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ScienceDirect

Policy and Society 35 (2016) 115–123

policy and society

www.elsevier.com/locate/polsoc

Introduction

Embracing Uncertainty in Policy-Making: The Case of the Water Sector

Abstract

Recent research on policy-making under uncertainty in the water sector has contributed to our understanding of types and sources of uncertainty as well as to the development of tools and approaches to manage uncertainty. This paper reviews the literature and identifies several strands of systematic bias, notably an emphasis on natural sources of uncertainty over human sources; a tendency to treat sources of uncertainty as independent and a corresponding neglect of interaction between sources; and a focus on tools to reduce or contain uncertainty rather than to accommodate it. The papers in this issue contribute to overcoming these biases.

1. Introduction

Rising concerns over climate change have placed policy-making under uncertainty in the spotlight in recent years (Hall et al., 2012; Polasky, Carpenter, Folke, & Keeler, 2011; Yousefpour et al., 2012). On the one hand, while there is no doubt that greenhouse gas emissions will have a major impact on climate, scientists and researchers have yet to settle on predictions of the extent of climate change in the near future, an essential condition for decisive action on the issue (Knutti & Sedláček, 2013; Weitzman, 2009; Whitmarsh, 2011). On the other hand, the stakes of delaying actions would be prohibitively high due to the magnitude of the potential impact. An approach of avoiding or ignoring uncertainty by repeatedly putting off decisions, a common response by policy-makers faced with uncertainty, would be grossly inadequate with regard to climate change (Adger et al., 2011; Eriksen et al., 2011; Hobson & Niemeyer, 2011; Morton, Rabinovich, Marshall, & Bretschneider, 2011).

Recent research on the typology of uncertainty has greatly contributed to improving our understanding of the nature of the challenges in dealing with uncertainty in policymaking (Koppenjan & Klijn, 2004; Walker, Marchau, & Swanson, 2010). First of all, there is a high level of agreement among scholars in distinguishing between epistemic and ontological uncertainty, where epistemic uncertainty stems from imperfect knowledge of a system while ontological uncertainty relates to inherent variability and unpredictability in the system itself (Brugnach, Dewulf, Pahl-Wostl, & Taillieu, 2008; Isendahl et al., 2009; Walker, Haasnoot, & Kwakkel, 2013). Such a distinction is critical because it suggests that different methods will be required to deal with different types of uncertainty. For example, more research and technological innovations would help to reduce epistemic uncertainty while little can be done to reduce ontological uncertainty.

In addition, advances have been made in considering a broader range of sources of uncertainty beyond the natural system. Since much uncertainty in policy-making is rooted in imperfect knowledge about human behaviour, as well as inherent variability and unpredictability of such behaviour, and therefore, uncertainty in the economic, social and

http://dx.doi.org/10.1016/j.polsoc.2016.07.002

political systems is just as critical to policy-making as that stemming from the natural system (Brugnach et al., 2008). More importantly, the interplay of uncertainty originating from different systems has added another layer of complexity in dealing with uncertainty in policy-making (Drieschova & Fischhendler, 2012).

Scholars have also broadened the study of sources of uncertainty beyond imperfect knowledge and variability to encompass the subjective nature of uncertainty. The fact that there are multiple stakeholders involved in the policy process, each with their own belief systems, views, preferences and interests, and thus their own interpretations of the same information, gives rise to a new type of uncertainty – ambiguity, ''a situation in which a decision-maker does not have a unique and complete understanding to be managed'' (Brugnach, Tagg, Keil, & de Lange, 2007).

Despite the advances made in developing a typology of uncertainty, systematic treatment of mechanisms, tools, and techniques in dealing with uncertainty in policymaking has been rare. Techniques taught extensively in public policy schools, such as sensitivity analysis, decision-tree analysis, system dynamics modelling and Monte Carlo simulation, invariably require the specification of not only future states but also their probability distribution, a condition rarely satisfied in the real world of policy-making. While the institutionalist literature has shown how institutions – the formal and informal rules and norms that shape interactions – can be harnessed to reduce uncertainty (North 1993, Calvert, 1995), it has focused mainly on factors external to the policy system, thus paying little attention to how institutions might constrain or exacerbate external sources of uncertainty (Shepsle, 1986).

Furthermore, little effort has been given to address complexities arisen from the co-existence and interaction among multiple sources of uncertainty. Identifying and treating sources of uncertainty in isolation may result in policy that is ill-prepared to deal with a situation in which multiple risks are realized at once. Moreover, while there have been attempts to address epistemic uncertainty resulting from imperfect knowledge and in measuring ontological uncertainty, effort in addressing ontological uncertainty and in dealing with ambiguity resulting from multiple knowledge frameworks has been scarce (Dewulf et al., 2005).

The water sector may provide fruitful ground to assess both the potential and limitations of some recent attempts aiming at dealing with uncertainty in policy-making. First of all, as an essential resource for human survival, the sector has received a disproportionately high level of attention unmatched in many other sectors, especially in countries and regions encountering water shortages, and substantial effort has been made in dealing with uncertainty in policy-making in water sector. Concerns about climate change reinforce this, as much of the impact is expected to be felt through the availability and quality of water (Stern, 2007).

In addition, there is a wide spectrum of policy sub-fields within water sector, such as flood prevention, security of urban water supply, and resource allocation in international river basins, each with its own unique set of characteristics with regard to nature and sources of uncertainty. Thus, experience in the sector may offer lessons useful for a range of other policy fields.

Lastly, the understanding of the sources of uncertainty has extended beyond variability in the natural system such as the hydrological cycle, to examine imperfect knowledge and variability in economic, social and political system, as decision-making in the water sector is no longer dominated solely by hydrologists and engineers. The broadening of participation in policy-making in the water sector has resulted in new thinking about how to deal with uncertainty that might be of interest to other sectors.

This theme issue brings together a collection of papers addressing uncertainty in policy-making in the context of water sector. The papers extend our understanding of uncertainty by considering political, social and economic sources of uncertainty in addition to natural sources, and by considering subjective uncertainty in multi-actor decision processes. Furthermore, they draw attention to how some of the mechanisms adopted by decision-makers to deal with uncertainty – laws, regulations, contracts – may in fact be subject to uncertainty themselves.

The papers also contribute to the evaluation and extension of tools for policy-making under uncertainty, showing how and under what conditions innovative methods can be successfully applied and scaled up. In order for these tools to be genuinely useful for policy-makers in the policy design process, their value needs to be demonstrated and policy-makers need to have confidence in the soundness of the methods.

A theme running through all the papers in this issue is the value of acknowledging and working with uncertainty in the policy-making process, rather than seeking at all costs to reduce it. By recognizing the limits of their knowledge, decision-makers may give themselves greater flexibility and better prepare the societies they govern for an uncertain future.