



Soft Systems Thinking and Social Learning for Adaptive Management

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Abstract: *The success of adaptive management in conservation has been questioned and the objective-based management paradigm on which it is based has been heavily criticized. Soft systems thinking and social-learning theory expose errors in the assumption that complex systems can be dispassionately managed by objective observers and highlight the fact that conservation is a social process in which objectives are contested and learning is context dependent. We used these insights to rethink adaptive management in a way that focuses on the social processes involved in management and decision making. Our approach to adaptive management is based on the following assumptions: action toward a common goal is an emergent property of complex social relationships; the introduction of new knowledge, alternative values, and new ways of understanding the world can become a stimulating force for learning, creativity, and change; learning is contextual and is fundamentally about practice; and defining the goal to be addressed is continuous and in principle never ends. We believe five key activities are crucial to defining the goal that is to be addressed in an adaptive-management context and to determining the objectives that are desirable and feasible to the participants: situate the problem in its social and ecological context; raise awareness about alternative views of a problem and encourage enquiry and deconstruction of frames of reference; undertake collaborative actions; and reflect on learning.*

Keywords: appreciative systems, communities of practice, complexity, social engagement

Pensamiento Sistémico Blando y Aprendizaje Social para Manejo Adaptativo

Resumen: *El éxito del manejo adaptativo en conservación ha sido cuestionado y el paradigma de manejo basado en objetivos en que se fundamenta ha sido criticado severamente. Los sistemas de pensamiento blandos y la teoría del aprendizaje social exponen errores en la suposición de que los sistemas complejos pueden ser manejados desapasionadamente por observadores objetivos y resaltan el hecho de que la conservación es un proceso social en el que los objetivos son contestados y el aprendizaje depende del contexto. Utilizamos estas ideas para repensar el manejo adaptativo de manera que se enfoque en los procesos sociales involucrados en el manejo y en la toma de decisiones. Nuestra aproximación al manejo adaptativo se basa en los supuestos siguientes: la acción hacia una meta común es una propiedad emergente de relaciones sociales complejas; la introducción de conocimiento nuevo, valores alternativos y nuevas formas de entender el mundo puede convertirse en una fuerza estimulante para el aprendizaje, la creatividad y el cambio; el aprendizaje es contextual y trata fundamentalmente sobre la práctica; y la definición de la meta a alcanzar es continua y, en principio, nunca termina. Consideramos que cinco actividades son cruciales para la definición de la meta a alcanzar en un contexto de manejo adaptativo y para la determinación de los objetivos que son deseables y factibles para los participantes: ubicar el problema en su contexto social y económico; promover conciencia*

sobre visiones alternativas de un problema y fomentar el cuestionamiento y la deconstrucción de marcos de referencia; emprender acciones de colaboración; y reflejar en aprendizaje.

Palabras Clave: complejidad, compromiso social, comunidades practicantes, sistemas apreciativos

Introduction

Recognition of complexity and uncertainty in the environment (Allen & Starr 1982; Levin 1998; Gunderson & Holling 2002) has led a growing number of conservation professionals to promote adaptive management (Holling 1978; Walters 1986). We conducted a search in Scopus for titles of peer-reviewed articles in the life sciences since 1978 that included *adaptive management* and found almost 600. Despite this extensive interest, the effective implementation of adaptive management remains a challenge (e.g., Walters 1997; Lee 1999; Moir & Block 2001).

In an assessment of adaptive management of spruce budworm (*Choristoneura fumiferana*) in eastern Canada and of fisheries in the Columbia River Basin, McLain and Lee (1996) found that these adaptive-management efforts were either unsuccessful or faced significant challenges. The authors conclude that adaptive management theory suffers from fundamental errors in its assumptions about the ways in which natural resource management decisions are made and implemented. The authors cite the underlying assumption that planning is an objective process in which scientists and policy makers are neutral actors and the failure of the approach to create arenas for the development of shared understanding among stakeholders. These findings reflect a growing realization that long-term conservation success often depends fundamentally on people: their values, their aspirations, and their relationships with one another (e.g., Buck et al. 2001; Borrini-Feyerabend 2003; Stern 2010). It is now generally accepted that social and political processes can determine whether management initiatives succeed irrespective of the quality of the science that supports them (Allen & Gould 1986; McCool & Guthrie 2001; Adger & Jordan 2009).

