BUILDING SOCIAL-ECOLOGICAL RESILIENCE THROUGH ADAPTIVE COMANAGEMENT IN THE CACHE RIVER WATERSHED OF SOUTHERN ILLINOIS

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Abstract.—There is growing recognition that the sustainable governance of water resources requires building social-ecological resilience against future surprises. Adaptive comanagement, a distinct institutional mechanism that combines the learning focus of adaptive management with the multilevel linkages of comanagement, has recently emerged as a promising mechanism for building social-ecological resilience. This paper employs the concept of adaptive comanagement to analyze ongoing institutional reforms in the Cache River watershed of southern Illinois. Since the 1970s, efforts have been made to promote collaborative decisionmaking aimed at the restoration of the watershed. However, the current governance system remains vulnerable because little attention has been given to building the capacity of the watershed for learning and adaptation. Adaptive comanagement can contribute to building resilience in the watershed by creating awareness, generating interest, creating opportunities, and building capacity for adaptation.

INTRODUCTION

Over the last few decades, comanagement has attracted a lot of research and policy focus as a promising institutional framework that can integrate the benefits of community-based, market-based, and centralized approaches to resource management (Acheson 2006, Berkes et al. 1989). Yandle (2003: 180) defines comanagement as "a spectrum of institutional arrangements in which management responsibilities are shared between the users (who may or may not be community-based) and government." In spite of its promise, failures in comanagement programs have been attributed to implementation challenges, such as the lack of political will on the part of governments and their representatives to share power with resource users (Berkes 2010) and the potential for capture by powerful local elite, leading to the entrenchment of pre-existing inequalities (Cinner et al. 2012). Comanagement has also been conceptually critiqued for its inadequate recognition of complexity and the need for learning (Berkes 2004).

Comanagement is evolving into adaptive comanagement, a distinct institutional mechanism that integrates the learning focus of adaptive management with the multilevel linkages of comanagement (Berkes 2009). Adaptive comanagement provides a framework within which different stakeholders across multiple scales are connected through networks from local users to international bodies in an ongoing process of learning and responding to changes in social-ecological systems (Olsson et al. 2004). The field of water resources management, for instance, is increasingly focusing on management approaches that promote learning as a means of dealing with complexity and uncertainties (Akamani and Wilson 2011, Bark et al. 2012, Pahl-Wostl 2007). There is a need for knowledge on strategies that can promote a successful transition to adaptive approaches to resource management (Olsson et al. 2008).

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This paper draws from perspectives on social-ecological resilience and adaptive comanagement to analyze ongoing institutional reforms in the Cache River watershed of southern Illinois. Building on previous works that have assessed the resilience status of governance institutions in the watershed (Akamani 2013) and the challenges in the transition to adaptive governance in the watershed (Akamani 2014), this paper proposes adaptive comanagement as a mechanism for building social-ecological resilience in the watershed. Key concepts are clarified and the case of the Cache River watershed is presented and briefly analyzed. Ways in which adaptive comanagement could inform policies and strategies for building resilience in the watershed, including creating awareness, cultivating interest, creating opportunities, and building capacities for change, are also discussed.

SOCIAL-ECOLOGICAL RESILIENCE AND ADAPTIVE COMANAGEMENT

Anderies et al. (2004: 3) define a social-ecological system as "an ecological system intricately linked with and affected by one or more social systems." Such linked social-ecological systems exhibit attributes of complex adaptive systems, such as cross-scale interactions, surprise, nonlinearity, and self-organization (Folke 2007, Liu et al. 2007, Pahl-Wostl 2007). The sustainable management of dynamic social-ecological systems requires approaches that build resilience rather than maximizing benefits in the short run (Folke et al. 2011). Social-ecological resilience has three interrelated meanings: the magnitude of disturbance that the system can absorb while remaining in a given state; the capacity of the system for self-organization; and the capacity of the system for learning and adaptation to change (Folke et al. 2002).

