Journal of Environmental Management 113 (2012) 228–236

Contents lists available at SciVerse ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Environmental planning and management in an age of uncertainty: The case of the Water Framework Directive

Jeremy G. Carter*, Iain White

School of Environment and Development, University of Manchester, Oxford Road, Manchester M13 9PL, UK

ARTICLE INFO

Article history:
Received 16 January 2012
Received in revised form
17 May 2012
Accepted 23 May 2012
Available online 6 October 2012

Keywords:
Scenarios
Future studies
Environmental planning
Uncertainty
Water Framework Directive
Decision making

ABSTRACT

Scenario planning is one of the most prominent methods applied by organisations to assist long-term decision making. This paper uses a case study method to demonstrate how scenarios can be operationalised to inform future strategies and to challenge rigid silo-based decision making approaches. The *WaterProof Northwest* scenarios developed by the authors in collaboration with a range of stakeholders, and described within this paper, offer a platform for considering the future of the water environment. The scenarios were developed in the context of meeting the goals of the European Water Framework Directive. This Directive has the core aim of improving the chemical and ecological status of Europe's water bodies. The scenarios highlight that water bodies in the case study area (the region of Northwest England) are impacted directly by a wide array of driving forces which will affect the state of the water environment over the coming decades. This analysis demonstrates that organisations responsible for creating and implementing long-term plans and policies to manage water are often far removed from the forces that will influence the effectiveness of the exercises that they are engaged in. The *WaterProof Northwest* scenarios highlight that organisations need different decision making approaches in order to adapt to modern environmental challenges. They also raise questions over whether environmental legislation such as the Water Framework Directive should incorporate a futures perspective in recognition of the wide ranging forces influencing their implementation.

1. Introduction

Analysing recent trends, integrating varied potential drivers of change and subsequently intervening through strategy and plan making to positively shape the future lies at the core of environmental planning. There is an implicit need to incorporate a 'futures perspective' in this field, and given this need, individuals and organisations should ideally be skilled at responding to uncertainty and complexity as part of the development of long-term strategies and forward plans. However, methods and approaches to analyse and respond to future uncertainties are not widely engaged with nor applied. Over recent decades, an increased level of awareness of the sheer unpredictability of complex natural and constructed systems has begun to emerge as societies experience the impacts of synergistic crises and powerful individual events (Brown et al., 2010). Changing climates, global financial crises and natural disasters affect economies, nations and ecosystems across the globe, highlighting the presence of external forces that lie beyond the control of even the most seemingly sophisticated organisational structures (Renn, 2008; Smil, 2008; White, 2010). Anticipating and incorporating these complex issues within environmental planning can bring significant benefits. However, the development of long-term strategies, plans and decisions are hampered by often narrow disciplinary, geographic or temporal foci of organisations. As understanding of the interconnected and global-localising nature of modern society deepens, planning and decision making practices should also evolve to better prepare actors and agencies for these wider, and progressively more dynamic, drivers of change.

In order to best serve the public, scientists and policy makers have a responsibility to recognise and respond to evolving circumstances that influence societies, economies and natural environments. All too often, however, responses materialise after a serious event has been experienced or a 'weak signal' becomes magnified. The increased risk of New Orleans to catastrophic flooding by a gradual erosion of natural defences and inappropriate development had been highlighted prior to Hurricane Katrina in 2005 (Wisner et al. 2004), yet this insight did not alter practice in order to lessen this risk. Whilst it is reasonable to assume that not

* Corresponding author. Tel.: +44 1612756882.
E-mail addresses: jeremy.carter@manchester.ac.uk (J.G. Carter), iain.white@manchester.ac.uk (I. White).

0301-4797/$ – see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.jenvman.2012.05.034

all such risks can be anticipated, in the New Orleans case the data was there and the threat identified. It is clear that evidence of a problem, identification of tangible causal chains and the proposal of possible solutions does not always provide a strong enough argument to motivate changes to plans or processes until *after* a detrimental event.

Although it is increasingly understood that many events have a direct or indirect influence way beyond their perceived sphere, to be more resilient to change there is a clear need to build strategic thinking into the process of developing strategies and forward plans. Whilst it is acknowledged that damaging events do have the potential to set agendas (Kingdon, 1984) or create momentum for policy change, for example in the case of flood risk management (Johnson et al., 2005), this is clearly an unsustainable, reactive process. There is real value in adopting a more long-term strategic view supported by appropriate tools and techniques, and developing a knowledge base to help better respond to the possible array of future uncertainties.