Developments in the management and education sciences and psychology relevant to ecosystem management have been explored (Endter-Wadna et al. 1998; Cortner & Moote 1999), and the links between participation and social learning in adaptive management have been highlighted (McLain & Lee 1996; Roling & Wage-makers 1998; Stringer et al. 2006). In general, these developments have not been applied in conservation efforts, despite numerous calls to engage the social sciences in conservation planning and management (Cowling et al. 2008; Knight et al. 2008; Reyers et al. 2010). Assertions about the importance of understanding social dynamics and of the need for compromises in decision making lead to fears of watered-down conservation. As a result, con-

servation professionals too often ignore developments in the social sciences. Responsibility for this interdisciplinary engagement, however, lies not only with conservation professionals trained in the natural sciences, but also with social scientists. The need for meaningful engagement between disciplines in search of solutions to complex natural resource management problems is imperative.

We identified the conceptual shortcomings associated with the current practice of adaptive management and gleaned insights from psychology, management sciences, and education, particularly soft systems thinking and social learning. We used these insights to rethink adaptive management in a way that addresses the social and political aspects of natural resource management.

Defining Adaptive Management

Adaptive management is based on learning by doing. Management actions are regarded as experiments (Walters & Holling 1990) and the results of these experiments are used to continually learn about a system in situations where knowledge is incomplete and uncertainty is high (Walters 1986). Adaptive management can be either passive or active, with the former focused on learning from a management activity in which decisions are made on the basis of the best current understanding and the latter focused on actively experimenting with management alternatives. In both cases, learning is an iterative process that involves stakeholders who learn through a cyclical process of setting objectives, planning, taking action, monitoring, and reflecting on the outcomes, learning, and taking action again (Walters 1986; Daniels & Walker 2001). Stakeholders may include not only scientists, but also local communities and other groups interested in the system being managed (Stringer et al. 2006). Collaboration among stakeholders is considered central to defining the management problem, facilitating knowledge sharing, and identifying realistic outcomes (Schreiber et al. 2004). Adaptive management often starts with a conceptual model or set of objectives or hypotheses to be tested, and then experimentation is used to validate, refute, and, ultimately, modify and refine the model and to make informed trade-offs among goals that may conflict (Holling 1978; Margoluis & Salafsky 1998; Gurung et al. 2006). Adaptive management is therefore often about outsiders looking in on complex problems and learning through the process of attempting to understand the problems.

Two fundamental assumptions in adaptive management are that identifying objectives is the first step in

the management process and that the final step in the cycle is to assess the extent to which objectives have been achieved (e.g., TNC 2003). We propose that greater attention to the process itself, to its influence on observed outcomes, and to how that process might be improved would strengthen adaptive management and contribute to its use in conservation.

Insights from Soft Systems Methodology

Simon (1960) described management as decision making in pursuit of goals or objectives. Here we refer to this approach as objective-based management. This approach is evident in the step-by-step process of adaptive management that begins with the identification of objectives. Vickers (1965), by contrast, rejected goal-oriented management and highlighted the fact that perceptions and judgments create constant feedbacks to action and decision making. Vickers referred to “appreciative systems” in which social actors selectively perceive their world, make value and fact-driven judgments about it, consider their social relationships, and then seek to make decisions that balance these relationships and judgments over time.

Although goal-oriented management has often dominated the management sciences, appreciative systems began to be taken more seriously in the early 1980s when Checkland (1981) highlighted the difficulties involved in clarifying the nature of the system in question and the objectives associated with it. Checkland argues that in complex human interactions, clear-cut objectives and the unquestioned pursuit of these objectives are the exception rather than the norm. He highlights four key points (Checkland 2000: 17): (1) Every situation in which decision making is involved is a social situation in which people attempt to take purposeful action that is meaningful to them. The identification of this purpose is an emergent outcome of interaction among multiple actors. (2) Many interpretations of a declared purpose (goal or objective) are possible; therefore, for every purposeful activity, the perspective or world view on which it is based has to be declared. (3) There is a need to move away from the identification of a problem that requires a solution and toward the idea of a situation that some people may regard as problematic. (4) Management action takes place when people in a given situation agree on a course of action that is desirable and feasible given their individual histories, relationships, culture, and aspirations.

