Environmental Impact Assessment Review 43 (2013) 144–150

Contents lists available at ScienceDirect

Environmental Impact Assessment Review

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

Avoiding climate change uncertainties in Strategic Environmental Assessment

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ARTICLE INFO

Article history:
Received 16 December 2012
Received in revised form 30 May 2013
Accepted 2 July 2013
Available online 13 August 2013

Keywords:
Climate change
Uncertainty
Decision-making
Strategic Environmental Assessment

ABSTRACT

This article is concerned with how Strategic Environmental Assessment (SEA) practice handles climate change uncertainties within the Danish planning system. First, a hypothetical model is set up for how uncertainty is handled and not handled in decision-making. The model incorporates the strategies 'reduction' and 'resilience', 'denying', 'ignoring' and 'postponing'. Second, 151 Danish SEAs are analysed with a focus on the extent to which climate change uncertainties are acknowledged and presented, and the empirical findings are discussed in relation to the model. The findings indicate that despite incentives to do so, climate change uncertainties were systematically avoided or downplayed in all but 5 of the 151 SEAs that were reviewed. Finally, two possible explanatory mechanisms are proposed to explain this: conflict avoidance and a need to quantify uncertainty.

1. Introduction

Uncertainty in Strategic Environmental Assessment (SEA) has been a recurrent theme within the literature for well over two decades. In the early stages of SEA, for example, Lee and Walsh (1992) noted that "ensuring that uncertainty is satisfactorily handled at each stage in the assessment process" is likely to be one of the most significant challenges faced when developing and implementing SEA (Lee and Walsh, 1992, p. 135). The body of literature within the field of uncertainty in impact assessment has grown substantially since then, with theoretical and empirical work that has attempted to develop a typology of risks and uncertainty (see, for example, Slovic et al., 1981; Lipshitz and Strauss, 1997; Walker et al., 2003; van der Sluijs et al., 2005; IPCC, 2007; Refsgaard et al., 2013).

The taxonomic approach to understanding uncertainty is useful, but insufficient in and of itself. Another key component of handing uncertainty is making sense of how people communicate and perceive uncertainty, since there are often large differences between the scientific, policy making, and non-scientific communities in their understanding of risk and uncertainty (Frewer, et al., 2003; Funtowicz and Ravetz, 1990; Hellström, 1996; Kuhn, 2000; Patt and Dessai, 2005; Walker, et al. 2003; Wardekker, et al. 2008). What has emerged from the literature is a consensus that communicating uncertainty is tricky, due to the trade-offs between scientific needs for precise enumeration/qualification of the underlying unknowns and policy-making needs of simplified analysis that does not demand detailed familiarity with the underlying science basis for policy decisions.

Since SEA is concerned with future states, dealing with uncertainty is an unavoidable part of assessment processes (Tennøy et al., 2006; Thissen and Agusdinata, 2008; Wilson, 2010) — though the degree and sources might be different from case to case. As stated by Zhu et al. (2011, p. 538) "*Since the future is inherently uncertain, all exercises about the future are facing, and should cope with great uncertainty. The same situation happens to SEA*". While uncertainty is involved in prediction, we very rarely, or never, succeed in having the information required or wanted. Zhu et al. (2011) have argued that there are both internal and external uncertainties involved in SEA. Internal in terms of changes brought on by the plan and changes in the natural environment being assessed and external in terms of uncertainty in social, economic, environmental, and policy development. All of these factors combine to yield a number of possible outcomes within the complex system under assessment (Zhu et al. 2011).

Apart from considering the question of uncertainty in impact predictions, handling uncertainties also involves presentation and communication, "*especially in the documents that most often reach decision-makers, the public and other actors*" (Tennøy et al., 2006, p. 55) — such as the environmental report required by the SEA Directive (European Parliament and Council of the European Union, 2001). Handling uncertainty requires communicating uncertainties in a way "*…which both match scientific practice and can be understood by lay people*" (Petersen, 2002, p. 87).

In the European Union Directive on SEA, the provisions for the content of environmental reports state that they should include "*an outline of the reasons for selecting the alternatives dealt with, and a description of how the*

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0195-9255/$ – see front matter © 2013 Published by Elsevier Inc.
http://dx.doi.org/10.1016/j.eiar.2013.07.003

assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information" (European Parliament and Council of the European Union, 2001, Annex 1, L 197/36). One of the difficulties encountered in an assessment can be uncertainty in different forms, including the uncertainty of the consequences of climate change in relation to the plan or programme. In the recently published EU Guidance on the integration of climate change into SEA, uncertainty is mentioned as one of the challenges that must be dealt with when working with climate change in SEA (European Commission, 2013). It is important to note that consideration of climate change issues should cover not only the impacts of the plan or programme on climate change such as calculations of greenhouse gas emissions, but also the climate change induced impacts on the plan and programme themselves, for example increased flooding events (Larsen and Kørnøv, 2009). SEA is particularly well suited for taking into account climate change objectives as it allows a broader strategic scope and also better consideration of cumulative effects associated with plans and programmes in a given sector or region.

