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Context matters: Context-related drivers of and barriers to climate information use

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ABSTRACT

This review addresses a critical research gap concerning why climate information (CI) is used (or not) and contributes to narrowing the knowledge-action gap to improve climate adaptation. The article reviews research on factors that are endemic to the context of CI use and that can influence whether use happens. It synthesizes factors that promote or impede use at three levels of social aggregation: the micro, meso, and macro levels. The organizing principle of the micro, meso, and macro levels enables a consideration of the nested social layers that comprise the context of CI use. The micro level consists of factors at the smallest level of social aggregation, individuals who use (or do not use) CI. The meso level consists of larger social aggregates, organizations, with leadership, decision-making processes, and technical and human capacity that influence CI use. Finally, the macro level is comprised of the political environment in which individuals and organizations operate, and which may be more or less supportive of CI use. Though the review is focused on the context of water management, the implications are much broader. A conceptual model is introduced to help explain how context shapes CI use. While the interactions between producers and users and the ways in which users see CI influence whether CI use happens, use only happens if elements in the micro, meso, and macro level contexts align to support use. That is, even when the best conditions for interactions between producers and users exist, these interactions alone may be insufficient in a context that stymies CI use, for political reasons or due to organizational dynamics. By attending to context, this new conceptual model shows where and how to strategically invest in supporting CI use.

1. Introduction

Mounting threats to the amount and quality of drinking water supplies make adaptation to climate change in the water sector now critical (Georgakakos et al., 2014). Yet, research suggests that water managers are not universally considering climate change in long-term planning (Dilling et al., 2015; Kirchhoff and Dilling, 2016) and that most water managers do not use climate information[1] (CI) to inform adaptation decisions (Lemos et al., 2012; Kirchhoff, 2013; Kirchhoff et al., 2015). This lack of use is pervasive not only among water managers but also among farmers (Haigh et al., 2015; Mase and Prokopy, 2014), agricultural advisors (Lemos et al., 2014a,b; Prokopy et al., 2013), urban planners (Mills et al., 2010), and users in the energy and transport sectors (Bruno Soares and Dessai, 2016; Troccoli et al., 2010). Scholars have sought to understand this lack of use focusing on two main areas: problems with the

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[1] By "climate information" we mean information that includes climate change projections, interannual and seasonal climate forecasts consistent with Lemos et al. (2012: 790).

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information itself and issues associated with how CI is produced. Regarding the information itself, a large body of research suggests that the ways in which users perceive the accuracy, credibility, saliency, and timeliness of the information affects whether or not users view the information as usable (Cash et al., 2003; Lemos et al., 2012; McNie, 2012). Beyond the information itself, an extensive and growing body of research on the process of CI production suggests that interactions between producers and users, especially through boundary organizations, facilitate CI use both by increasing producers and users' understanding of each other's perspectives and expectations and by building trust between producers and potential information users (Beier et al., 2015; Gordon et al., 2016; Kiparsky et al., 2012; Kirchhoff, 2013; Kirchhoff et al., 2013a,b, 2015; Lemos and Morehouse, 2005; Lemos et al., 2012; McNie, 2012; Moss et al., 2013; Prokopy et al., 2017; Steinemann, 2006). Bridging these two domains, emerging research on knowledge networks and communities of practice suggests that CI use improves within specialized networks that are able to increase the fit of information to better meet user needs (Guido et al., 2016; Kalafatis et al., 2015). Research in these areas has dominated our response to addressing the knowledge-action gap.