These four ideas are embodied in soft systems methodology (SSM) (Checkland & Scholes 1990). A *methodology* refers to a body of practices, procedures, and rules used by those who engage in an inquiry, whereas a *method* refers to the specific action that the user of a methodology chooses to take in a particular situation (Checkland 2000). The difference between hard and soft approaches is described as a shift from considering the external world

as the system that can be engineered (hard systems approach) to considering the system to be the observer’s interaction with the complex real world. It is assumed in a soft systems approach that systems that include people cannot be engineered toward some ideal condition.

Adaptive management is commonly based on a hard-systems perspective that views the world as consisting of multiple systems interacting in unpredictable ways to produce high levels of uncertainty. When management decisions have to be taken, however, a soft systems perspective may offer a valuable complement. Soft systems methodology has been used to examine complex catchment-scale resource problems in Europe (Collins et al. 2007; Ison et al. 2007) and in ecosystem assessments in Nepal (Waltner-Toews et al. 2005), but has not been applied to the conservation of species and ecosystems. Elephant (*Loxodonta africana*) abundance in South Africa’s Kruger National Park is an example of the type of issue that conservation agencies are confronted with in which we think soft systems thinking would be useful. Park managers’ perceptions of the negative effects of elephants on other species of animals and plants led to an extensive culling program that kept the abundance of Kruger National Park’s elephant population fairly stable from 1967 to 1994 (Whyte et al. 2003). From the early 1990s, animal rights groups increasingly voiced opposition to elephant culling. More recently, ecologists have suggested that not only elephant abundance but the spatial distribution and patterns of vegetation use by elephants are associated with how elephants affect other species (Scholes & Mennel 2008). In addition, communities near the park have requested they be given the meat from culled elephants (a needed source of protein) (H. Biggs, personal communication). Different stakeholder groups therefore perceive different problems, for different reasons, and solutions are value dependent and context specific. There is thus no single solution for managing the effects of elephants on other species.

Insights from Social Learning Theory and Practice

Social theories of learning complement soft systems thinking by focusing attention on how people learn and on how learning can lead to a transformation in norms, values, and worldviews (Wals 2007). Social learning is gaining increasing attention in natural resource management as a process fundamental to coping with complexity and uncertainty (Lee 1993; Ison & Watson 2007; Pahl-Wostl et al. 2009) and as a process that supports participation, collective action, and decision making (Pretty 1995; Daniels & Walker 2001; Measham 2009). Although learning by doing has long been the basis of adaptive management and the importance of learning is being more widely included in second-generation approaches to adaptive

management (e.g., adaptive comanagement) (Ruitenbeek & Cartier 2001; Olsson et al. 2004; Armitage et al. 2007), it is less clear how learning might be better facilitated (Garmendia & Stagl 2010; Reed et al. 2010).

In natural resource management, social learning is generally regarded as an outcome of deliberative processes (Daniels & Walker 1996) that go beyond the individual to include the social units and networks in which individuals interact (Reed et al. 2010). *Social learning* is therefore defined as the collective action and reflection that takes place among both individuals and groups when they work to understand the relations between social and ecological systems; it is conceptualized as a process of transformative social change in which participants critically question and potentially discard existing norms, values, institutions, and interests to pursue actions that are desirable to them (Keen et al. 2005).

Facilitated social learning allows for knowledge, values, and competence to be developed among individuals, groups, or networks that enable them to participate effectively in the resolution of problems (Wals 2007). A key mode of learning inherent in adaptive management involves communities of practice. A community of practice refers to a group, or groups, of people who share a concern for something that they do (e.g., a management team) and learn how to do it better through regular interaction (Wenger 1998). Ongoing interaction defines a community of practice and determines how the meanings of what members learn are negotiated and how joint enterprise (e.g., identifying goals and objectives) is defined and redefined over time. The Fire Learning Network in the United States provides a useful example of communities of practice that have been purposefully created for conservation planning (Goldstein & Butler 2010). As the knowledge and expertise of members grow through ongoing interaction and the practice of fire management, these communities of practice have created opportunities for fundamental changes in the values and norms that underpin the culture of fire management in the United States.