The provisions of the directive have been translated directly into the Danish legislation on SEA (LBK nr 1398, 2007, Annex 1 (h)). In Denmark, they are supplemented with guidance stating that the potential impacts of a plan may be uncertain, for example due to the geographical extent of the plans and the range of activities that they may encompass. Also, it is stated that any assumptions made in the assessment should be made clear (VEJ nr 9664, 2006, pp. 45–6). From the above, it is clear that there is emphasis in the Danish guidance on uncertainty of the impacts resulting from the plan, rather than uncertainty of impacts on the plan, such as those of climate change.

Climate changes and the predictions of future climate are inherently uncertain (see for example Willows and Connell, 2003; Füssel, 2007; IPCC, 2007). According to Jenkins and Lowe (2003, p. 3), "*the climate of the future will be determined by two factors*: *the amount of man-made emissions of greenhouse gasses and other pollutants*, *and the response of the climate system to these emissions*" and both of these factors as well as impact assessments of climate changes are influenced by uncertainty (Jenkins and Lowe, 2003). For example, in the report *Impacts of Europe's Changing Climate* from the European Environment Agency, it is pointed out that there is uncertainty regarding how the climate system functions and how the driving forces of society will affect the climate system (Erhard, 2008). Specifically, future emission profiles are driven by factors such as population, economic growth, and technological development (Jenkins and Lowe, 2003). The IPCC (2005, p. 1) breaks down uncertainty into three categories:

- Unpredictability; related to unpredictable human behavior, and chaotic components of complex systems
- Structural uncertainty; related to inadequate modelling, conceptual frameworks, and system boundaries
- Value uncertainty; related to lack of data and parameters and inappropriate resolution

The uncertainty premise embedded in impact assessment is highly relevant and critical for climate change and the complex natural and social processes involved. In the European context, integration of climate change in SEA is also legally required (European Parliament and Council of the European Union, 2001). In spite of this, the 5-year monitoring review of the SEA Directive reveals that member states in general lack climate change integration and "*that much progress is still to be made to address biodiversity and climate change in SEAs*" (COWI, 2009, p. 42). In order to address this lack of integration, new guidance on climate change and impact assessment was published in 2013 (European Commission, 2013). In a Danish context, Larsen et al. (2012) find that climate change is increasingly considered in SEA, but that especially climate change adaptation is lacking attention. In an international context, however, other studies have found climate change adaptation better integrated in SEA (see for example Posas, 2011).

Based on the above considerations, this article is motivated by the perception that uncertainty is an important issue for SEA to deal with, and the authors currently see examples where uncertainty acts as a barrier for dealing with climate change. Prominently, in Denmark, climate change has been excluded as an issue in the process of preparing river basin management plans at state level based on an argument of uncertainty (Larsen, 2010). Furthermore, the Danish municipalities who are to prepare river basin management action plans state complexity, uncertainty, and long time horizons as being among the main barriers for dealing with climate change (Larsen, 2010). On this basis we find it worthwhile to explore the issue of climate change uncertainty in relation to planning through SEA as a planning and decision support tool.

The main purpose of this article is to investigate whether and how climate change uncertainties are acknowledged and presented explicitly in SEA practice in the case of Denmark. For this purpose, in Section 2 a theoretical model is developed for analysis. This model is used in Sections 3 and 4 where a document study of 151 SEA reports is presented. The final section offers two theoretical explanations for avoiding uncertainty, conflict avoidance and a perceived need to quantify uncertainty.

2. Strategies involved in uncertainty handling in decision-making

The question of how people respond to uncertainty has for decades been a focus within decision-making literature. Such literature (see e.g. Swin et al., 2009; Funtowicz and Ravetz, 1990; Dawes, 1988; Morgan and Henrion, 1990) can play an important role in our understanding of how SEA actors handle climate change uncertainty. When using the term SEA actors, we mean politicians, planners, and SEA practitioners who take part in the processes of development and implementation the SEA and thus determine how climate change uncertainty is handled. In this study, literature together with the authors' knowledge of the field is used to propose a model of strategies for how uncertainty is or is not handled in SEA. The model can be seen in Fig. 1 and is explained below.

Handling uncertainty in decision-making can happen according to different strategies. A basic premise for understanding how SEA actors handle uncertainty is to know if they are aware of the uncertainty in question and whether they accept its presence — thus whether uncertainty is acknowledged or not. If uncertainty is not acknowledged, explicit or implicit denial is a likely strategy.

The first strategy discussed is thus *denying uncertainty*. In this strategy, uncertainty is explicitly rejected either through denying that there is uncertainty or denying the relevance of the uncertain issue in question — in this case climate change. Denial can, for example, be understood in relation to "*the existence of climate change and human contribution to climate change, and could include more specific denial of the role that one's behavior or one's group's behaviors has in harming others*" (Swin et al., 2009, p. 126). According to Washington and Cook (2011, p. 1) denial is "*a refusal to believe something no matter what the evidence*". Washington and Cook point out various types of denial in relation to climate change, for example having impossible expectations such as stating that "*scientists can't even predict the weather next week, so how can they predict the climate years from now*" (Washington and Cook, 2011, p. 47). Thus in this strategy climate change or climate change uncertainty would not be considered real or relevant and would not be part of the SEA.

If, on the other hand, uncertainty is acknowledged, it is first a question of whether this is done explicitly or implicitly and thus whether uncertainty is presented or not. Funtowicz and Ravetz (1990) distinguish between three ways of presenting uncertainty: presentation of a range of results, characterisation of the methodological acceptability of results, and acknowledgement of ignorance about the system studied. In the case of