Can Adaptive Comanagement Help to Address the Challenges of Climate Change Adaptation?

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ABSTRACT. A shift is taking place within environmental governance that draws attention to modes and instruments that respond to system dynamics, uncertainty, and contested values. Adaptive comanagement is one process being advanced to make governance operational as it emphasizes collaboration among diverse actors, functions across scales and levels, and fosters learning through iterative feedback. Although extensive experience with adaptive comanagement has been gained in relation to other environmental and resource issues, its potential contribution to the governance of adaptation is largely unexplored. This paper probes how adaptive comanagement might offer support to climate change adaptation and identifies gaps in knowledge requiring attention. In drawing upon existing literature and applied experiences, it is argued that adaptive comanagement may contribute to climate change adaptation by building generalized adaptive capacity as well as providing a novel institutional arrangement to generate adaptive responses. At the same time, several questions emerge about adaptive comanagement in this context. Considerations are thus discussed for adaptive comanagement scholarship and application in addressing the challenge of climate change adaptation.

Key Words: adaptive capacity; adaptive comanagement; adaptive responses; climate change adaptation; environmental governance

INTRODUCTION

Human activities drive global environmental change in the era of the Anthropocene and are pushing the Earth system outside the stable state of the Holocene (Rockström et al. 2009). Climate change is one planetary boundary already transgressed and analysis by Rockström et al. (2009) reveals that continued change at the present rate will cause significant erosion of resilience for Earth system functioning. Although variables such as temperature, precipitation and, evapotranspiration fluctuated within a relatively narrow range in the Holocene, anthropogenic climate change is altering the variability and predictability of natural systems, and thus undermining the concept of stationarity (Milly et al. 2008). As a result, past approaches and technical designs are of limited utility for future conditions (NRC 2009, de Loë and Plummer 2010). Emerging research on complex systems highlights further challenges to views of stability and predictability. For example, Scheffer et al. (2009) draw attention to critical thresholds or tipping points that prompt abrupt change as a system shifts from one state to another. Although mitigation is essential in this context to slow the rate of climate warming, the Intergovernmental Panel on Climate Change (IPCC 2007) observes that even the most aggressive efforts will not prevent climate change, and thus, that adaptation is essential.

In this context, “dealing with climate adaptation not only demands a rethink of how we arrange our social-ecological or social-technical systems but also how we govern them” (van Nieuwaaal et al. 2009:8). As the introductory text to this Special Feature makes clear, the concept of governance is highly relevant for adaptation because societal actors at a variety of levels are building adaptive capacity, undertaking adaptive actions, and developing adaptation policies. Simultaneously, pressing issues are emerging regarding the extent to which governors need to deliberately intervene, at what levels, and the adequacy of responses emerging by actors in communities. This raises important questions about the appropriateness and effectiveness of governance modes and instruments in addressing the challenge of adaptation.

In taking up these important questions, this paper investigates how adaptive comanagement may help to address climate change adaptation. The transition underway in environmental governance, its hybridization of forms and emerging key challenges serve as an entrée into adaptive comanagement. Because adaptive comanagement has not typically been employed to address climate change adaptation, this conceptual investigation draws upon existing literature and preliminary applied experiences to (1) explore how it might offer support and (2) identify gaps in knowledge requiring attention to advance this governance strategy.

THE CHANGING LANDSCAPE OF ENVIRONMENTAL GOVERNANCE

Governance is goal oriented and steers society toward a particular end through deliberate interventions (Kooiman 1993). All forms of governance are concerned about what could and what should be; they commonly address (1) categories of actors and their roles, (2) an intention for change in relationship between actors and their roles, and (3) the social context in which change is required (Glasbergen 1998). Biermann et al. (2009:3) define Earth system governance as...
“the interrelated and increasingly integrated system of formal and informal rules, rule-making systems, and actor-networks at all levels of human society (from local to global) that are set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change and, in particular, earth system transformation, with the normative context of sustainable development.”

