



Institutional networks and adaptive water governance in the Klamath River Basin, USA



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ABSTRACT

Polycentric networks of formal organizations and informal stakeholder groups, as opposed to centralized institutional hierarchies, can be critically important for strengthening the capacity of governance systems to adapt to unexpected social and biophysical change. Adaptive governance is one type of environmental governance characterized by the emergence of networks that stimulate adaptive capacity through increases in social-learning, communication, trust, public participation and adaptive management. However, detecting and analyzing adaptive governance networks remains elusive, especially given contexts of highly contested resource governance such as large-scale negotiations over water use. Research methods such as social network analysis (SNA) are often infeasible as they necessitate collecting in-depth and politically sensitive personal data from a near-complete set of actors or organizations in a network. Here we present a method for resolving this problem by describing the results of an institutional SNA aimed at characterizing the changing governance network in the Klamath River Basin, USA during a period of contested negotiations over water. Through this research, we forward a method of institutional SNA useful when an individual or egocentric approach to SNA is problematic for political, logistical or financial reasons. We focus our analysis on publically available data signaling changes in formal relationships (statutory, regulatory, contractual) between organizations and stakeholder groups. We find that employing this type of SNA is useful for describing potential and actual transitions in governance that yield increases in adaptive capacity to respond to social and biophysical surprises such as increasing water scarcity and changes in water distribution.

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1. Introduction

Organizations and actors engaged in environmental governance – processes for making decisions about the use and conservation of natural resources – are often stymied by ecological uncertainty and overwhelmed by the complexity of public and private demands on resources (Allen and Gunderson, 2011). In the Western U.S., for example, the dominant paradigm of centralized and hierarchical water governance has not kept pace with the dynamic social-hydrologic landscape and has instead continued to privilege powerful agricultural interests over rising environmental concerns

(e.g., endangered aquatic species) and marginalized water users such as Native American tribes (Bark et al., 2012). Ineffective coordination amongst a myriad of public agencies and private organizations with conflicting mandates and missions for water management have increased conflicts over water use and conservation. In addition, the onset of climate change will bring a change in water supplies and distribution across much of the West, likely further exacerbating current conflicts over water governance. In this respect, water governance in the Western U.S. is representative of the complex challenges that face environmental governance more generally.

As a solution to better accommodate both the uncertainty and complexity surrounding environmental governance in social-ecological systems (SESs), scholars have built upon the concepts of adaptive governance (Brunner et al., 2005; Folke et al., 2005; Chaffin et al., 2014b). Broadly, adaptive governance is an oft cited

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'form' of environmental governance with the capacity to adapt to changing social and biophysical circumstances including shocks and surprises such as those induced by climate change (Folke et al., 2005). Approaches cited in the literature as adaptive governance assume a shift away from exclusive control by the hierarchical organization of governments and instead toward a more diffuse governance of resources through the activation of cross-scale and cross-level networks (Olsson et al., 2004; Folke et al., 2005; Crona and Hubacek, 2010). Polycentric networks – networks with multiple sources of power or legitimacy – are essential for spanning multilevel governance systems (local to global) to coordinate the collaboration, trust-building and learning necessary to maintain ecosystem-based management and facilitate decision making in response to disturbance and change (Huiteima et al., 2009; Schultz et al., 2015).

Examples of adaptive governance, however, have been difficult to capture and analyze, and published accounts have been limited to a few prominent cases (Schultz et al., 2015). A partial explanation for this is that adaptive governance is difficult to achieve through legislation or mandate and is instead an emergent phenomenon (Chaffin and Gunderson, 2016). Thus, any systematic analysis remains elusive. An additional challenge is detecting governance change over time given the reality of unpredictable time lags. A diversity of examples of adaptive governance may be existent in the world, but it may be years or decades before the social and biophysical outcomes of these governance processes become detectable. The study of adaptive governance must therefore shift to investigating contemporary transitions in governance in an effort to better understand the processes of emergence, and then translate this understanding into policy mechanisms that create space for emergence in other contexts.

