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Adaptation in a transboundary river basin: Linking stressors and adaptive capacity within the Mekong River Commission

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ABSTRACT

River basin organizations serve as potential forums to promote adaptation to environmental change in transboundary river basins. Yet how these organizations adapt is an understudied area of the literature. We explore and compare four examples of adaptation within the Mekong River Commission (MRC), focusing on how the nature of stressors shapes adaptation responses. We measure adaptation responses in terms of adaptive capacity, which includes technical, institutional, social and financial capacity. We find that the uncertainty of the impact of stressors plays a role in shaping the extent of adaptive capacity. We also find that the adaptive response may depend on a river basin organization's pre-existing capacity to address the stressor. Finally, our research suggests that investments in new capacity can create a feedback mechanism that helps reduce uncertainty and foster further adaptation.

1. Introduction

International river basins provide vital resources to support the livelihoods, health and development of human societies. Yet the quality and availability of transboundary water resources are vulnerable to stressors, such as climate change, growing populations and developing economies (UNESCO, 2009). Many scholars are calling attention to the need for adaptation to address such challenges in international river basins (Conway, 2005; Cooley and Gleick, 2011; Drieschova et al., 2008; Eckstein, 2009; Fischhendler et al., 2004; Lebel et al., 2010). Adaptation involves the actions, decisions, and adjustments that help a system cope with external stresses or future perturbations therefore mitigating the vulnerability to such stressors. (Brooks et al., 2005; Nelson et al., 2007).

One venue for adaptation to emerge in international river basins is through river basin organizations (RBOs). RBOs increasingly are tackling system-level governance issues at the basin scale (Conca et al., 2006; Gerlak and Grant, 2009). RBOs are bodies or organizations – often in the form of international commissions and committees – for the management of transboundary water resources (Kliot et al., 2001). Researchers suggest that RBOs can help

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facilitate the sharing of information (Lebel et al., 2010), identify possible adaptation measures (Fischhendler, 2004), or help to shoulder financial and resource burdens (Eckstein, 2009), which are often needed for adaptation. While a growing number of scholars have begun to study adaptation in the context of regional water governance (Aerts and Droogers, 2004; Beniston et al., 2011; Ceccato et al., 2011), much of this literature focuses on the structural features that RBOs need in order to adapt to changing climatic and hydrologic conditions (Beniston et al., 2011 Eckstein, 2009; Sietz et al., 2011). Yet the literature examining how RBOs develop adaptation strategies is still nascent (Kranz et al., 2010).

To address this gap, we explore how the nature of external stressors influences adaptive responses within a single RBO – the Mekong River Commission (MRC). The Mekong is an important international river basin to study adaptation because it has become vulnerable to climate-related and human-induced stressors (Grumbine and Xu, 2011). Not only does the Mekong provide a setting where the need for adaptation is present, but the MRC has adapted its programmatic structures in response to diverse types of stressors. In this paper, we compare four cases of adaptation that the MRC established in response to four common basin stressors: extreme flooding, drought, hydropower development, and climate change. These stressors vary in terms of their exposure and impacts on the basin. These differences allow us to explore how the characteristics of stressors influence an RBO's adaptive response. Specifically, we focus on how uncertainty surrounding the exposure of basin actors and uncertainty around the impacts of stressors shape adaptation responses – measured as the building of adaptive capacity – which we describe in more detail below.

2. Literature review: adaptation, stressor uncertainty, and adaptive capacity

A diverse body of literature, which explores how individuals, organizations, societies, and governments adapt to stressors such as climate change and natural hazards, can inform our understanding of adaptation within RBOs. This literature emphasizes that adaptation is part of a broader process that influences the vulnerability and resilience of social–ecological systems (Anderies et al., 2004; Walker et al., 2004). In general, the adaptation process is triggered when actors in a social–ecological system perceive that a stressor reaches a threshold level in the system – one that poses an obvious risk or vulnerability (IPCC, 2001; Yohe and Tol, 2002). Such vulnerability is a function of both the exposure to a stressor (e.g. the geographic extent, frequency, and probability of the stressor) and the impacts the stressor has on the health and vitality of actors or resources in a system (Turner et al., 2003). These impacts can include outcomes such as loss of life, disease, economic costs, and damage to ecosystems (Brooks et al., 2005). The exposure to and impacts of a stressor are thus key components of the decision calculus that actors in any context – whether in RBOs, local governments, or households – undertake in deciding when and how to adapt.[3]

Adaptation decisions in settings such as RBOs are collective choices, but made by individuals. Arguably, the degree of uncertainty surrounding the nature of a stressor can shape the decision-calculus of these individuals. We base this expectation on the assumption that individual decision-makers are boundedly rational, or intentional in their behavior but possess limited cognitive abilities to acquire and process information (Jones and Baumgartner, 2005). Scholars who employ a boundedly rational model of individual decision-making to explain collective action recognize that where there is relative certainty over the exposure of a stressor, the benefits of adaptation in mitigating those stressors are more likely to be perceived as outweighing the costs of not adapting (Ostrom, 1990; Scheffer et al., 2000). This argument is supported by literature that finds that the geographic proximity of crises – in other words greater certainty of their exposure – will enhance the likelihood that actors will adapt (Nohrstedt and Weible, 2010). Conversely then, greater uncertainty over exposure to the stressor can inhibit adaptation.

In terms of the uncertainty surrounding the impacts of a stressor, a similar argument holds. For instance, Young (2010) argues that a stressor that emerges abruptly can make the impacts difficult to predict, which can challenge adaptation. Even if a stressor is fairly predictable, a low probability of occurrence can create an element of surprise, or lack of knowledge about the impacts, especially in complex systems (Wilson, 2002; Schneider, 2004; Nelson et al., 2007). Thus, we would expect that higher uncertainty surrounding the impacts of a stressor may inhibit adaptation, while less uncertainty might foster adaptation.

Adaptation, of course, is not a binary outcome. The extent and types of adaptive responses can vary, just as uncertainty over stressors can vary. In particular, the extent of adaptation depends on the degree to which the response builds capacity to mitigate or respond to system vulnerabilities (Nelson et al., 2007). Therefore, in this paper we measure and operationalize the adaptation in terms of adaptive *capacity*. Generally, adaptive capacity refers to the institutional, technical, social and financial resources of actors to respond and adjust to stressors (Brooks et al., 2005; Gupta et al., 2010; Yohe and Tol, 2002). In the case of RBOs, adaptive capacity may include the technical processes created to understand river basin systems, institutional capacity such as shared rules to govern or manage water supplies, social capacity to collaborate across diverse actors and financial capacity. Many scholars recognize

[3] We recognize that many factors, beyond the nature of stressors, can influence the extent to which actors decide to invest in adaptation in the context of RBOs. For instance, where the values and beliefs of different member governments or stakeholders diverge on either the extent or importance of a problem, or where actors' beliefs diverge around how to address the problem (Page, 2007), the ability to engage in adaptation could be challenged. Further, in the case of international river basins, power issues might either promote or inhibit adaptation based on the upstream-downstream configuration (e.g. Zawahri and Mitchell, 2011; Stinnett and Tir, 2009). We hone in on uncertainty, however, as a starting point to build theory.