



Adaptive and risk-based approaches to climate change and the management of uncertainty and institutional risk: The case of future flooding in England



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ABSTRACT

This paper focuses on how scientific uncertainties about future peak flood flows and sea level rises are accounted for in long term strategic planning processes to adapt inland and coastal flood risk management in England to climate change. Combining key informant interviews ($n = 18$) with documentary analysis, it explores the institutional tensions between adaptive management approaches emphasising openness to uncertainty and to alternative policy options on the one hand and risk-based ones that close them down by transforming uncertainties into calculable risks whose management can be rationalized through cost-benefit analysis and nationally consistent, risk-based priority setting on the other hand. These alternative approaches to managing uncertainty about the first-order risks to society from future flooding are shaped by institutional concerns with managing the second-order, 'institutional' risks of criticism and blame arising from accountability for discharging those first-order risk management responsibilities. In the case of river flooding the poorly understood impacts of future climate change were represented with a simplistic adjustment to peak flow estimates, which proved robust in overcoming institutional resistance to making precautionary allowances for climate change in risk-based flood management, at least in part because its scientific limitations were acknowledged only partially. By contrast in the case of coastal flood risk management, greater scientific confidence led to successively more elaborate guidance on how to represent the science, which in turn led to inconsistency in implementation and increased the institutional risks involved in taking the uncertain effects of future sea level rise into account in adaptation planning and flood risk management. Comparative analysis of these two cases then informs some wider reflections about the tensions between adaptive and risk-based approaches, the role of institutional risk in climate change adaptation, and the importance of such institutional dynamics in shaping the framing uncertainties and policy responses to scientific knowledge about them.

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1. Introduction

While the scientific challenges of assessing the impacts of future climate change are enormous, the institutional challenges involved in using that science for policymaking are arguably even greater. A growing body of work has highlighted the difficulties of reconciling the supply of climate science with the demand for research that is useful, useable, and used by policymakers (Sarewitz and Pielke, 2007; Dilling and Lemos, 2011; Kiem and Austin, 2013). Others have pointed to processes of co-production

and institutional boundary-work involved in the construction of science and its use in policymaking and political debate (Shackley and Wynne, 1996; Demeritt, 2001; Lemos and Morehouse, 2005; Lövbrand, 2011). For instance, science agencies often assume that adaptation policymaking requires more accurate and detailed predictions about future climate changes. To this end, the UK Research Council's Living with Environmental Change Strategy has promised to "strengthen the evidence base for policy, by addressing the uncertainties about the impacts of environmental change" (LWEC Partnership, 2011: 3). But that assumption and the associated linear model of upstream science feeding into policy decision-making downstream are both contested (Demeritt, 2006; Dilling and Lemos, 2011; Kirchhoff et al., 2013).

Alongside an increasingly vocal debate among climate scientists about the priority and policy relevance of reducing scientific

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uncertainties (Mearns, 2010, 2012; Meyer, 2012), a growing social science literature has sought to explain how climate policymaking should proceed in the face of uncertainty. While some advocate risk-based approaches to optimizing climate policymaking (Yohe and Leichenko, 2010; Cox, 2012; Ekström et al., 2013; Borgomeo et al., 2014), others endorse flexible, adaptive management strategies for dealing with uncertainty (Holling, 1978; Pahl-Wostl, 2006; Allen et al., 2011) or urge the need for decision-making that is robust to errors in current understanding (Dessai and Hulme, 2007; Lempert and Groves, 2010; Wilby and Dessai, 2010). Although these approaches share some common roots in the traditions of academic decision analysis, we show in this paper how the institutional logics driving the adoption of risk-based climate adaptation are in strong tension with the principles of adaptive management. More specifically, risk-based approaches aim at closing down the vast space of future possibilities by attributing probabilities and consequences to them in order to optimize decision-making and deflect criticism by rationalizing how far it is reasonable to go in seeking to prevent potential adverse outcomes (Power, 2004; Amore, 2013; Oels, 2013). Adaptive management approaches, by contrast, seek to keep the management process open to the uncertainties inherent in future developments by highlighting the conditionality and contestedness of current knowledge about the future (Holling, 1978). While the conceptual distinctions between closing down and opening up are widely acknowledged in academic science studies (Irwin, 2006; Stirling, 2007), if perhaps not always in the normative literature on climate policymaking – compare Hallegatte (2009) and Stern (2006) with Bellamy et al. (2013) – the tensions between them and their practical implications for adaptation and the institutional dynamics of policymaking and implementation are less well understood.

