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Review

# Emergence, institutionalization and renewal: Rhythms of adaptive governance in complex social-ecological systems

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ABSTRACT

Adaptive governance provides the capacity for environmental managers and decision makers to confront variable degrees of uncertainty inherent to complex social-ecological systems. Current theoretical conceptualizations of adaptive governance represent a series of structures and processes best suited for either adapting or transforming existing environmental governance regimes towards forms flexible enough to confront rapid ecological change. As the number of empirical examples of adaptive governance described in the literature grows, the conceptual basis of adaptive governance remains largely under theorized. We argue that reconnecting adaptive governance with foundational concepts of ecological resilience—specifically Panarchy and the adaptive cycle of complex systems—highlights the importance of episodic disturbances and cross–scale interactions in triggering reorganizations in governance. By envisioning the processes of adaptive governance through the lens of Panarchy, scholars and practitioners alike will be better able to identify the emergence of adaptive governance, as well as take advantage of opportunities to institutionalize this type of governance in pursuit of sustainability outcomes. The synergistic analysis of adaptive governance and Panarchy can provide critical insight for analyzing the role of social dynamics during oscillating periods of stability and instability in social-ecological systems. A deeper understanding of the potential for cross–scale interactions to shape adaptive governance regimes may be useful as society faces the challenge of mitigating the impacts of global environmental change.



**Contents**



## 1. Introduction

Managing environmental issues has become more complex due to expanding scales of the problems (e.g., climate change and widespread land and water degradation) and the dynamic and

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evolutionary characteristics of these problems (Steffen et al., 2011; Rockstrom et al., 2009). One approach to dealing with the complexity of managed resource systems has been to acknowledge the strong coupling between the social and ecological aspects of systems (Berkes and Folke, 1998; Gunderson et al., 1995; Ostrom, 2009). Because of the changing nature of both the ecological and social dimensions, many scholars have proposed the term adaptive governance (AG) as a type of environmental governance that has arisen in systems characterized by large degrees of dynamism, complexity and uncertainty (Dietz et al., 2003; Brunner et al., 2005; Folke et al., 2005; Chaffin et al., 2014b).

While historical reconstructions are subject to multiple interpretations, there is a growing theoretical heuristic that emerged from comparisons of patterns of change over time in coupled social-ecological systems (SESs). Holling (1986) proposed a construct called an adaptive cycle to explain patterns of stability and instability in systems over time. Originally devised to explain irruptive dynamics in ecosystems such as fire, pest, or disease outbreaks, the adaptive cycle has been used to explain historical dynamics of coupled SESs (Gunderson et al., 1995; Gunderson and Holling, 2002).

This construct has been used to understand social phenomena such as natural resource policy cycles (Light et al., 1995), changes in natural resource management institutions (Chapin et al., 2009), as well as legal structures and processes (Garmestani and Allen, 2014). Avelino and Rotmans (2009) describe how power shapes transitions among regimes in social systems. Also, there are recent contributions (Cosens et al., 2014; Chaffin et al., 2014a) linking these patterns to governance trajectories specifically in managed riverine systems. Gunderson and Holling (2002) used the adaptive cycle to propose a theory of cross–scale interactions, called Panarchy. Nonlinear dynamics and cross–scale interactions of Panarchy provide a new theoretical lens to explore and test concepts of AG.

AG was originally described by scholars and practitioners in terms of characteristics, structures and processes (Brunner et al., 2005; Folke et al., 2005; Olsson et al., 2006), and recently by a shift toward prescriptions, principles and guidelines (Huitema et al., 2009; Wyborn, 2015). Ongoing theorizations of adaptive governance are exposed to scholarly critiques similar to those directed at the application of ecological resilience to social components of SESs. These critiques include a lack of attention to history, culture, power, and human agency in research framed by the SES and ecological resilience paradigms (Davidson, 2010; Cote and Nightingale, 2012; Welsh, 2013; Fabinyi et al., 2014). However, we find that by reconnecting AG with a foundational concept of ecological resilience—the adaptive cycle of complex systems—we are able to demonstrate that an analytical approach to the contexts of environmental governance generally, and adaptive governance more specifically, has the potential to yield resilience-framed research that explicitly recognizes implications of history, culture, power, and human agency. Using Panarchy to describe governance as a dynamic process clearly highlights the importance of historical and political contexts as key cross–scale interactions that influence critical periods of collapse and rebirth of governance towards forms with an increased capacity to function amidst complexity and uncertainty.