Many models of governance exist relating to environmental policy (Glasbergen 1998); each reflects norms about societal organization and taking a position on how and who should address environmental challenges. Glasbergen (1998) offers a typology encompassing the five types: regulatory control, market regulation, civil society, contextual control and self-regulation, and co-operative management. Although regulatory control provides the basis of environmental policy (Glasbergen 1998) and has made considerable headway with some environmental problems of the 20th century, its limitations are now realized because it alone fails to reconcile conflicts and polarized positions of actors, is unable to enforce compliance, and is limited in effectiveness under conditions of uncertainty and change that characterize contemporary environmental challenges (Holling and Meffe 1996, Kettl 2002). Alternatively, it is argued that the retreat from a regulatory approach or a ‘rolling back of the state’ is due to neoliberal reforms (Himley 2008, Lockwood and Davidson 2010). Attention has thus been shifting away from ‘government’ and toward alternative models of governance (Himley 2008, Pahl-Wostl et al. 2008, de Loë et al. 2009).

Although concentrating on the types of governance is useful for the purpose of highlighting their defining attributes, Glasbergen (1998) notes that in practice they frequently combine and are not mutually exclusive. Lemos and Agrawal (2006) illustrated this concept by bridging ideal types of environmental governance models (state, market, community) in relation to hybridized or boundary crossing forms, e.g., comanagement, public-private partnerships, private-social partnerships. Novel conceptualizations of environmental governance are emerging in light of complexity and uncertainty, often associated with climate or environmental change. Bulkeley (2005), for example, argues that new spatial grammars (i.e., dimensions of space concerning identities, institutions, and processes are articulated in reference to a phenomenon) are required to comprehend hybrid forms and their social and ecological implications. Others, such as Paavola (2007), concentrate on the role(s) of institutions and institutional design solutions in this reconceptualization. Duit and Galaz (2008) tackle the issues of complexity and uncertainty head-on and offer a complex adaptive system perspective on governance.

A transition is thus underway in environmental governance. This shift involves environmental governance being reconceptualized from an overly structural or static view and toward a dynamic perspective that stresses the ability to navigate interconnected and multilevel social-ecological systems (Lemos and Agrawal 2006, Folke 2007, Ostrom 2007, Galaz et al. 2008, de Loë et al. 2009, Plummer and Armitage 2010). Several recent efforts (Lemos and Agrawal 2006, Biermann et al. 2009, de Loë et al. 2009, Lockwood et al. 2010, Reed and Bruyneel 2010) draw attention to changes in what governance implies, how it occurs, and what it seeks to achieve. In bringing together the concerns identified with the shift in environmental governance, Armitage et al. (2012:247-248) draw attention to “... five key concepts or issues in environmental governance: (1) recognition of the importance of fit and scale; (2) fostering adaptiveness, flexibility, and learning; (3) coproducing knowledge from diverse sources; (4) understanding the emergence of new actors and their roles in governance; and (5) changing expectations about accountability and legitimacy.”

Set against this background, several strategies, e.g., adaptive governance, cogovernance, adaptive comanagement, are emerging to make such governance operational. These strategies similarly assert requirements of “... collaboration among heterogeneous actors with diverse interests, institutions that are flexible and nested across scales and levels, and analytic deliberation that develops understanding through multiple knowledge systems; builds trust through repeated interactions; and fosters learning and adaptive and continuous feedback through continuous feedback” (Plummer and Armitage 2010:5, see also Dietz et al. 2003, Folke et al. 2005).

Adaptive comanagement specifically is described as a strategy for governance of social-ecological systems (Armitage et al. 2009, Kofinas 2009, Plummer 2009, Cundill 2010, Cundill and Fabricius 2010). Huitema et al. (2009) identify the connection between governance and adaptive comanagement and opportunity for gaining insights into this institutional prescription and its performance by collating studies. In taking up their suggestion, Plummer et al. (2013) conducted a systematic review and analysis of the adaptive comanagement literature to better understand its relationship with environmental governance. Their findings illuminate a blurred or fuzzy boundary between the two concepts, the contributions of adaptive comanagement scholarship to each of the emerging concerns of environmental governance (as identified above in the work of Armitage et al. 2012), and the advantaged position of adaptive comanagement in reference to navigating dynamic and multilevel systems. Although in this paper, I concentrate on adaptive comanagement, it is important to acknowledge that the requirements to meet the shift in governance may take several forms, and correspondingly, are open to a range of benefits and/or challenges.

