribute at each site. The percentage values of the initial and follow-up monitoring events thus obtained were used to develop radar graphs (Campbell et al. 2001, Reed et al. 2006) using Microsoft Excel to illustrate change in system attributes for each respective site; the axes represented a range from 0 to 100%.

## RESULTS

The radar graphs indicate the quantity of a particular attribute in the system relative to other attributes and other sites (Fig. 2). In Machubeni, where the implementation process was characterized by an investment in social facilitation, an increase in all system attributes except adaptive capacity was reported. In Mkhuze, where the implementation process was characterized by strong traditional leadership with ongoing interaction among a small group of people, social capital and adaptive capacity

**Table 2.** Key variables and outcome indicators for collaborative governance monitoring.<sup>†</sup>

Attribute	Key variable	Outcome indicator
Social capital (Pretty and Ward 2001, Pretty 2003)	Trust building	Trust building takes place among the groups involved in collaborative decision making. - Decision making is perceived as open and fair; information is shared and understood by all participants
	Common rules and norms	See “Rule compliance” under Preconditions for adaptive governance
	There are common-interest groups	There is a common interest and a shared vision. - Participants jointly identify and agree on the problems to be solved and what the future should look like; it is clear to all participants why a decision-making body is needed; participants agree on what the major problems are and what the benefits might be of resolving these problems
	Financial and capacity support from higher levels of organization	A long-term investment has been made. - The state or its partners are committed to making a substantial and long-term financial investment in the project; long-term skills and leadership development programs are in place; planning and decision-making support is offered
	Security of tenure over the resources of concern	Security of access to resources. - There is long-term security of access to resources; the decision-making body is confident that they are or will be able to prevent outsiders from using the resources
	Economic or other incentives for collective action	Incentives exist. - People who contribute more are rewarded; people who lose ways of earning a living because of the project are compensated
Adaptive capacity (Armitage 2005)	Willingness to learn from mistakes	All actors, within and outside the community, listen to each other and are willing to change what they are doing in response. - The organization or committee involved in the initiative is made up of people from the community and from outside the community; these actors respect one another and listen to each others’ points of view
	Willingness to engage in collaborative decision making	All participants are willing to engage in collaborative learning and decision making. - Participants recognize the value of sharing information among actors; experts are willing to learn from resource users, and resource users are open to alternative ways of doing things; the project is viewed as a learning process by everyone involved
	Willingness to accept a diversity of institutions	Diversity of institutions. - Participants understand that it is unlikely that one institution will be able to manage the entire ecosystem; although a broad institution should be established to provide vision and overall coordination, members of the institution are aware that smaller groups may be formed to deal with specific issues
	Maintaining options for adaptation (e.g., diversity of ecosystems, livelihoods, institutions)	Maintaining options. - Projects can bring many benefits, but they cannot solve all the problems; for example, it should be understood that not everyone can be employed on the project; people understand this and continue to do their work as usual; over time, the projects provide some new opportunities
Self-organization (Olsson et al. 2004a)	Enabling legislation is in place, is accessible, and is understood	Enabling legislation. - Legislation is in place that allows people to form legal entities to manage natural resources; project participants have access to and an understanding of the legislation

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Funds are available for adaptive management	See “A long-term investment has been made” under Social capital
Information flow and social networks	Networks are established that connect the local decision-making body with other institutions. - Outside partners such as government officials, researchers, and nongovernmental organizations are involved and willing to devolve decision-making powers. Other, relevant, local decision-making bodies are consulted and included in decision making; the roles of these different actors are clearly defined
Various sources of information are combined for sense making	Information flow. - There is good communication among everyone involved; people are informed about what is happening, and their views and opinions are heard
Arenas of collaborative learning	See “All actors, from within and outside the community, listen to each other and are willing to change what they are doing in response” and “All participants are willing to engage in collaborative learning and decision making” under Adaptive capacity
Leadership	Leadership is effective and recognized. - The leaders of the initiative care about more than just their own interests; the leaders are trusted and acknowledged by all actors
Preconditions for adaptive governance (Dietz et al. 2003)	Access to accurate and relevant knowledge and information Combination of “Enabling legislation” and “Networks are established that connect the local decision-making body with other institutions” under Self-organization
Conflict resolution mechanisms	Conflict resolution mechanisms are in place. - Participants are aware that there will be conflict; the decision-making body is prepared for conflict and solves problems before they become serious; people are kept informed and their complaints and problems are heard
Compliance with rules and regulations	Rule compliance. - There are a management plan and rules for the use of natural resources, especially those that people depend on for their livelihoods; resource users respect and adhere to the rules
Being prepared for change	Being prepared for change. - A combination of “All actors, from within and outside the community, listen to each other and are willing to change what they are doing in response” under Adaptive capacity and “Conflict resolution mechanisms are in place” under Adaptive governance

