



Adapting to climate change: three key challenges for research and policy—an editorial essay

INTRODUCTION

The volume of research on adaptation to climate change has expanded massively since the publication of the IPCC's First Assessment Report in 1990. Since 2000 at least 300 articles a year have been published on the topic of adaptation and climate in ISI listed journals, over 40% of all articles on the topic have been published since 2006, and in 2008 alone over 1200 articles on this topic were published (accounting for 15% of all papers). The main subject areas in which these articles were published says much about the nature and diversity of this research: the top 10 subject areas are ecology, environmental sciences, plant sciences, meteorology and atmospheric sciences, multidisciplinary geosciences, agronomy, evolutionary biology, forestry, environmental studies, and physical geography. So, while the sciences dominate the published research on adaptation and climate, most of the research fields are implicitly or explicitly multidisciplinary in nature. The main journals, too, are multidisciplinary, with the top three (by number of adaptation and climate publications) being *Climatic Change*, *Global Environmental Change-Human and Policy Dimensions*, and *Climate Research*. Of the top 20 journals in which this research is published, only two are social science journals.

Adaptation, then, has been investigated as a largely scientific and technical problem, albeit one that demands multidisciplinary approaches. There has been relatively little research on adaptation that seeks to inform decision makers, and much of the research seeks to estimate impacts and quantify vulnerability more than inform about options to avoid the adverse effects of climate change.¹ It is also the case that there are relatively few studies about adaptation that are informed by evidence about the ways in which social–ecological systems respond and adjust to change, and many more articles that explain concepts, propose models, and identify knowledge gaps. This is a reflection of the still fairly minimal presence of social scientists in adaptation research. Yet, as chapter 17 of Working Group II of the IPCC has

noted,² communities will respond to climate change in complex and diverse ways depending on their needs, values, cultures, capacities, institutional forms and environmental features, and understanding these characteristics, and how to plan for and manage them, is the very stuff of the social sciences.

Thus, consistent with the goal of *WIREs Climate Change* which seeks to take stock of, and enhance knowledge of, climate change in its broadest sense, the *Vulnerability and Adaptation to Climate Change* domain of the journal seeks to review and push forward the frontiers of knowledge about adaptation, but with a particular focus on knowledge that can inform decision-making about adaptation. The structure of this domain is therefore such that the articles draw largely from anthropology, economics, human geography, history, law, political science, public administration, public policy, and sociology, and in particular those approaches within these and other disciplines that seek to speak to policy. This editorial essay explains the logic of the structure of this domain in terms of three key challenges for policy-oriented research on adaptation.

The first challenge is the need to specify more clearly the goals of adaptation (adaptation for what purpose?) in order to move research and policy away from abstractions to focus on particular issues, places, and groups at risk. This inevitably entails understanding the values that groups hold and the contestation of values within and between groups that are likely to be associated with decisions about adaptation.³ The second challenge is to continue to learn about adaptation from investigations of specific instances of response to actual or cognate changes: a process that Glantz⁴ calls 'learning from analogy'. The third challenge is to understand the ways in which institutions—i.e., the reasonably predictable arrangements that structure transactions and relationships in a society⁵—enable and/or constrain adaptation to climate change. In this domain of *WIREs Climate Change* each of these challenges is the subject of an agenda-setting overview article, and a series of subsequent review and focus articles that provide greater depth and specificity of issues and approaches. The remainder of this article expands on

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these three key challenges for policy-oriented research on adaptation, and outlines the kinds of articles that will address them in this domain of the journal.

A VALUES-BASED APPROACH TO ADAPTATION

Adaptation refers to action or actions taken to avoid actual or anticipated impacts from climate change, or to attain potential benefits arising from climate change. Judgments of the success of adaptation actions, and goals for adaptation policies can only be based on subjective and social processes. Effective and efficient decision-making about adaptation requires identifying desired outcomes, either in terms of (negative) impacts avoided, or (positive) gains achieved. If adaptation is to be itself an adaptive process, then there is also a need for measures by which progress toward goals can be monitored and if necessary adjusted. Determining what these goals are entails understanding the way people value the things that are at risk from climate change, how those values come into being—and how they change—and how people may respond to damage to or the loss of these things. These things of value may be particular to individuals and communities, but some are also universal, such as the right to health, food security, freedom from violence, and employment. They may include elements of the natural environment such as species, ecosystems, or sites of significance, and may include elements of the built environment such as settlements and buildings. They may also include important social values, such as a sense of community, lifestyle, identity, and widely held values such as equity and justice.

If decision-making about adaptation is to be equitable, then processes of value elicitation will need to engage with the plurality of values that policy constituencies hold. Such processes can help identify potential maladaptations by highlighting adverse consequences on others that may arise from one group or sector's adaptation strategies. Communities most at risk must be engaged in value elicitation. However, there will often be larger communities of concern, e.g., in the case of damage to world heritage sites,⁶ or expatriate populations.⁷ In the case of decisions about adaptation concerning public goods, too, there may be diverse perspectives on the goals of, means to achieve, and costs of adaptation.