ADAPTIVE COMANAGEMENT

Adaptive comanagement draws upon the collaborative and adaptive narratives that have been gaining traction in resource and environmental management over the past 25 years. The
of the EKV included conducting inventories, undertaking mapping, increasing accessibility to the wetlands, providing information, and monitoring. These activities are usually project-based and thus provide opportunities for self-organization, learning, and adjustments. They typically involve diverse actors and draw upon different types of knowledge, thus enhancing capacity for adaptation. Over time the activities and scope of the EKV expanded beyond the initial area. In 2005 the area was designated a UNESCO Biosphere Reserve and the EKV changed its name to Biosphere Office. In 2010 Naturum opened as a center for interpretive displays, conferences, schools, and restaurants. The multilevel network was decisive for protecting the project, again signaling enhanced resilience adaptability (see Hahn 2011).

Adaptive comanagement is garnering considerable attention because it is anticipated to enhance the robustness of social-ecological systems (Olsson et al. 2004a) and orient them toward sustainable trajectories (Folke et al. 2002). It is also identified to potentially address the problem of fit where social and ecological dynamics do not match (Olsson et al. 2007) and build adaptive capacity (Armitage 2007, Fabricius et al. 2007). This enthusiasm for the outcomes of adaptive comanagement has been tempered by valuable critique. For example, Nadasdy (2007) highlights the need to critically question the sociopolitical context and framing of interests, and Fennell et al. (2008) observe how adaptive comanagement is not immune from tensions of efficiencies, equity, and marginalization.

ADAPTIVE COMANAGEMENT AND CLIMATE CHANGE ADAPTATION

The introduction to the Special Feature poses questions about the appropriateness and effectiveness of governance modes and instruments in addressing the challenges of climate change adaptation. Scholars of adaptive comanagement are clear that it is not a governance panacea and needs to be tailored to particular contexts (Armitage et al. 2009, Berkes 2009, Plummer and Hashimoto 2011). In this paper, I explore how adaptive comanagement may support climate change adaptation and identify gaps in knowledge requiring attention to advance it in this context.

How might adaptive comanagement support climate change adaptation?

Conceptualizations of adaptive capacity and adaptation serve as an entrée to investigate how adaptive comanagement might support climate change adaptation. Adaptive capacity, in the context of climate change, concerns the ability of a system to modulate exposure and sensitivity and influence its vulnerability (e.g., Adger 2003, Smit and Wandel 2006, Engle 2011). In the social-ecological systems literature the notion of adaptive capacity is often positioned in relation to the concept of resilience. Adaptive capacity from this perspective concerns “... the ability of a social-ecological system to cope with novel
Adaptive capacity has a close relationship with the concept of adaptation. Adaptive capacity manifests in adaptations (Smit and Wandell 2006) and in simple terms describes the ability of a system to adapt (Engle 2011). Adaptation, in the context of environmental change, is “an adjustment in ecological, social, or economic systems in response to observed or expected changes in environmental stimuli and their effects and impacts in order to alleviate adverse impacts of change” (Nelson et al. 2007:398). The concerns and intricacies of the adaptation research agenda are considerably broad and reviewing them is beyond the scope of this paper (see Smithers and Smit 1997, Smit and Pilifosova 2003, Smit and Wandell 2006, Engle 2011). However, it is important to recognize that adaptive comanagement is not equally suited to the entire realm of adaptation. Smit and Pilifosova (2001) characterize and differentiate types of adaptation according to the nature of the system (natural vs. human), who adapts (private vs. public), and its timing/intention (anticipatory vs. reactive). More recently, Tompkins and Eakin (2012) examine the suppliers and beneficiaries of adaptation. They set out a typology of institutional arrangements and challenges consisting of four domains: public provision of adaptation goods for public benefit; public provision of adaptation for private benefit; private adaptation for private benefit; and private provision of adaptation goods for public benefit. In following this categorization of the adaptation realm, one would have limited expectations of adaptive comanagement to assist with the first three domains. For example, adaptive comanagement would be of little help in supporting market mechanisms such as insurance. It is the domain of private adaptation for public benefit in which adaptive comanagement is best positioned to offer support as it brings together public and private actors to address an environmental or resource problem, typically a common resource, with diffuse benefits not accruing to the individuals.