The use of centralized, expert-driven approaches to resource management is inadequate for managing complex social-ecological systems (Westley et al. 2011). Olsson et al. (2004: 75) define adaptive comanagement as "flexible community-based systems of resource management tailored to specific places and situations and supported by, and working with, various organizations at different levels." Adaptive comanagement, an innovative institutional mechanism for managing complex social-ecological systems, has emerged out of the conceptual integration of comanagement and adaptive management (Plummer 2009). Adaptive management is a management approach that recognizes the inherent uncertainty and unpredictability of social-ecological systems and aims at increasing knowledge and reducing uncertainty through constant monitoring (Allen and Gunderson 2011). However, the implementation of adaptive management programs frequently fails due to the absence of an enabling institutional framework (Walker et al. 2004). Through the integration of comanagement and adaptive management, adaptive comanagement is more socially responsive to the aspirations of resource users than adaptive management and focuses more on learning and adaptation than comanagement (Berkes 2009). These attributes make adaptive comanagement a promising mechanism for building resilience in social-ecological systems (Olsson et al. 2004, Walker et al. 2006).

CASE STUDY OF THE CACHE RIVER WATERSHED

The Cache River watershed covers an area of 1,944 square miles near the confluence of the Mississippi and Ohio Rivers in southern Illinois. Over the last two centuries, multiple drivers of change have resulted in significant modification of the watershed (Duram et al. 2004). For instance, the construction of the Post Creek Cutoff in 1915 divided the watershed into two separate drainage basins, the Upper Cache basin and the Lower Cache basin. The 1940s and 1950s saw further

modification of the Cache River, including channelization, dredging, and construction of levees, reservoirs, and water control structures (Cache River Watershed Resource Planning Committee 1995).

Public recognition of ecological crisis in the watershed triggered institutional reforms in the 1970s. The purchase of land by the Illinois Department of Natural Resources (IDNR) in 1970 subsequently led to the formation of the Cache River Joint Venture Partnership (JVP) in 1991. Membership of the JVP currently comprises the IDNR, The Nature Conservancy (TNC), the U.S. Fish and Wildlife Service (USFWS), Ducks Unlimited, and the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS). The goal of the JVP is to protect and restore 60,000 acres of wetlands along the Cache River (Cache River Ecosystem Partnership 1999). The reconnection of the Lower Cache basin and the Upper Cache basin is considered another primary goal of the JVP (Davenport et al. 2010). Between 1993 and 1995, the NRCS and TNC led the preparation of the Cache River Watershed Resource Plan with funding from the U.S. Environmental Protection Agency. The plan was expected to help various organizations in the watershed secure funds for conservation efforts in the watershed (Cache River Watershed Planning Committee 1995).

Assessment of Institutional Reforms

In all, progress appears to have been made in promoting collaboration among various organizations to address the ecological challenges in the watershed. However, from an adaptive comanagement perspective, a number of shortfalls can be identified in the goals and underlying assumptions, as well as in the institutional mechanisms for decisionmaking and implementation in the watershed.

Resource Management Goals and Assumptions

The goals for the current management of the Cache River watershed appear too narrow and static. As such, they do not reflect the need for integrated and adaptive water management. Lant (2003) attributes this outcome to the NRCS and TNC who, as leaders of the planning process, limited the scope of the plan to resource management issues, neglecting socio-economic concerns in the watershed, such as poverty and population decline. Studies show that members of the JVP, such as the NRCS, USFWS, IDNR, and TNC, have been quite successful in using the plan to obtain funding for various conservation efforts, such as wetlands reclamation and soil protection (Adams et al. 2005). However, community members are concerned about the adverse socio-economic impacts of land acquisition and restoration programs (Davenport et al. 2010). Besides its narrow scope, the Cache River Watershed Resource Plan also failed to explicitly recognize the uncertainties in the restoration process and the need to proceed through experimentation and learning.