Thus in this domain of *WIREs Climate Change*, articles have been elicited that seek to explore the challenges of adaptation to secure key social values. These include adaptation to sustain or improve food security, human health, gender equity, peace, equity,

and poverty alleviation. There are linkages here to the *Climate and Development* domain.

LEARNING FROM WHAT CAN BE KNOWN

If adaptation is intended to sustain or enhance the provision of things that societies value, then assessments of vulnerability in part need to identify the values that are at risk. Too often these values are implied in the analysis, rather than derived through research with groups whose values are at risk. This is a function of the traditional approach to climate impacts research, which begins with modeling atmospheric and oceanic circulation, and then considers the effects of changes in these on various biophysical systems. Because the assessment process considers impacts on social systems last (if at all), issues about social vulnerability are subordinate. Thus climate change has predominantly been framed as an environmental problem, rather than as a problem concerning people's needs, rights, and values.⁸ This prevailing approach to climate impacts research has been called 'first generation' climate impacts research.⁹

There is a 'second generation' of research⁹ which sees climate changes as 'a societal problem that has an environmental constituent' (Ref 10, p. 537) and vulnerability as largely being the product of social forces.¹¹ It seeks to learn from historical and contemporary analogous events such as droughts, floods, and cyclones, and what these events reveal about vulnerability and capacity to respond to climate change and variability.⁴ Critically, it seeks to understand why climate change matters to exposed groups—what values and assets are at risk, and how adaptation responses can sustain those values and protect these assets despite uncertainty about risks.⁸ Both the approaches—first and second generation—are needed, but the former is increasingly being seen to be of less utility for adaptation than the latter.¹

Thus, this domain of *WIREs Climate Change* also includes articles that review research on cases of vulnerability and adaptation. The intention is to build a body of evidence about adaptation to diverse risks arising from climate change, from diverse places around the world. Although no single case can be the basis for decision-making about adaptation outside of that area of study, there may emerge from such a body of evidence some robust principles and lessons that can help guide further research and decision-making about adaptation. There are linkages here to the *Assessing the Impacts of Climate Change* and *Integrated Assessment* domains.

INSTITUTIONAL OPPORTUNITIES AND BARRIERS

The role of institutions in adaptation is widely discussed in the literature on adaptation. In part this is because the term ‘institutions’ has a broad meaning that covers much of the ‘social stuff’ that remains otherwise unexplored, but also because it is increasingly clear that how societies organize themselves at every level and in every sector is a critical determinant of adaptation. If, as Dovers⁵ defines them, institutions are regular social practices, then they include most facets of social life, ranging in scale from marriage to international regimes, and across diverse sectors such as resource management, international development, community services, and manufacturing. Understanding how institutions at each level and in each sector enable or constrain adaptation (and how indeed they give rise to goals for adaptation) is an important challenge.

There are some very important institutions that will influence the form that adaptation takes, although their influence varies from place to place and sector to sector. The law—i.e., the body of rules that govern society—is clearly important. So too are markets, in that how goods and services are exchanged determines their value, and the formal and informal rules that govern markets shape the extent to which markets can adjust (or be adjusted) to the effects of climate change. Governments are obviously critical institutions, particularly with respect to sustained or improved access to public goods. How governments interact in international regimes, and with the private sector and civil society is also very important. In terms of scale, it is the local scale institutions—be they customary governance systems, small businesses, local governments, or non-governmental organizations—that will most probably bear the brunt of adaptation actions, and so understanding how things work locally is critical. Finally, the institutional challenge of adaptation is not just a matter of adjusting specific institutions to

remove barriers or enhance opportunities; it is also a matter of harmonizing the activities of institutions across sectors and scales to maximize the efficiency, efficacy, and equitability of adaptation within and between societies.

Thus, this domain of *WIRES Climate Change* also includes articles that review research on the institutional dimensions of adaptation. These include articles on the role of markets, legal systems, the international climate change regime, planning systems, and customary governance systems in enabling or constraining adaptation. There are linkages here with the *Climate Policy and Governance* domain.

CONCLUSION

Adaptation has received relatively little attention thus far in climate change research and policy. Yet it is a concern that is rapidly growing, and will become more important as social systems increasingly experience climate impacts and recognize the need to adjust to future changes. Meeting the challenge of adaptation will take research and policy into difficult, if not entirely novel, terrain: the plurality of values within and between social systems needs to be recognized and reconciled as fairly as possible, the lessons from existing responses to cognate climate problems should be learned and institutionalized, and the ways in which societies are organized needs to be better understood and improved. The vulnerability and adaptation domain of *WIRES Climate Change* seeks to focus existing and future knowledge about adaptation according to these three challenges of understanding values, learning from multiple cases, and understanding institutions.

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