## 2. Governance, resilience and Panarchy in social-ecological systems

Environmental governance generally—the act or process of governing use and access to the environment—differs from "government" in its inclusion of a wide range of institutions, actors, and organizations involved in producing environmental policy and management outcomes. Governance expands the role of government to include both state and non-state actors and organizations, as well as the "political–economic relationships that institutions embody and how these relationships shape identities, actions, and outcomes" (Lemos and Agrawal, 2006: 298). In this way, governance is a fitting lens for analyzing SESs; governance encompasses interactions and feedbacks between social and biophysical components of a system and the outcomes of governance differ across SES contexts and nested scales.

AG arose as an alternative to environmental governance regimes that were intended to control and stabilize ecological systems to meet societal goals of sustainable resource use (Folke et al., 2005). AG includes a range of responses to failures to coordinate the management of natural resources in such a way as to avoid environmental degradation and human conflict over resource allocation. The concepts of AG are an outcome of multiple strains of research: 1) institutional analysis of collective action under situations when knowledge is incomplete and uncertainty is high (Dietz et al., 2003); 2) the search for modes of governing sustainability goals by managing for resilience to disturbance in social-ecological systems (Walker et al., 2004; Lebel et al., 2006); 3) applications of adaptive management to structure learning from ecosystem-based management under assumptions of scientific uncertainty (Folke et al., 2005; Gunderson and Light, 2006); and 4) attempts to resolve stagnation between resource management policies that cause gridlocked decision making and conflict over resource use and allocation (Brunner et al., 2005). As a consequence of extending the lens of complex systems analysis from ecological systems to also include interacting social contexts (Berkes and Folke, 1998), AG was initially defined as a mode of environmental governance that facilitated adaptive management to ensure data-driven, ecosystem-based management despite extreme ecological uncertainty (Dietz et al., 2003; Folke et al., 2005).

AG is heavily influenced by the theories of ecological resilience (Holling, 2001; Walker et al., 2004; Walker and Salt, 2006), and some have even referred to AG as "resilience-based governance" (Garmestani and Benson, 2013). Resilience (ecological resilience as opposed to engineering resilience, see Gunderson and Holling (2002)) is a valueless property of systems that describes the capacity of a system to withstand disturbance while still maintaining structure and function. Governance, in context, includes the processes of steering or guiding human activity—mediating what society wants from environmental systems (Pierre, 2000). Thus, unlike resilience (as a property of systems), governance has normative goals, and AG in particular is framed around the goals of social-ecological sustainability (Folke et al., 2005; Gunderson and Light, 2006; Lebel et al., 2006; Elbakidze et al., 2010; Clark and Clarke, 2011) and building sustainable policy solutions to pressing environmental problems (Brunner et al., 2005; Scholz and Stiftel, 2005). The underlying assumption linking sustainability to AG is that the equitable allocation and conservation of life-sustaining resources and ecosystem services is desirable (both now and for future generations). In addition, governance with sufficient adaptive capacity to forward sustainability goals (e.g., AG) is also inherently desirable. It follows then that the normative goals of AG, as well as the normatively framed concept of AG itself, are not only associated with a preferred mode of governance given complexity and uncertainty, but also closely linked with the concept of "good governance"— principles for "how governance actors should exercise their authorities" including fairness, inclusiveness, transparency, and accountability (Lockwood, 2010: 758).

It is critical for us to clarify our assumptions of the relationship between AG, resilience, and sustainability early on as many of the critiques leveled at both resilience and SES-framed research could also be applied to much of the previous work on AG. In their critique of the adequacy of the SES framework for explaining social