Planning and Implementation Mechanisms

The institutional mechanisms for the preparation and implementation of the Cache River Watershed Resource Plan failed to offer adequate representation of the various segments of society and provided limited opportunities for the integration of community values and local knowledge. One shortfall of the process is that a 25-member planning committee that was established to represent the five counties in the watershed was mostly composed of large-scale commercial farmers and did not adequately represent the diverse interests of communities in the watershed (Lant 2003). Also, a 15-member technical committee, composed of expert representatives from various organizations including TNC and NRCS, was more powerful in orienting the plan toward ecological issues that did not include the broader socio-economic issues in the region (Adams et al. 2005). As a consequence,

the content of the plan reflected the views of expert scientists affiliated with the various organizations rather than the views of all stakeholders. Furthermore, although the planning committee held four public meetings and sponsored a telephone survey to ascertain the concerns of residents in the watershed, the planning process did not explicitly resolve conflicts in stakeholder perceptions that emerged from the survey (Kraft and Penberthy 2000). Following the adoption of the plan, there have been limited opportunities for community input in the implementation process (Adams et al. 2005). Community members are largely unaware and unsupportive of restoration efforts in the watershed (Davenport et al. 2010). As such, the Cache River Watershed Resource Plan has been critiqued for its lack of legitimacy (Adams et al. 2005) as well as its potential contribution to the erosion of social capital in the watershed (Lant 2003).

APPLYING ADAPTIVE COMANAGEMENT TO THE CACHE RIVER WATERSHED

The analysis of institutional reforms in the Cache River watershed has shown that while progress has been made in the adoption of a collaborative approach to the management of the watershed, further institutional interventions are needed to build a more resilient governance regime. This section discusses various ways in which adaptive comanagement could inform strategies for building resilience in the watershed. The discussion is structured around four key themes on the conditions for social-ecological resilience: awareness about social-ecological complexity; interest and motivation to act; availability of opportunities for change; and capacity requirements (Gunderson et al. 2006, McLain and Lee 1996, Olsson et al. 2004).

Enhancing Awareness

A key challenge in the adoption of adaptive management policies is the reluctance of decisionmakers and other powerful stakeholders to embrace complexity and resilience thinking (Walters 2007). The ability to successfully adapt to social-ecological change requires knowledge and information on social values and the ecological system as well as the uncertainties in their interaction (Dietz et al. 2003, Olsson and Folke 2001). Adaptive comanagement can contribute to awareness about social-ecological complexity in three ways: integration of local and scientific knowledge, promotion of social learning, and emphasis on monitoring and assessments.

First, adaptive comanagement promotes the integration of different types of learning approaches, both experiential and experimental, to understand social-ecological systems (Armitage et al. 2009). Through the use of both science and indigenous knowledge, adaptive comanagement opens up possibilities for indigenous people and other local communities to be involved in the coproduction of locally relevant knowledge as well as linking such local knowledge directly into the decisionmaking process (Berkes 2009). Second, the promotion of social learning through iterative processes of learning by doing is another defining feature of adaptive comanagement. Reed et al. (2010: 6) define social learning as "a change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between actors within social networks." Social learning can contribute to the accumulation of collective social memory, comprising historical experiences, knowledge, values, and institutions that could be drawn upon for future responses to change (Adger et al. 2005, Olsson et al. 2004). Finally, adaptive comanagement can contribute to awareness about social-ecological complexity through its emphasis on monitoring and assessment of environmental outcomes (Armitage et al. 2009). The development of indicators at

appropriate scales for assessing the dynamics of social-ecological systems is critical to providing early warning information about threats to social-ecological resilience and informing appropriate policy responses that preserve diversity and adaptive capacity (Folke et al. 2002).

In the case of the Cache River watershed, there is the need for broadening the scope of knowledge used in decisionmaking through an explicit recognition of local ecological knowledge. Olsson et al. (2004) illustrate the successful integration of local observations and scientific knowledge in the management of Lack Rachen watershed in Sweden within an adaptive-comanagement institutional framework. Social learning could also be enhanced in the Cache River watershed through sustained social interactions among the various stakeholders in the watershed, including local communities, in all stages of decisionmaking from planning to monitoring and evaluation. The promotion of community-based monitoring (Berkes 2007) is one promising approach for integrating local knowledge into resource management in a way that also enhances social learning. For instance, in an evaluation of 18 community-based ecological monitoring and assessment projects in the United States, Fernandez-Gimenez et al. (2008) found that these projects led to several benefits, including enhanced ecological understanding among participants as well as social learning that contributes to adaptive management.