Enhancing knowledge and awareness of the dynamic nature of problems affecting society, and their potential implications, is a precursor to understanding how best to adapt governance structures and decision making processes. Taking this broad challenge as its starting point, this article provides theoretical and practical insights into addressing uncertainty and complexity with a particular focus on environmental planning. Broad themes related to the motivation for, and methods lying behind, future thinking are discussed. Specific focus is paid to scenarios, which have emerged as a key route for embedding futures perspectives into planning and decision making. The *WaterProof Northwest* project, which developed scenarios to incorporate a long-term perspective within water management in Northwest England, is analysed as a case study (Carter and White, 2010). *WaterProof Northwest* is discussed in the context of the methods employed and the transferable learning that the process, and the interpretation of its outcomes, generated. Particular attention is paid to the European Water Framework Directive, which set an important context for the development of the *WaterProof Northwest* scenarios.

This article aims to stimulate a wider appreciation of the value of scenario development as a tool to address the inherent uncertainty and complexity that characterises environmental decision making, and increase awareness of how this approach can be applied in practice. The insights contained with this article, including the learning generated from engaging in the process of scenario development, can support proactive future-oriented decision making in the field of environmental planning and management.

2. Futures methods

> "*We can either stumble into the future and hope it turns out alright or we can try and shape it. To shape it, the first step is to work out what it might look like*".
>
> (Ladyman, 2006)

The view that some issues are just too complex to be resolved by standard, linear and analytical approaches is not a new one. Rittel and Webber (1973) compartmentalised problems into two types: *tame problems* and *wicked problems*, where the latter may be multi-causal, dynamic, subject to ambiguity, and importantly, resist resolution. In addition to this complexity, the high degree of uncertainty characterising many contemporary issues was highlighted by Funtowicz and Ravetz (1991) who advocated that we should move towards 'post-normal' science; reflective of a situation where data may be limited and normal planning and decision making approaches may not be equipped to provide timely interventions. Owens and Owens (1991) have also questioned the effectiveness of the traditional environmental policy and planning cycle, which may create implementation gaps inhibiting action, particularly where information is hard to quantify, problems are complex and the distribution of related costs and benefits varies spatially and temporally.

Despite the high degree of uncertainty that characterises the description and analysis of forces with the potential to shape the future, planners and decision makers must continue to develop and implement long-term plans and strategies that aim to maintain and improve environmental quality. Indeed, there are often legislative mechanisms in operation at supra-national and national scales that mandate the production of such plans and strategies in fields including water management, nature conservation and flood risk management (European Union, 2000, 2007). The long time horizons that characterise such legislation implies the need for methods and approaches that offer a means of embedding 'future thinking' and 'horizon scanning' into environmental planning. Further, the increased focus on sustainable development over recent years, and the intergenerational timescales that this concept implies, has moved the task of considering potential future patterns of growth and development to the centre of policy and scientific agendas (Rankin, 2005).

Perhaps as a result of the uncertainty influencing environmental planning and management agendas and the associated challenges for planners and decision makers, Skaburskis and Teitz (2003) state that spatial planners have tended to overstate and exaggerate future forecasts when these are compared with eventual outcomes. They cite reasons for overstating future conditions and outcomes, including limited knowledge of the complex processes affecting cities and social networks (and how these systems and processes function themselves), errors in estimation based on projecting forward past trends, limited information on relevant issues and institutional factors affecting the forecasters. Exaggerated predictions may also result from an underestimation of the power of individual and collective behaviour change that can act to moderate the impact of emerging trends (Skaburskis and Teitz, 2003).

There is, however, a range of decision aiding tools and techniques that can help to overcome some of the pitfalls of forecasting outlined above, enabling a more nuanced perspective of possible future conditions to be gained. These can be broadly categorised according to the time horizons that they focus on. Quantitative trend analyses are data driven approaches generally used to make near-term projections based on existing trends using mechanical and sometimes statistical methods. These include time-series forecasts and trend extrapolations, which are used to project forward relatively stable systems and processes such as demographic change. Their objective nature makes such approaches easy to communicate, but they generally fail to address dynamic processes that are not easy to quantify. Also, as noted by the Cabinet Office (2001: 6) trend analyses are "…extrapolations of the past…" and should therefore ideally be complemented by with qualitative approaches that provide scope to incorporate the consideration of future drivers of change. Indeed, predictive modelling is not well suited to studying complex and integrated social and ecological systems that are strongly influenced by human behaviour (Rankin, 2005).

Qualitative trend analyses, which generally have a longer term focus, are based on the notion that many of the seeds of the future are contained within the present, although relevant information is often widely dispersed and difficult to extrapolate. Investigating potential 'mega-trends' across the fields of society, politics, environment, economics and technology is one route into gaining a better understanding of forces that could exert a significant influence over the future of a defined topic. This process is also referred to as 'horizon scanning.' Looking beyond the traditional