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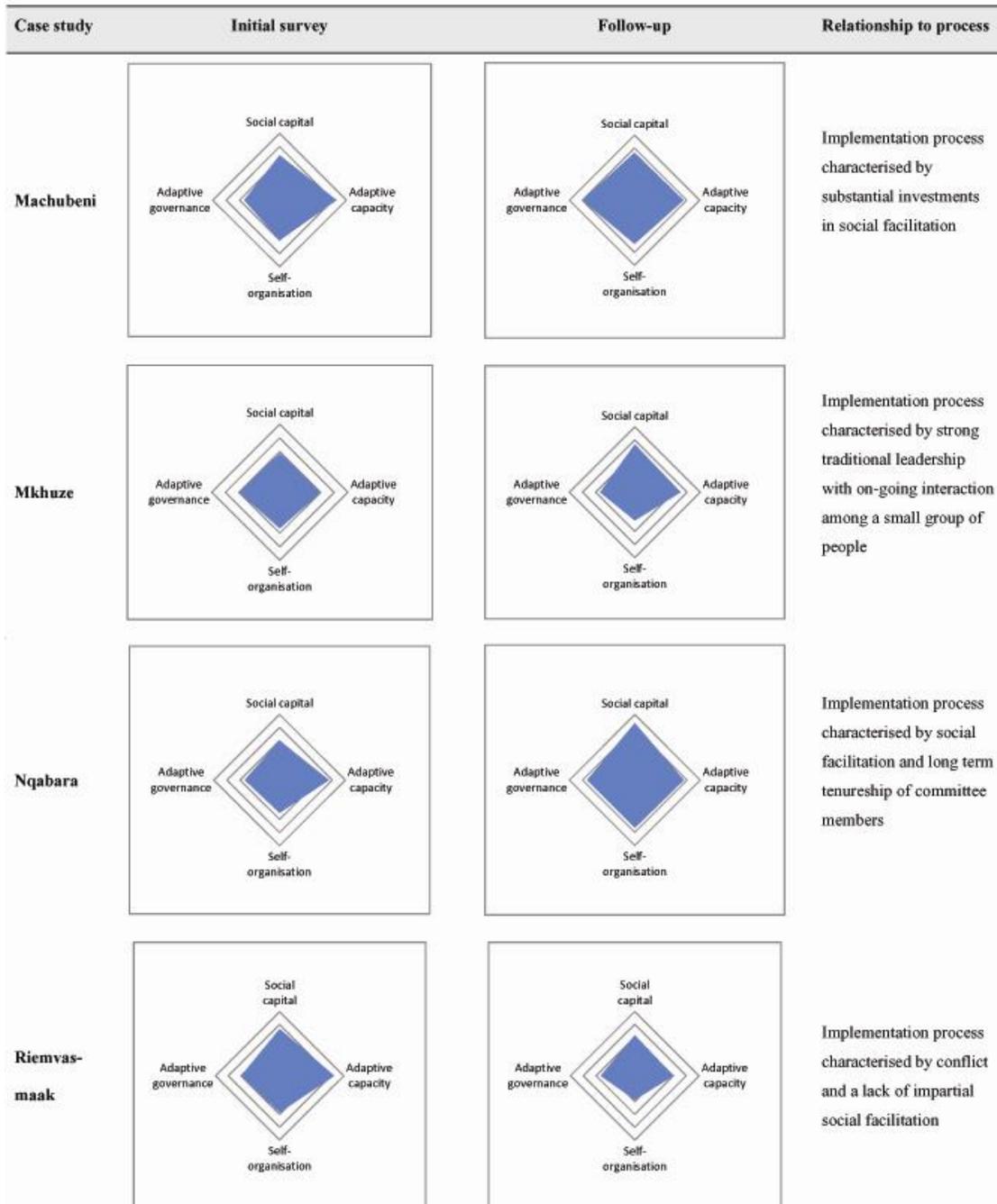
†Each outcome indicator was rated according to a five-point scale (5 = strongly agree; 1 = strongly disagree).

increased while adaptive governance and self-organization decreased. In Nqabara, where the implementation process was characterized by long-term facilitation and long-term tenure of committee members, all system attributes increased. In Riemvasmaak, where the implementation process was characterised by ongoing conflict and a lack of impartial facilitation, a decrease was reported in every system attribute.