One method already employed by scholars to better understand transitions toward adaptive governance is that of social network analysis (SNA). Researchers have employed SNA techniques to correlate changes in structure of governance networks with characteristics of adaptive governance (e.g., Prell et al., 2009; Bodin and Prell, 2011). Network research on emerging adaptive governance remains sparse, however, due to the challenges associated with collecting adequate network data for meaningful analysis. For example, in situations of conflict over natural resource management (e.g., lawsuits or public protests), information on active, informal governance networks may be regarded as sensitive or political, and stakeholders may perceived it as advantageous not to share information with researchers. This renders traditional, egocentric approaches to SNA nearly impossible (Knoke and Yang, 2008).

In this paper, we present research responding to the difficulties in employing SNA to capture and analyze transitions toward adaptive governance. We apply this approach to the contexts of a governance transition in the Klamath River Basin, USA, including a set of recently negotiated agreements between stakeholders in the basin aimed at equitable water allocation and climate change preparedness. Using the tools of SNA, we 'map' changes in legal, financial and other fiduciary relationships over time among water stakeholder organizations in the Klamath basin to determine the potential emergence of adaptive governance. In so doing, we critique the application of SNA for its usefulness in scaled SESs, proposing that: (1) SNA metrics alone are generally insufficient to determine the emergence of adaptive governance; but (2) a focus on institutional SNA as opposed to egocentric SNA, may yield a relatively accessible, rapid assessment tool for scholars and practitioners interested in mapping the architecture of governance change over time to determine where additional capacity is needed to foster the emergence of adaptive governance. Increasingly, contested water governance will be addressed with large, multi-stakeholder agreements much like the Klamath Agreements described herein. Thus, our research has direct policy implications

– institutional SNA can be used to evaluate these types of agreements prior to their establishment and funding to determine the potential for fostering the emergence of adaptive governance.

2. Adaptive water governance and social networks

In this section, we first review concepts surrounding adaptive governance. We then introduce literature on SNA of environmental governance networks to determine the characteristics of networks that suggest transitions toward adaptive governance.

2.1. Adaptive governance and water resources

Adaptive governance is an approach to governing the use and protection of natural resources that emerged from research on failures of governments and other organizations to equitably allocate scarce resources amidst overwhelming complexity and uncertainty (Dietz et al., 2003). Adaptive governance has theoretical roots in research on collective action and ecological resilience and has been described as the social contexts necessary to manage resilience in SESs (Folke et al., 2005). In this sense, 'governance' differs from 'government' by expanding social contexts to explicitly include the "range of interactions between actors, networks, organizations, and institutions emerging in pursuit of a desired state" for SESs (Chaffin et al., 2014b). The term 'governance' inherently introduces normative connotations along with tenuous idea that there is a universally desirable path forward to both allocate and conserve environmental resources. While there is no panacea for resource allocation conflicts (Ostrom, 2007), nor is there a utopian path toward resource sustainability, the normative concept of governance is useful as it emphasizes state and non-state processes for negotiating tradeoffs and resolving conflicting demands on resources. Governance is not management, but instead includes the processes for determining what management actions to pursue 'on-the-ground' that directly affect the use, conservation and sustainability of environmental resources (Green et al., 2015). For example, in the U.S. West, water management would include operating plans (and outcomes) for organizations tasked with water distribution, while governance would include the multi-level processes, parties and institutions involved in negotiating the terms of those operation plans.

Research on adaptive governance has commonly discussed water as a focal resource (Huiteima et al., 2009; Pahl-Wostl et al., 2007; Cosens et al., 2014). Governance of water is inherently the governance of complexity and uncertainty – complex because water spans boundaries from administrative to biophysical, and uncertain due to the potential impacts of climate change on the distribution of water through changes in both extreme and slow onset events (Vörösmarty et al., 2000). Analysis of the sheer diversity of actors, organizations and institutions involved in water governance has yielded important insights for framing adaptive governance. Of interest here is the role of networks (as opposed to hierarchies or markets) as a mode of governance. Network governance tends to be polycentric – having multiple sources of power or legitimacy – and polycentric governance systems are more likely to learn and adapt following a disturbance (Huiteima et al., 2009; Pahl-Wostl, 2009). Network governance increases the capacity for a diversity of actors and/or organizations, both state and non-state, to participate in decision making processes by building trust, increasing communication and initiating collaborations across administrative and political boundaries spanning both vertically and horizontally (Folke et al., 2005; Pahl-Wostl, 2009). Network governance can also promote social learning through increased exposure to information through knowledge brokers and bridging organizations strategically positioned throughout the

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