Because communities of practice are groups of people who interact regularly and learn together through the sharing of ideas and the practical application of these ideas in their work or lives, the concept is related to both social and human capital. Social capital refers to the value created by belonging to a social network, whereas human capital refers to the education and skills possessed by members of a society (Portes 1998; Lambooy 2010). As with economic partnerships, adaptive management presumably will be most effective where levels of both social and human capital are high (Westlund & Adam 2010). Social learning, facilitated through the development of communities of practice, may build both kinds of capital.

Rethinking Adaptive Management

Adaptive management was originally conceptualized as a means of managing hard systems (i.e., complex systems that are viewed as external to the observer and possible to manage dispassionately). For adaptive management to lead to practical action, far more emphasis has to be placed on the processes of enquiry that are involved in understanding social and ecological systems and on the ways in which learning might be promoted within these processes (Ludwig 2001; Knight et al. 2006; Hughes et al. 2007).

We think a methodology that goes beyond the current step-by-step method of adaptive management will enable users to better navigate the multiple values, worldviews, and aspirations that make the identification of management objectives problematic. A number of core assumptions underlie our proposed methodological changes to current adaptive-management practice (Checkland 2000; Wals 2007): (1) action toward a common goal is an emergent property of complex social relations, (2) the introduction of new knowledge, alternative values, and ways of understanding the world can stimulate learning, creativity, and change, (3) learning is contextual and is fundamentally about practice, and (4) the process of defining the goal to be addressed is continuous and in principle never ends. Five key activities are crucial to defining the goal that is to be addressed in an adaptive-management context and to determining the objectives that are desirable and feasible to the participants: situate the problem in its social and ecological context and engage relevant stakeholders; raise awareness about alternative views of a problem and encourage enquiry and deconstruction of frames of reference; undertake collaborative actions; and reflect on learning. We explain each of these activities based on insights from social learning (Keen et al. 2005; Wals 2007) and SSM (Checkland 2000). Since we are unaware of any examples where this type of approach has been implemented in conservation, we draw on the case of elephant management in Kruger National Park to illustrate what these different phases might entail in practice.

Situate and Engage

The many interpretations of the problem to be solved in any management activity means a process of orientation and exploration is required in which concerns or the problems to be addressed are identified. For example, from one perspective, the problem facing conservation professionals in Kruger National Park (and many other protected areas in southern Africa) is that the high abundance of elephants is negatively affecting other species (Cumming et al. 1997). From another perspective, the problem facing conservation professionals is the need to make ethically and politically difficult decisions about

culling animals. From yet another perspective, the problem is that communities surrounding the park do not have access to sufficient food as a result of historical exclusion from the reserve, and the culling of elephants is a potential solution to this problem. The process of identifying the problem to be addressed must therefore consider participants' prior experiences, their relationships with one another, their aspirations, and history. During this process the different worldviews and perspectives that participants bring to the management context are made explicit.

Raise Awareness and Encourage Enquiry and Deconstruction

A frame of reference is composed of the assumptions, beliefs, norms, and values that filter one's experiences and influence how one understands the world (Mezirow 1997). When dealing with highly contested issues, the process of clarifying and exposing differing frames of reference, or mental models (*sensu* Biggs et al. 2011), requires skilled facilitation. In the case of elephant management in Kruger National Park, the process would entail bringing together park managers, animal rights groups, and neighboring communities to share perspectives and explore the viewpoints of others in carefully facilitated interactions. This phase should lead to the development of shared frames of reference for understanding a problem, and this might lead back to the process of problem identification and result in a new problem being identified. This is a creative phase in which participants are exposed to alternative frames of reference and develop a vision or a desired and feasible set of actions. Developing a vision might take the form of identifying possible activities that address identified problems. A key research question during these activities is to what extent any conflict or disagreement created by introducing new knowledge and alternative values and worldviews can stimulate learning, creativity, and change (Wals 2007).

Take Collaborative Actions

An implicit assumption in adaptive management is that actions are based on previous input from stakeholders. Learning is about practice, and therefore the action itself should be collaborative in the sense that it is based on a co-created frame of reference or understanding of the issue. Individual and co-created frames of reference are iteratively revisited and adapted, which allows the emergence of a shared vision for action. Therefore, rather than protected-area managers leaving a public forum and taking action on the basis of input received from stakeholders, possible actions are agreed on by all actors. This entails compromise by all actors.