### **Social capital**

Social capital increased in all sites except Riemvasmaak. The reasons behind the positive trends include the emphasis placed on trust building and facilitation by the implementing agents for Machubeni and Nqabara. The reasons behind negative trends related largely to perceptions about the effectiveness of trust building processes and confidence in long-term financial and capacity

**Fig. 2.** The nature of change in each case study. Change is calculated as the sum of the ratings applied to variables relevant to each system attribute, divided by the maximum possible ratings for those variables. Axes represent a range from 0 to 100%.



support from higher government for Mkhuze and Riemvasmaak. The negative trends in Riemvasmaak were due to conflicts and distrust that emerged during the initiative, both within the community and between the community and outside actors. Conflict and tenure insecurity at this site were due to ongoing and unresolved negotiations with government departments regarding access to a piece of land that officially belonged to the community, but to which the community still had limited access to because of conservation concerns on the part of government.

### **Adaptive capacity**

Adaptive capacity decreased at Macubeni and Riemvasmaak, remained constant at Nqabara, and increased slightly at Mkhuze. The reasons for decreases in adaptive capacity were an unwillingness to accept a diversity of institutions in Riemvasmaak, as well as the perception that community members were not maintaining options because they were placing too much store in the temporary employment opportunities offered through the co-management initiatives, rather than seeking to take advantage of long-term self-employment possibilities, as reflected in the following statements made during monitoring workshops.

*The community depends too much on the project. Everyone wants to be involved, and [those who are not involved] don't understand why they can't be involved (PASC member, Riemvasmaak, November 2007).*

*Most people know [about maintaining livelihood options], but there are those that just sit and wait for jobs to land on their laps (PASC member, Machubeni, March 2007).*

### **Self-organization**

Self-organization increased at Macubeni and Nqabara and decreased at Mkhuze and Riemvasmaak. The increases can be ascribed largely to the development of effective leadership, the effectiveness of the PASCs as collaborative learning and decision-making forums, and

increased access to information due to careful facilitation and tight links between implementing agents and the PASCs in Machubeni and Narabara. The decreases were due to negative trends reported for access to and an understanding of enabling legislation for Riemvasmaak, and a lack of access to long-term funding support for Mkhuze and Riemvasmaak. The reasons behind these trends included perceptions that the initiatives were being driven by the sub-contracted consultants. Also, at the municipal level, there was a pervasive frustration with “projects that are parachuted in from national level” (municipal manager, Mkhuze). The perceived danger was that neither the community nor local government had access to the necessary information, and that once the funding ended and the consultants withdrew, the information would be lost with them.

### **Adaptive governance**

Adaptive governance increased at Macubeni and Nqabara, and decreased slightly at Mkhuze and Riemvasmaak. Positive changes can be ascribed to the creation of management plans and thus rules for resource use, a growing readiness for change due largely to monitoring activities, and the ability to deal with conflict.

*We have received training in conflict management and resolution... We are aware that there are problems with conflicts, but to the best of our knowledge, we are dealing with them as they arise (PASC member, Nqabara, November 2006).*

*Monitoring opens our eyes to see forthcoming crises, so that when those crises arrive, we are not surprised (PASC member, Machubeni, September 2007).*

Although negative trends were due largely to a feeling of a lack of access to reliable information, problems with rule enforcement were identified in every case. The positive assessments regarding rule compliance and regulations were generally due to the development of management plans, although these management plans were not yet enforced in any of the cases by the end of the monitoring period. This was reflected in the explanations given for ratings attached to this indicator.

*Rules exist, but they are not implemented. People know what they are and are not supposed to do, but the rules are not enforced* (PASC member, Riemvasmaak, November 2006).

*Things have not changed: some people are aware of the rules, others aren't. The major challenge is the support from the traditional leaders. If they won't support the rules, then we can't enforce them* (PASC member, Machubeni, March 2007).

## DISCUSSION

The monitoring results suggest that it is indeed possible to demonstrate short-term gains in governance when interventions are explicitly designed with the principles of adaptive co-management in mind. Careful facilitation by skilled individuals who understand the theory and practice of adaptive co-management plays a critical role in the strengthening of governance (Holte-McKenzie et al. 2006, Blackstock et al. 2007). Nevertheless, certain driving factors are beyond the control of facilitators and implementation agents. In the case studies, these factors included historical conflict (e. g., in Riemvasmaak), uncertainties about future funding (all cases), and the effect of government social responsibility projects on a community's capacity to adapt and self-organize (all cases). These trends should act as warning signals to implementation agents and facilitators that adaptive co-management is no panacea and that governance remains its Achilles heel.

