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Contextual and interdependent causes of climate change adaptation barriers: Insights from water management institutions in Himachal Pradesh, India

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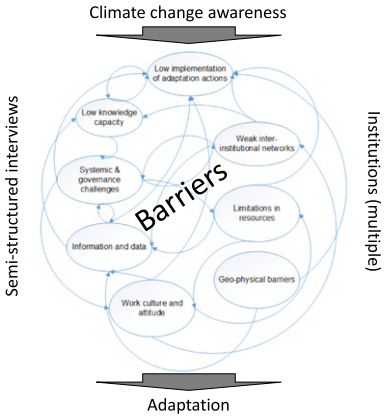
HIGHLIGHTS

- Investigates the poorly studied underlying causes of adaptation barriers
- Semi-structured interviews in Himachal Pradesh, India reveal complex interconnected barriers
- Low knowledge capacity compounds resource, information and data barriers
- Trust deficits, power struggles, and institutional fragmentation underpin observed barriers
- Systemic approach to barriers needs to consider socio-economic and institutional contexts

GRAPHICAL ABSTRACT



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ABSTRACT

Research on adaptation barriers is increasing as the need for climate change adaptation becomes evident. However, empirical studies regarding the emergence, causes and sustenance of adaptation barriers remain limited. This research identifies key contextual causes of adaptation barriers in water institutions in the mountainous Himalayan state of Himachal Pradesh in northern India. Semi-structured interviews were carried out with representatives from twenty-six key governmental, non-governmental, academic and research institutions in the State with responsibilities spanning domestic water supply, irrigation and hydropower generation, environmental monitoring and research. It identified low knowledge capacity and resources, policy implementation gaps, normative attitudes, and unavailability and inaccessibility of data and information compounded with weak inter-institutional networks as key adaptation barriers. Although these barriers are similar to those reported elsewhere, they have important locally-contextual root causes. For instance, inadequate resources result from fragmented resources allocation due to competing developmental priorities and the desire of the political leadership to please diverse electors, rather than climate scepticism. The identified individual barriers are found to be highly inter-dependent and closely intertwined which enables the identification of leverage points for interventions to maximise barrier removal. For instance, breaking down key barriers hindering accessibility to data and information, which are shaped by systemic bureaucracies and cultural attitudes, will involve attitudinal change through sensitisation to the importance of accurate and accessible data and information and the building

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trust between different actors, in addition to institutional structural changes through legislation and inter-institutional agreements. Approaching barriers as a system of contextually interconnected cultural, systemic, geographical and political underlying factors enriches the understanding of adaptation enablers, thereby contributing to achieving a better adapted society.

1. Introduction

Climate change is expected to be experienced most through water (IPCC, 2012; Jiménez Cisneros et al., 2014). Water institutions at all levels will need to adapt to climate change (IPCC, 2014), and hence, many national and regional governments are now developing adaptation policies and plans (Krysanova et al., 2010; Mertz et al., 2009; Pittock, 2011; Preston et al., 2010). However, many factors can stop, delay or divert even well-planned adaptation strategies (Preston et al., 2010; Moser and Ekstrom, 2010) if they are not adequately identified and addressed (Eisenack et al., 2014).