Reflect on Learning

Reflection on the degree to which frames of reference have been changed as a result of experience and the

extent to which they remain valid is an important part of social learning. Generally, a protected-area manager, or a management team, reviews experiences as part of the adaptive-management process. The reflection process should, however, include the actors who helped define the action that was taken. Experience gained from taking action may lead to changes in the co-created frames of reference or the problem that is being addressed. Whereas adaptive management aims to test management interventions amid uncertainty, social-learning approaches additionally aim to explore the worldviews that inform management interventions. Underlying this process is the recognition not only of imperfect knowledge, but also of socially constructed values, knowledge, and aspirations. A key research question relevant to reflective activities is how people will be able to recognize, evaluate, and, when needed, potentially transcend, or break with, existing social norms, group thinking, and personal biases (Wals 2007).

Practical Challenges

Conservation professionals are likely to encounter a number of challenges when attempting to employ the methodology described above. It will be difficult to overcome views that have developed, and hardened, over many years of disputes over natural resource management (Daniels & Walker 1996). Changes in relationships are a long-term goal, but progress can be made through shared problem identification, co-created frames of reference, and the identification and implementation of collaborative actions.

Stakeholders will have divergent frames of reference in accordance with their personal experiences, education, culture, personality profiles, and power relations. Moving toward a shared understanding thus requires special efforts, insights, and time (Mathevet et al. 2011).

Deciding who should participate, when they should be engaged, and how they should be engaged is different in every case. Innes and Booher (2004) highlight the problem of common simplifications that are made regarding who should participate and discuss approaches that are effective. Stringer et al. (2006) stress that who participates and what they contribute is context specific and should continually be revised throughout the adaptive-management process. How social-learning workshops should be facilitated is context specific, but examples have been critically assessed by Schusler et al. (2003), Rist et al. (2006), Selin et al. (2007), Steyaert et al. (2007), Bommel et al. (2009), Leys and Vanclay (2011), and Sanging et al. (2010).

Appropriate institutional structures are essential for collaborative and adaptive decision making where learning is a key goal (Steyaert & Jiggins 2007; Collins

et al. 2007). Identifying which kinds of institutional environments support learning-based collaborative decision making, where the eventual management action is unpredictable, is a crucial issue (e.g., McLain & Lee 1996; Kallis et al. 2009).

The conservation community has long faced an additional set of challenges that we believe undermine the ability of conservation professionals to engage in effective social engagement (Knight et al. 2008). Many conservation professionals lack interdisciplinary training and consequently may lack insight, interest, and expertise in the facilitation of social-engagement processes. For managers, policies that do not provide an enabling environment for social engagement or are incongruent with strategic policies and operational practice (e.g., time spent engaging stakeholders is not considered a valid activity) undermine the ability of managers to undertake time-consuming social engagement processes. Among scientists, social engagement is at times unrecognized by institutions of higher education as a valid research output and there is, therefore, a lack of incentive for academics to invest time in this type of activity. However, many universities and research agencies now see social engagement as a valid academic activity, are funding it, and consider it when evaluating the performance of academic personnel. For example, South Africa's National Research Foundation has for the first time in 2010 invited funding applications for "community engagement" research. There is no panacea for these problems, but one solution may be to further develop the study of social engagement in scientific processes as a research domain in its own right, with attendant disciplinary standards and courses. Social engagement by scientists would then become a legitimate form of field work, during which general principles could be developed and tested and ultimately published.

We believe recognition of the need to learn and adapt to change in complex systems, as represented by the adaptive-management approach, has been one of the most important advances in conservation biology and natural resource management in the past three decades. Yet adaptive management is extremely difficult to implement in practice. Soft systems thinking can aid in the recognition that the identification of management objectives is an emergent property of complex social interactions. Social theories of learning can help guide the facilitation of social interactions in a way that supports the ongoing definition of problems and objectives on the basis of individual histories, relationships, and aspirations. Our methodology is intended to refocus interdisciplinary dialogue on the ways in which decisions are made in the management of complex systems. Ultimately, conservation strategies will need to be both ecologically and socially sustainable. Achieving this goal requires recognition of the importance of social processes in decision making.

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