Cultivating Interest

Ostrom (2009) has noted that actors' interest in engaging in collective processes of institutional change boils down to the computation of the costs and benefits of their actions. In many instances, individuals and organizations need to be convinced that it is in their best interest to engage in proenvironmental behaviors (McLain and Lee 1996). Factors influencing the behavior and motivations of actors are multi-dimensional and include cultural, psychological, economic, policy, and institutional factors (Lambin 2005). The use of different types of institutional mechanisms is therefore more likely to succeed in enhancing rule compliance and innovative responses to social-ecological change (Dietz et al. 2003, Westley et al. 2011). Adaptive comanagement relies on a range of monetary and nonmonetary incentives to enhance cooperative behavior (Plummer et al. 2012).

One attribute of adaptive comanagement that enables the provision of economic incentives is its holistic scope. Plummer and Armitage (2007: 65) have argued that, "The instrumental rationale of adaptive comanagement is sustainability: it aims to solve resource problems through a collaborative process which fosters ecologically sustainable livelihoods." The emphasis on sustainable livelihoods and well-being enhancement is important for generating interest since economic incentives are known for their effectiveness in changing behaviors (Vincent 2007). Another way that adaptive comanagement could generate interest is through its contributions to social learning and social memory (Westley et al. 2011). Through the promotion of interaction processes by which social learning occurs, adaptive comanagement can contribute to creating shared meanings, values, and preferences, as well as the building of trust and social capital that enhance collective responses to social-ecological change (McLain and Lee 1996, Olsson et al. 2004, Plummer et al. 2012).

In the case of the Cache River watershed, the use of an adaptive comanagement approach suggests the need to employ a diversity of institutional mechanisms to sustain the interest of stakeholders in the management of the watershed. Karkkainen (2004) attributes the success of the Chesapeake Bay program to the use of different types of mechanisms to gain support for policy implementation,

such as regulatory mechanisms, promotion of voluntary cooperation, use of social pressure, as well as provision of technical and financial assistance. In this regard, the current ecological focus of the Cache River Watershed Resource Plan needs to be broadened to include the livelihood needs of communities in the watershed. Innovative funding mechanisms, such as payments of ecosystem services, could be explored to address the needs of local communities. Beyond these economic incentives, greater attention needs to be paid to promoting inclusive and participatory decisionmaking processes through which social learning and social capital can emerge to promote cooperative behavior in the watershed. For instance, in the case of the community-based monitoring programs discussed earlier, Fernandez-Gimenez et al. (2008) found that besides their contributions to learning, the programs had built trust among participants, thereby enhancing opportunities for rule compliance and collective action.

Creating Opportunities

Institutional structures and processes that promote participation and communication among networks of diverse actors are essential for resilience building (Plummer et al. 2013). Additionally, the availability of arenas or forums for social interaction is critical for enhancing shared understandings and promoting collective responses to social-ecological change (Gunderson et al. 2006). Adaptive comanagement creates opportunities for social interaction through a reliance on multilevel institutional structures that provide vertical and horizontal linkages among actors (Armitage et al. 2009) and a decisionmaking process that is based on communication and conflict management (Plummer and Baird 2013).

First, the institutional structure of adaptive comanagement responds to the need for connecting actors across multiple scales in addressing challenges at any given scale (CIFOR 2008). The multilevel institutional structures allow for horizontal interaction among actors within levels as well as vertical interaction among actors across scales (Berkes 2009, Plummer and Baird 2013). The linking of semiautonomous actors within and across scales enhances the fit between institutions and management challenges (Plummer et al. 2012), sharing of decisionmaking authority at appropriate scales, and the flexibility of institutions in responding to change (Plummer and Baird 2013).

Second, the adaptive comanagement process also emphasizes communication and negotiation as mechanisms for conflict management (Plummer and Baird 2013). Adaptive comanagement recognizes the diversity of interests and knowledge systems of participants and seeks to promote shared understandings and joint problem-solving (Plummer and Fennel 2009). The explicit recognition of conflict in the adaptive comanagement process calls for the use of conflict management professionals, such as facilitators, who could enhance the linkages and interactions among actors and build their capacity for sustaining the iterative problem-solving and learning processes (CIFOR 2008).