Barriers to adaptation has been defined from different aspects with terms such as limits (Dow et al., 2013), challenges (Fünfgeld, 2010), obstacles (Bedsworth and Hanak, 2010), and constraints (Klein et al., 2014) often being used synonymously. Klein et al. (2014) differentiated adaptation constraints from limits by defining the former as 'factors that make it harder to plan and implement adaptation actions' and the latter, following Adger et al. (2009); Dow et al. (2013); Islam et al. (2014), as 'the point at which an actor's objectives or system's needs cannot be secured from intolerable risks through adaptive actions'. On the other hand, Moser and Ekstrom (2010) defined barriers positively as 'obstacles that can be overcome with concerted effort, creative management, change of thinking, prioritization, and related shifts in resources, land uses, institutions, etc.'. Hence, a consensus is emerging among researchers to use 'limit' to refer to 'the threshold beyond which existing adaptation efforts cannot overcome it' (IPCC, 2014) and studies on adaptation 'barrier' commonly focus on the challenges emerging from socio-economic and institutional factors (Barnett et al., 2015; Biesbroek et al., 2014a; Eisenack et al., 2014; Oberlack, 2016). Adger et al. (2009), argued that limits (and barriers) are endogenous and emerge from 'inside' society and hence contingent upon ethics, attitudes to risks, knowledge and cultural values depending on the ultimate goals of adaptation. Therefore, Eisenack et al. (2014) stressed the contextual nature of adaptation barriers and defined them as 'an impediment to specified adaptations for specified actors in their given context that arise from a condition or set of conditions'. Hence, barriers can be 'valued differently by different actors, and can, in principle, be reduced or overcome' (Eisenack et al., 2014). This means barriers are contingent upon the attributes of adaptation, actors, and their context.

Moser and Ekstrom (2010) propose that resolving barriers, rather than skipping phases of the decision process, will ultimately prove beneficial for the decision outcome. This requires exposing and questioning the factors that stop, divert or delay institutions from effectively adapting (Berkhout, 2012), preventing them from becoming limits to adaptation (Barnett et al., 2015). If barriers are 'factors that make it harder to plan and implement adaptation actions' (Klein et al., 2014), then lack of knowledge, technology, financial resources, and political will are important barriers which many other studies have identified. For example, Engle (2012) pointed out the lack of financial resources, infrastructure, focus on short-term issues and competing developmental priorities as important barriers, while Amundsen et al. (2010) and Baker et al. (2012) pointed out legislation issues such as unclear roles of actors and lack of consistent and clear policy guidelines from state and federal governments based on specific case studies. However, although such generic barriers have been identified, the circumstances in which these barriers arise and persist are poorly understood (Biesbroek et al., 2014b) and require explaining (Eisenack et al., 2014). The relevance of this paper arises from the need to better understand why such barriers emerge and persist and how they are interrelated with other barriers and socio-cultural and politico-economic factors.

The ability of water management institutions to adapt to the new and changing climate depends on how decision makers within those institutions perceive and interpret the potential risks (Berkhout, 2012). However, public agencies, such as water supply departments, are also shaped by the constraints of external factors such as laws, regulations and socio-cultural-politico-economic context in which they operate (Pahl-Wostl, 2009; Roggero, 2015). Moreover, institutions operating in different sectors; from environment to irrigation to hydropower and domestic supply have both distinct and complementary roles in developing and implementing adaptation strategies (Adger et al., 2005; Fidelman et al., 2013; Nalau et al., 2015). This is particularly so for adapting water management to climate change from basin level management organisations to regional and national governments and local municipal bodies (Bisaro et al., 2010; Finger et al., 2006; Lebel and Garden, 2008; Mollinga et al., 2006; Pittock, 2011; Wilby and Wood, 2012). Barriers emerging from poor coordination between and within institutions responsible for planning and implementing adaptation strategies are particularly prominent in developing economies (Spires et al., 2014). But knowledge on barriers for institutions to adapt, particularly in developing economies, remains scattered and barriers emerging from socio-economic, political and cultural factors are poorly understood (Shackleton et al., 2015). Studies that seek to expound the underlying causes of barriers and the interdependences between them are lacking (Eisenack et al., 2014), due to which designing successful adaptation strategies remain challenging (Oberlack, 2016). Although there is a growing research interest on adaptation barriers in general, research on barriers for institutions to adapt is relatively minimal (Biesbroek et al., 2013). This study aims to address this key knowledge gap by

Box 1
Highlights of interview questions.

a) Views on climate change and likely impacts for Himachal
b) Adaptation strategies adopted or initiated
c) Involvement in the State Strategy and Action Plan on climate change
d) Guidelines and instructions received regarding climate change adaptation
e) Key partner institutions and reasons and challenges
f) Perceived role of institutions operating at different scales: Federal and State
g) Suggestions for adaptation enablers including for improved coordination and overcoming barriers and opportunities