Although there is relatively little experience with adaptive comanagement in relation to climate change, there are two main ways in which it may support adaptation in this context. First, adaptive comanagement builds generalized adaptive capacity (e.g., Armitage 2007, Fabricius et al. 2007, Armitage et al. 2009, Plummer et al. 2012). General adaptive capacity refers to characteristics that promote the ability to respond to almost any kind of challenge, e.g., available wealth or skilled human resources, whereas specific adaptive capacity concerns sector specific skills, knowledge, and systems (Bergkamp et al. 2003). These factors generally fall under the literature on determinants of adaptive capacity and across scales it has been found to be influenced by economic development, technology, and social factors (Nelson et al. 2007). Armitage (2005) draws attention to the operational (e.g., technical, financial, social, institutional, political) and strategic (e.g., power, scale, knowledge, community, culture) factors that influence adaptive capacity in community-based natural resource management. In adaptive comanagement specifically, there are several factors identified that foster adaptive capacity. For example, Fabricius et al. (2007) observe that adaptive comanagers have adaptive capacity, which “… becomes possible through leadership and vision, the formation of knowledge networks, the existence or development of polycentric institutions, the establishment and maintenance of links between culture and management, the existence of enabling policies, and high levels of motivation in all role players.” Armitage et al. (2009) describe how adaptive comanagement additionally encourages the key ingredients of adaptive capacity by encouraging flexibility and innovation.

Perhaps most pointedly, Pelling et al. (2008:870) observe that “seeing adaptation in terms of learning highlights both material adaptation and institutional modification as valid adaptive strategies. If learning itself is considered a kind of adaptive behavior, then this opens up questions surrounding the process through which actors can learn to learn (or learn to be adaptive).” A central line of inquiry for those studying adaptive comanagement is about learning, and in particular the functioning of social or multiple loop learning (Plummer and FitzGibbon 2007, Armitage et al. 2008, Berkes 2009, Plummer 2009). Specific attention to learning and knowledge within comanagement in relation to adapting to climate change comes from work in the Arctic (Berkes and Armitage 2010, Armitage et al. 2011). This work examines linkages among knowledge, learning, and adaptation in relation to comanagement cases of Narwhal (Monodon monoceros), Beluga (Delphinapterus leucas), and Dolly Varden Char (Salvelinus malma). Insights gained through the analysis draw attention to how knowledge coproduction may trigger or act as a mechanism for learning, which emerged in the cases as a key type of adaptation.

Second, adaptive comanagement may act as a novel institutional arrangement through which adaptive responses to climate change may be generated. As Adger (2003:33) points out, “adaptive capacity is only potential until there are governance institutions that make it realizable.” In the Canadian Arctic for example, comanagement institutions such as the Fisheries Joint Management Committee and the Nunavut Wildlife Management Board are new institutional processes through which responses to the impacts of climate change are being generated (Berkes and Armitage 2010).
Although such comanagement arrangements were not initially envisioned to address climate change per se, “these arrangements provide emerging networks, or horizontal and vertical linkages that give rise to new social practices and stakeholder interactions, and thus a greater ability to cope with variability and build longer-term adaptive responses to minimize risk and uncertainty” (Armitage et al. 2011:995).

By extension, the idea of introducing adaptive comanagement as a pathway for climate change adaptation is emerging. In one of the few applied examples connecting adaptive comanagement and climate change, Locatelli et al. (2008) argue that adaptive comanagement is a good example for forestry because it builds upon three prongs crucial for climate change adaptation: understanding diverse views of many stakeholders; developing better mechanisms for learning from experiences; and addressing power inequities. Another example comes from the Niagara Region of Canada in which a social-ecological inventory (SEI) was used to prime the governance system and lead into an adaptive comanagement process (see Baird et al., in press). Adaptive comanagement in this example was approached as an action research project to examine the process and outcomes in relation to the context of climate change adaptation. The researchers initiated and facilitated the iterative and participatory processes, which involved 32 stakeholders from various sectors. Over a 14 month period the stakeholders routinely interacted and formed a steering committee. In addition to attending workshops and discussing the impacts of climate change on the Niagara Region, the group developed a climate charter, was instrumental in commissioning a climate change report for the Region, and expressed intention to collaborate on a climate change action plan. The longitudinal design of the research was truncated because of funding cuts and the researchers were notified that the steering committee disbanded a few months after the end of the study. Analysis of the case is presently underway in regard to learning that occurred (J. Baird, R. Plummer, D. Huitema, and C. Haug, unpublished manuscript) and the initiation of adaptive comanagement through such intervention using social network analysis (J. Baird, R. Plummer, and O. Bodin, unpublished manuscript).