The existing institutional structures and decisionmaking processes in the Cache River watershed do not provide adequate opportunities for vertical and horizontal interaction among stakeholders. Regulatory interventions at the level of the state or other appropriate level of action appear necessary to safeguard the role of local communities and other marginalized stakeholders in the management of the watershed. For instance, in their analysis of the involvement of indigenous communities in adaptive water governance in the United States and Australia, Bark et al. (2012) concluded that

the availability of legislation recognizing tribal water rights provided better opportunities for the involvement of indigenous communities in water governance in the western United States than Australia. The establishment of channels of communication and deliberation between local and nonlocal actors is also critical in the Cache River watershed. Given the history of conflict in the watershed, an explicit recognition of conflict as an inherent component of the resource management process and investment in the capacity for conflict management could also enhance the process and outcomes of deliberation among stakeholders in the watershed.

Building Capacities

A central focus of adaptive comanagement is to build adaptive capacity, particularly at the local level and regional levels (Plummer and Baird 2013). Adaptive comanagement "strives to recognize, build on and strengthen local people's capabilities in addressing the challenges that their changing environments pose" (CIFOR 2008: 1). The capacity to adapt to change is a function of access to various forms of capital (social, economic, human, natural, and physical) and the availability of appropriate institutions and governance systems (Akamani 2012, Walker et al. 2006). Adaptive comanagement has the potential to build and enhance access to the capitals and institutions needed for adapting to change.

With regard to institutions, adaptive comanagement draws from the benefits of comanagement, such as equity, efficiency, effectiveness, and legitimacy, in decisionmaking (Plummer and FitzGibbon 2004), as well as cross-scale linkages that enhance participation, information access, flexibility and response capacity at the local level (Berkes and Jolly 2001). Adaptive comanagement also enhances access to various forms of capital as it seeks to achieve outcomes, such as poverty reduction, enhanced well-being, increased food security, enhanced knowledge, and improved ecosystem health (McDougall et al. 2013, Plummer and Armitage 2007).

In the case of the Cache River watershed, the marginalization of local communities from decisionmaking processes in the watershed coupled with the adverse effect of regional influences on local livelihoods may have eroded community capacity to adapt to change. In addition to modifications in the institutional structures and processes discussed earlier, the pursuit of adaptive comanagement will require external support in building community institutional infrastructure and capital assets. As Bark et al. (2012: 174) have noted, "Without a process to access legal entitlements and without significant government funding for capacity building in…communities and water planning, planning mechanisms will prove less effective."

CONCLUSIONS

Research on the governance of water resources is increasingly embracing complexity and resilience thinking. In this regard, adaptive comanagement has recently emerged as a promising mechanism that combines the learning orientation of adaptive management with the vertical and horizontal linkages of comanagement. The analysis of transitions in the Cache River watershed has shown that progress has been made in promoting a collaborative approach to managing the watershed. However, the current regime still remains vulnerable due to its lack of prioritization of integrated adaptive management and limited community participation.

The paper has argued for the adoption of adaptive comanagement as a framework for informing institutional reforms for building social-ecological resilience in the watershed. Adaptive comanagement has the potential to contribute to creating awareness about social-ecological complexity, generating interest among actors through economic and noneconomic incentives, creating opportunities for involvement by diverse actors, and building the capacity for institutional change across scales. In spite of its promise, it must be cautioned that adaptive comanagement cannot be seen as a panacea (Armitage et al. 2009). Folke et al. (2011) has noted the difficulty of breaking down the robustness of older regimes and the challenge of consciously designing the multilevel institutional frameworks required for adaptive comanagement and adaptive governance. Similarly, Akamani (2014) has identified a range of challenges from the metaphysical to the practical that constrain the transition toward adaptive water governance approaches. Nonetheless, success in the transition toward adaptive comanagement could be enhanced where favorable conditions exist, such as leadership by key individuals and bridging organizations (Gunderson et al. 2006, Olsson et al. 2008), as well as an enabling policy environment that promotes transparency, participation, and legitimacy in decisionmaking (Folke et al. 2011). These preconditions for successful transition deserve attention in the Cache River watershed.

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