To date, the primary avenue for addressing the knowledge-action gap has been through processes that bring producers and users together to change the characteristics of the information itself and to influence users' perceptions and attitudes towards the information to make it more likely to be used. For example, Kirchhoff et al. (2015) found that the partnership between two organizations (the Great Lakes Integrated Sciences + Assessment [GLISA] and the Huron River Watershed Council [HRWC]) on the Climate Resilient Communities Project (CRCP) led to greater use of CI. Sustained interactions between these two organizations improved the usability of the information, which in turn increased CI use. Similarly, sustained interactions between organizations in a boundary chain promoted CI use between GLISA and other linked organizations according to Briley, Brown, and Kalafatis (2015). Other Regional Integrated Sciences and Assessments programs (RISAs) like GLISA and the Western Water Assessment (WWA) in Colorado "connect with decision-makers at multiple levels within a region" (Gordon et al., 2016: 236, 237) to inform as well as co-produce CI that is more useful for managers and, as such, more likely to be used (Lowrey et al., 2009). Coproduction approaches have also been effective for promoting usability of CI for agriculture (Prokopy et al., 2015; Prokopy et al., 2017) and for managing adaptation in the Arctic (Armitage et al., 2011). While these interactive processes have been effective at bridging the knowledge-action gap for some users in some contexts, there are other cases in the literature where interactions with producers of CI does not result in use (see for example, Engle, 2012; Kirchhoff et al., 2013a,b; Lövbrand, 2011; Rasmussen et al., 2017) or where available and potentially usable CI goes unused (see for example, Bedsworth and Hanak, 2010; Bruno Soares and Dessai, 2016; Lemos, 2008; Rayner et al., 2005; Rice et al., 2009). Reasons for this lack of use have to do largely with the context of use rather than the characteristics of the information or the process of information production. By context of use, we mean factors that pertain to the characteristics of individual CI users, their organizations, and the broader institutional and political environment within which they work. Unfortunately, while scholars know a great deal about the characteristics of CI that influence use and about how CI is produced that affect use, much less attention has been paid to developing a systematic understanding of context-related factors and their influence on CI use. Consequently, continued efforts to improve the process of climate information production, dissemination, and communication (Lemos et al., 2014a,b; Vaughan et al., 2016; Vaughan and Dessai, 2014) without sufficient regard to a systematic consideration of the context of use, may be insufficient to fully bridge the knowledge-action gap.

We argue that to advance progress and bridge the knowledge-use gap we must develop a more holistic and comprehensive understanding of the range of factors and dynamics endemic to the context of use that impede or promote CI use. We must also begin to develop conceptual models about how these context factors and dynamics work together with what we know about the characteristics of information and CI production to support or constrain use.

This review aims to begin to fill this critical gap by advancing knowledge about barriers and enablers to CI use that exist within the context of use of CI in the water sector. Early work applicable to this area of inquiry suggests there are three aspects related to the context of use that influence CI uptake: the characteristics of individual CI users (e.g., whether or not they perceive climate-related risks), the characteristics and dynamics of the organizations within which individual users work (e.g., the type of organizational culture), and the political environment within which the potential user and their organization operate (e.g., the level of politicization of climate change) (see for example, Bolson et al., 2013; Ekstrom et al., 2017; Kirchhoff, 2013; Lewis, 2015). Given this focus on factors nested within the individual, organizational, and institutional/political spheres, we structure the literature review by synthesizing factors that promote or impede CI use at three levels of social aggregation: the micro, meso, and macro levels, see Fig. 1. These levels of social aggregation are commonly applied in the social sciences literature (see for example, Barrett and Swallow, 2006; Bergstrom and Dekker, 2014; Kapiriri et al., 2007; Reid et al., 2010) because they offer a useful organizing principle and take into account the nested nature of the social system (Dietz et al., 2010). Likewise, we adopt this organizing principle because it offers a useful way to illuminate the diverse array of context-related factors that influence CI use. To our knowledge, this review paper is the first to use this framing in the context of understanding drivers and barriers of CI use.

With a focus on the water sector, we begin the review by examining research that has explored the factors that promote or impede CI use at the micro scale of use. Micro is the smallest level of social aggregation and consists of the characteristics, perceptions, and behaviors of individual water managers who decide to use (or not use) CI. Next, we review the factors that promote or impede CI use at the next highest level of aggregation, the meso level, which is comprised of water management organizations. Water managers work within water management organizations that have their own characteristics, culture, and organizational dynamics that create (or stymie) opportunities for CI use. Next, we review research on the barriers to and drivers of CI use that exist at the broader macro level, or the institutional and political conditions that enable or constrain CI use. Finally, we discuss how different factors at the micro, meso, and macro levels work together to drive or constrain use. In doing so, we present a conceptual model that helps to begin to explain how context matters in efforts to bridge the knowledge-action gap for climate adaptation. We conclude with directions for future research.