To explore these issues we compare how uncertainties figured in the execution of three related long-term strategic planning processes designed to ensure Flood and Coastal Erosion Risk Management (FCERM) in England is adapted to climate change. With devolution, responsibility for FCERM in other parts of the United Kingdom is now overseen by the devolved administrations in Scotland, Wales, and Northern Ireland. Though differing in some small details, their approaches to FCERM are broadly similar to those in England. England was chosen as the site for this comparative case study analysis because the national adaptation programme for England (Defra, 2013a) and associated policy guidance for taking climate change into account in FCERM (MAFF, 1993, 2000; Defra, 2006a, 2009; EA, 2011a) require decision-makers to follow an adaptive management approach to allow flexibility for responding to future changes that are uncertain or as yet entirely unknown. On the other hand, however, the strategies for FCERM in England are also notable for their full-throated commitment to being ‘risk-based’ (Defra, 2004; Johnson and Priest, 2008; EA, 2011b). In keeping with the UK government’s longstanding advocacy of risk-based approaches to ‘better regulation’ (Dodds, 2006; Rothstein et al., 2013; Demeritt et al., 2015), FCERM uses various risk-based technologies and policy instruments, like risk mapping, risk-based protection standards, and risk-based resource allocation, to calibrate policymaking and ensure that FCERM interventions are proportionate to their expected costs and benefits (Krieger, 2013). In this way, ‘risk’ is not simply an object to be managed, but a central principle for the organization of FCERM itself. Rather than trying to eliminate all potential harms, risk-based approaches aim for an optimal balance between socially acceptable levels of risk and the costs of further risk reduction.

These alternative policy commitments pull those responsible for adapting FCERM in different directions. Adaptive management ideas enjoin policymakers to acknowledge uncertainty and adopt

provisional measures that can be adjusted or even reversed with learning from experience. This emphasis on openness and flexibility can be challenging. FCERM often involves multi-million pound decisions about whether to invest in protection schemes whose up-front costs will only be repaid, if ever, by benefits realized many years into the future. While deferring investment or planning FCERM in stages “through multiple interventions” (Defra, 2009: 23) can preserve the space to adapt to new information, it also introduces delays and opens avenues for criticism and inconsistency that can increase costs and complicate implementation. As well as being adaptive, FCERM must also be risk-based so as to ensure its proportionality and cost-effectiveness (Defra, 2004; EA, 2011b). This requires policymakers to close down uncertainties and transform them into calculable risks (Lane et al., 2011a) whose management can then be rationalized through cost-benefit analysis and nationally consistent, risk-based priority setting. Whatever approach they take to managing uncertainty, the organisations responsible for FCERM also face second-order institutional risks of criticism and blame for their conduct and decision-making in managing the first-order risks to society for which they are accountable (Rothstein et al., 2006). As we will detail below, concern for managing these second-order institutional risks not only shapes how the first-order risks to society from future flooding are understood and managed but also feeds back to inform how uncertainties are framed and science used to inform revisions to the management framework itself.

The paper is organized as follows. After describing our data and methods, we define our conceptual approach to understanding risk and uncertainty and explore their implications for adaptation decision-making and the emergence of institutional risk. An institutional overview of adaptation and FCERM in England then sets up two empirical case studies of how climate change uncertainties about peak flood flows and sea level rise are accounted for in different FCERM processes. In the first the poorly understood impacts of future climate change were represented with a simple precautionary adjustment to peak flow estimates. Although crude, this one-size-fits-all adjustment provided a basis for formulating FCERM plans that was robust to institutional challenges, at least in part because its scientific limitations were only partly acknowledged by all of the various parties involved. By contrast in the second case, greater scientific confidence led to successively more elaborate guidance on how to represent the science. This, however, then led to inconsistencies in how future sea level rise was taken into account in different FCERM planning processes and thus increased controversy and institutional risk for the operational officials involved. Comparative analysis of these two cases then informs some conclusions about the tensions between adaptive and risk-based approaches, the role of institutional risk in adaptation, and the importance of institutional dynamics in shaping the framing climate uncertainties and policy responses to scientific knowledge.

2. Case study design and methodology

Our case study used a mixed methods approach combining policy document analysis with key informant interviews conducted in the summer of 2011. Whereas policy documents disclose the formal basis by which climate change considerations are incorporated into FCERM, interviews illuminate the informal processes and ‘backstage’ understandings shaping the design and implementation of those policies and of the science underwriting them. To exploit these complementarities and the potential for source triangulation to enhance the validity of analysis, research proceeded iteratively, with data collection interspersed with periods of analysis.

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