Emerging questions for adaptive comanagement in relation to climate change adaptation

In the process of exploring how adaptive comanagement might support climate change adaptation several knowledge gaps emerged. These gaps are framed as a series of questions and the discussion accompanying each question draws attention to considerations for adaptive comanagement scholarship and application in moving forward with climate change adaptation.

Can further insights be gained about how adaptive comanagement as a governance strategy builds general adaptive capacity and generates adaptive responses?

Developing a fuller understanding of adaptive comanagement is a critical challenge. The findings from a recent systematic review and analysis of adaptive comanagement literature reveal that existing research is insufficient in terms of definitional clarity, measurement, and findings to answer: the extent to which variables, e.g., social and political context, properties of networks, assets employed by agencies, organizations and individuals, attributes of organizations and individuals, key functions of individuals, can be traded off; which variables always need to be present; and the variables that can improve its quality (Plummer et al. 2012). Addressing these present challenges would make possible the collection of robust and comparable evidence about how adaptive comanagement builds general adaptive capacity and generates adaptive responses. Gaining insights specific to variables associated with adaptive comanagement, e.g., learning, knowledge, networks, leadership, is also required to understand the roles they play within the dynamic process and to comprehend their influence on outcomes. These are formidable challenges for adaptive comanagement scholarship at present. Pursuing a fuller understanding of adaptive comanagement in a systematic and rigorous manner raises the prospects of developing theory to help guide human-environment interactions (Plummer et al. 2012).

How does the context of climate change influence adaptive comanagement?

Because knowledge and experience of adaptive comanagement in the specific context of climate change adaptation is limited, an underlying assumption of this paper is that scholarship on adaptive comanagement in other environmental contexts is transferable to some degree. Determining the degree to which such knowledge and experience is indeed transferable as well as understanding how this context shapes the adaptive comanagement process is essential. For example, Armitage et al. (2009:100) derive “ten conditions for successful adaptive co-management” from a variety of empirical cases that must be present to some extent for a successful outcome. Conditions of success they identify that present immediate challenges in regard to climate change include: well-defined resource system, small-scale resource use contexts, reasonably clear property rights, and national and regional policy environment. The context of climate change seems to add a level of ‘abstraction’ and a lack of immediacy, which may precipitate stakeholders to act in other adaptive comanagement situations. Being aware of how adaptive comanagement manifests in different situations is also critical. Plummer and Hashimoto (2011) offer a framework for researchers and policy makers in this regard. They argue that adaptive comanagement can thus be tailored to a context, and in turn, the adaptability and fit enhanced.

How does adaptive comanagement compare to, and connect with, other governance strategies for climate change adaptation?

Both parts of this double-barreled question require consideration and warrant future investigation. The first part...
of the question identifies the need to clearly identify the outcomes from adaptive comanagement and evaluate its successes or failures. Although evaluation of adaptive comanagement is critical, few studies have undertaken such an assessment (Plummer and Armitage 2007, Cundill and Fabricius 2010). Efforts to assess the effectiveness of institutional prescriptions of adaptive comanagement based on evidence from the existing literature were inconclusive and led to the call for more empirical and theoretical work (Huitema et al. 2009). The subsequent systematic review of adaptive comanagement literature to 2010 found little basis for meaningful comparisons and thus identified evaluating outcomes and establishing generalizable patterns of how components of adaptive comanagement relate to goals and outcomes as a critical future challenge (Plummer et al. 2012).

The second part of this question draws attention to the need for multiple governance strategies for climate change adaptation and consideration of their interplay. Climate change is an example of a wicked problem with global to local interdependencies. The very definition of Earth system governance offered by Biermann et al. (2009) earlier highlights the interrelations and increasing integration of institutions as well as connections between mitigation and adaptation to environmental change. Duit and Galaz (2008:318) observe that “... different governance systems might coexist and interact over societal levels” and that “... the combination of different governance systems will be decisive for the impact of disturbances and surprises.” Adaptive comanagement is one example of an emerging governance strategy and determining how it works with others will be critical. Adaptive comanagement works across levels and scales, but usually focuses on an identifiable landscape or small scale. Attention is required as to how changes prompted by adaptive comanagement may cascade upward. Recent work by Galaz et al. (2012) is a reminder that all governance strategies present both opportunities and limitations. Future research is required to better understand what those are for adaptive comanagement generally, and specifically in regard to climate change.