Creating the conditions that facilitate self-organization appears to be the major challenge facing adaptive co-management. In the sites that received long-term and focused facilitation, self-organization increased. However, in the sites where similar levels of facilitation did not occur, self-organization actually decreased, mainly due to growing and unresolved conflicts.

Improvements in cross-scale linkages is one of the defining features of transformations in social-ecological systems (Walker et al. 2006) and is a necessary precondition for self-organization (Olsson et al. 2004b). We identified a number of

key variables that are currently undermining such linkages. These include perceptions of lack of long-term capacity support from agencies outside of the local context, lack of access to long-term funding for adaptive decision making, and weak access to reliable information about such varied issues as the resource base and legal options for resource management. Differences in access to support, funding, and reliable information reveal the potential role of power asymmetries to undermine long-term change and point to the need to consider the role of power, knowledge, and access to information far more carefully when arguing for nested institutional structures (Dietz et al. 2003) that rely on networks and linkages (Olsson et al. 2007). The potential danger of these power asymmetries has been highlighted by other scholars (Adger et al. 2006).

Adaptive capacity did not show a marked increase during these initiatives. However, the positive increase observed in social capital in all sites except Riemvasmaak may bode well for the long-term development of adaptive capacity. Adaptation is a social process that is determined, at least in part, by the ability of people to mobilize collectively around a common problem (Adger 2003). Social capital is a necessary precondition for collective action, and therefore, for adaptive capacity (Armitage 2005). Scholars have suggested that adaptive capacity is a slowly changing attribute that is dependent upon experiential learning (Berkes et al. 2000). In the long term, positive change in adaptive capacity might therefore be expected; this points to the need for long-term monitoring to come to terms with the governance outcomes of initiatives. Another implication is that initial attention should focus on building social capital and the conditions necessary to enable self-organization, rather than focusing on adaptive capacity per se.

However, there is an additional explanation that is worth noting for the observed trends in Riemvasmaak. The development of social capital, although necessary for self-organization and building adaptive capacity, can have potentially negative consequences such as coercion, corruption, and capture by local elites (Pretty 2003). Social capital, if misappropriated, may negatively affect collaborative efforts and lead to a reduction in wider social trust and interaction, preventing the flow of information, increasing inequality, and undermining collective action (Pelling and High 2005). This

dynamic was evident in Riemvasmaak, where community members tended to be distrustful of outsiders; even within the community, two separate groups have formed along ethnic lines. Indeed, Riemvasmaak was the only site that reported negative trends in the flow of information within social networks and in social capital in general. This finding supports the work of other scholars, who have suggested that social capital manifests in context-specific ways and is often tightly connected with the ways in which power is distributed and experienced (Mansuri and Rao 2004).

Efforts to evaluate governance have been criticized for their assumptions of linear progress, rather than considering context, history, and political economy (Mehta et al. 1999). An emphasis on transitions in social-ecological systems, and the associated implication that monitoring should track improvements over time, faces similar challenges. We found that changes in key variables were neither linear through time nor uniform across sites. Indeed, adaptive co-management is an ongoing process (Carlsson and Berkes 2005), rather than a project with clear inputs and identifiable outputs. This highlights the difficulties associated with interpreting “before” and “after” measures. These measures (Table 2) tended to mask variation over time and the rate of change. Indeed, the rate with which the key variables for each attribute changed over time varied significantly. Indicators such as rule compliance, the existence of common-interest groups, and incentives for collective action fluctuated widely, whereas indicators such as conflict resolution were comparatively stable. Contextual issues provided critical information needed to understand these differences. For example, the far stronger emphasis placed on facilitation in Machubeni and the long tenureship of the Development Trust in Nqabara, and conversely, the lack of these two factors in Riemvasmaak, help explain variation among the case studies, despite the similar collaborative processes followed by the initiatives. Monitoring should therefore be combined with a clear understanding of the historical social-ecological context in which governance outcomes are located.