What if adaptation is not appropriate and a different system trajectory is required?
Adaptive strategies and capacity for adaptation are essential to dealing with change. However, it is possible that adaptability can ‘mask business as usual’ and that they may be maladaptive, undermine long term solutions, and cause undesirable consequences (Folke et al. 2003, Scheffer 2009). An important distinction is required between adaptability, capacity for reconfiguration within a social-ecological regime, and transformability, the capacity to create a fundamentally new social-ecological system and shift to a social-ecological trajectory (Walker et al. 2004, Lebel et al. 2006). Responses, even adaptive ones, that fail to respond adequately to system feedbacks can create lock-in or rigidity traps that cause persistence along established paths as well as reduced capacity to innovatively respond to opportunities (see Folke et al. 2010, Olsson et al. 2010). Understanding when and how these situations occur and building capacity to transform conditions at particular scales are essential, and complimentary, processes (Walker et al. 2004, Lebel et al. 2006, Olsson et al. 2010). Despite recognizing the need for transitions and transformations, few examples based on empirical cases exist and “there is still a lack of understanding on how to transform SES into new, improved trajectories that sustain and enhance ecosystem services and human well-being” (Olsson et al. 2010:264). Adaptive comanagement appears to be an exception to this observation. Building upon work in Kristianstads Vattenrike as well as navigating transitions in other cases (e.g., Olsson et al. 2006, 2008), Olsson et al. (2010) introduce the idea of transformative capacity. From their experiences, building capacity for transformation requires understanding where you are, determining where to go, and devising ways to get there. They conclude that “important questions for future research on SES transformations are what needs to be transformed and how transformations happen” (2010:281). Adaptive comanagement thus might be particularly applicable to deliberative transformational change.

CONCLUSIONS
The title of this paper provocatively posed an ambitious question to adaptive comanagement scholarship: can it help to address the challenge of climate change adaptation? There are many domains of adaptation to which contributions from adaptive comanagement are unlikely. It is the domain of private adaptation for public benefit where contributions from adaptive comanagement may be anticipated as it brings together actors in a problem solving process with diffuse benefits not accruing to the individuals. In drawing upon present knowledge of and experiences with adaptive comanagement, it was argued that it may support climate change adaptation by building generalized adaptive capacity and offering a novel institutional arrangement to generate adaptive responses to climate change.

Tompkins and Eakin (2012:6) observe that “the case of private production of adaptation public goods is a special case that is not completely congruent with examples of coproduction and co-management.” The conceptual exploration thus identified and discussed questions that emerged in relation to the proposition that adaptive comanagement may support climate change adaptation. Despite the growing abundance of adaptive comanagement literature, the extent to which robust conclusions can be systematically drawn from evidence is presently limited because of inconsistent definitions and varied measurements (Plummer et al. 2012). A research agenda that overcomes these challenges will increase understanding how adaptive comanagement builds general adaptive capacity and generates adaptive responses. As
experience is gained with adaptive comanagement for climate change adaptation, insights may be gained about tailoring the process to this context. Adaptive comanagement is one governance strategy among many for climate change adaptation. An important avenue for future research is to examine its salience as well as relationship to other governance strategies. Finally, adaptive comanagement may serve as a useful governance strategy to consider if adaption is appropriate or if transformations are necessary.

Undertaking adaptive comanagement to address climate change adaptation will not be an easy task because it is neither a set prescription nor a governance panacea. At the same time, it offers a viable way to foster governance and build capacity to navigate change. As Olsson et al. (2010:281) argue:

...if we can increase our understanding of SES transformations and provide strategies and guidelines for initiating and navigating SES’ transformations, we could better prepare for and potentially speed up the responses to the rapid changes in the capacity of the earth’s ecosystems to sustain our development and civilization. The issue is pressing, considering the windows of opportunity for transformations towards sustainability that are currently wide open due to rapid, pervasive global changes in many dimensions.

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