Converting qualitative ratings, especially those derived from participatory methods, into quantitative measures is a challenging process. In the case of monitoring, however, this process is essential to allow cross-site comparison and to reduce uncertainty (Ascough et al. 2008). Collaborative

monitoring is a cyclical process that seeks both to explore collaboration and governance and to create arenas within which these processes can take place. Throughout, this a priori trade-off between the ability to objectively measure change in social processes and the acceptance that monitoring is part of the observed change was accepted as part of a scholar’s responsibility to advance sustainable development (Kates and Dasgupta 2007) and as a necessary precondition for coming to terms with complex system dynamics. This does, however, introduce an unavoidable element of circularity to the research, and it must be acknowledged that the act of monitoring likely influenced the trajectory of some of the variables. For example, the ratings given to the indicators dealing with the existence of arenas for collaborative learning (self-organization) and being prepared for change (preconditions for adaptive governance) would have been influenced by the ongoing collaborative monitoring processes.

Therefore, collaborative monitoring and evaluation go well beyond the data that are produced (Innes and Booher 1999, Conley and Moote 2003, Becker et al. 2005) and address the criticism that participatory approaches focus too heavily on knowledge production at the expense of action and raising awareness (Brock 2002). A shift in perceptions and attitudes has been identified as a positive outcome of collaborative monitoring (Becker et al. 2005, Danielsen et al. 2005, Poulsen and Luanglath 2005, Uychiaoco et al. 2005, van Rijsoort and Jinfeng 2005). This idea was supported during workshop evaluations.

*Monitoring helps us as human beings in our everyday lives. It helps us to set goals and to find ways of achieving them (PASC member, Nqabara, September 2007).*

*Through monitoring, we are learning how to plan for projects and also for the future. Before monitoring, we just watched things like erosion happen, we never planned (PASC member, Machubeni, June 2007).*

However, monitoring was less effective in discerning subtle changes at broader temporal and spatial scales that influenced outcomes. For example, national and provincial political election processes fundamentally influenced the outcomes

in Machubeni, but that effect was not picked up during the periodic monitoring events. Indeed, assumptions about the correct scale at which to address and monitor processes pose difficulties (Cash et al. 2006). The selection of an appropriate scale for monitoring can be an exercise of power because the selection may favor the ability of one set of actors to influence decision making while disempowering others (Lebel et al. 2005). Our monitoring effectively took place at the scale of community decision-making bodies, and in some cases, government officials did not take part either because of conflicts between community members and government officials or because role players would not talk openly in the presence of other role players. As a result, the community perspective was privileged over other stakeholders during the monitoring process, and key processes operating outside of the local context were not discerned.

## CONCLUSIONS

We have sought to expand on the work of scholars who have identified key system attributes that enable transformation in social-ecological systems (Walker et al. 2006) and who have sought to describe transformations in local governance systems (Olsson et al. 2004b, 2006). In so doing, some of the theory underpinning the ways in which adaptive co-management is understood has been tested in a manner that was simultaneously systematic and participatory. The outcomes offer insights for both adaptive co-management and the monitoring of complex adaptive systems.

Governance in adaptive co-management is fundamentally founded on the concept of cross-scale linkages, but the cases that are used to illustrate how this might work are almost invariably drawn from experiences in developed countries (e.g., Olsson et al. 2006). In developing countries, which are characterized by low levels of capacity at multiple scales, cross-scale institutional linkages constitute the fundamental challenge when attempting to initialize transitions toward adaptive co-management. Creating a supportive environment for developing the self-organizing capabilities of role players in adaptive co-management is therefore critical. Across all system attributes, variables that undermined the governance outcomes in the case studies, and therefore factors requiring greater attention in efforts to initiate adaptive co-management in the future, include community perceptions of support from outside agencies,

access to long-term funding for adaptive management, and access to reliable information.

The collaborative monitoring system that we tested provided a means to share state-of-the-art theory and best-practice insights about adaptive co-management directly with community decision-making bodies, government officials, and donors. The conceptual approach that informed this monitoring system, which included system attributes, key variables, and outcome indicators, provided the conceptual space to create easily understood indicators that participants could identify with while at the same time allowing the researcher to test the conceptual underpinnings of adaptive co-management. The approach was less effective in capturing multi-scale changes or in adapting to the tempo of change in key variables. This undermined the ability of monitoring activities to proactively predict forthcoming crises. Identifying and testing innovative methods to capture multi-scale changes in governance is an important area for future research. The role of the researcher in bringing larger-scale changes that might affect local dynamics to the attention of local actors should not be underestimated. This challenges conventional notions of objectivity as a precondition for good research.

*Responses to this article can be read online at:*  
<http://www.ecologyandsociety.org/vol15/iss1/art15/responses/>

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