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Roles of scientists as policy advisers on complex issues: A literature review

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ARTICLE INFO

Keywords:
Roles of scientists
Policy advice
Complex issues
Scientific experts
Scientometrics

ABSTRACT

Background and Aims: Policymakers frequently encounter complex issues, and the role of scientists as policy advisers on these issues is not always clearly defined. We present an overview of the interdisciplinary literature on the roles of scientific experts when advising policymakers on complex issues, and in particular on the factors that influence these roles.
Methods: A structured literature search was combined with literature found in reference lists of peer reviewed papers (the snowball method). In total, 267 publications were analyzed using scientometrics analyses (discipline clustering analysis and co-citation analysis) followed by a qualitative analysis and interpretation.
Results: The scientometrics analysis shows an amalgam of disciplines that publish on our research topic. Five clusters of authors were identified based on similarities in the references used: post-normal science, science and technology studies, science policy studies, politics of expertise and risk governance. The content of the clusters demonstrates that authors in different clusters agree that the role of experts is influenced by the type of problem (simple or complex) and by other parties (the public and stakeholders). However, opinions vary on the extent to which roles can vary and the necessity to explicate different viewpoints.
Discussion and conclusions: Publications on scientific experts who provide policy advice affirm that such experts should and do hold different roles, depending on the type of problem and factors such as values held by the expert and the type of knowledge. We conclude that research on expert roles has remained mostly theoretical. Existing theories about science systems can be used to study real policy advice processes. Most theories are well elaborated, but empirical proof for the described changes, roles and processes is limited.

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http://dx.doi.org/10.1016/j.envsci.2014.03.002

1. Introduction

Policymakers are frequently confronted with complex issues. Highly industrialized countries are almost inevitably faced with new technologies that entail high degrees of uncertainty (Beck, 1992). In addition, some of the more mainstream environmental issues, such as air pollution, are still not fully resolved, and economic and environmental concerns are often considered contradictory. Scientists are regularly asked to advise on such complex issues. However, their role as policy advisers is not always clearly defined. This ambiguity is particularly true for contested issues, such as synthetic biology, antimicrobial resistance and nanotechnology. Because these issues are so new, it is impossible to present long-term research results that give a clear and unequivocal overview of the potential risks involved. Uncertainties inherent in such issues permit differences in the appraisal of risks. When experts differ in their interpretation of the uncertainty and consequently give different advice, these differences can affect the decisions of policymakers. An example is the topic of electromagnetic fields: uncertainty about the effect of electromagnetic fields has led to a situation in which some countries have adopted a precautionary approach and others have emphasized the absence of proof of adverse health effects and therefore have not implemented any policy interventions (Kheifets et al., 2001; Van Dijk et al., 2011).

In recent years, scholars have addressed the ways in which experts assess complex issues in a policy-relevant manner (Jasanoff and Wynne, 1998; McNie, 2007; Hessels and Van Lente, 2008). Approaches to policy advice and matching research and policy questions are addressed by a diverse set of theoretical concepts, such as wicked problems (Churchman, 1967; Rittel and Webber, 1973), ill-structured problems (Dunn, 1988; Simon, 1977), messy problems (Ackoff, 1974), unstructured problems (Hisschemöller and Hoppe, 2001), intractable issues (Eeten, 2001; Hisschemöller and Hoppe, 2001), systemic risks (OECD, 2003; Briggs, 2008) and untamed problems (WRR, 2006). Despite the diversity in terminology, a common characteristic of these concepts is that they refer to uncertain and potentially risky issues that merit a transdisciplinary approach, which indicates that these risky issues are embedded in wider environmental, social, economic and political systems (Beck, 1992; Sarewitz, 2004; Renn and Graham, 2005; Klinke and Renn, 2006; Briggs, 2008; Van Asselt, 2010; Van Asselt and Renn, 2011). In this paper, we refer to these types of issues as complex issues.

In 1945, Merton wrote about the role of scientific experts in policymaking. He particularly addressed the lack of empirical data on the actual roles of experts with respect to public policy (Merton, 1945). Furthermore, Merton suggested that common frustrations in the interaction between scientists and policymakers are related to (1) conflicts of values and (2) the different ways in which bureaucratic and academic organizations function (time horizons, communication styles, etc.). Then, as now, scholars note the peculiarity of studying the role of their own profession (Merton, 1945; Jasanoff, 2013).

Theories focusing specifically on scientists as policy advisers provide insights into common struggles in practice. For example, many policymakers seek certainties and solutions, whereas scientists typically offer probabilities, uncertainty and multiple scenarios. It is a complicated task to reconcile these different perspectives. To improve decision-making processes, it is necessary to bridge the resulting ''science–policy gap'' (Bradshaw and Borchers, 2000; Choi et al., 2009). Intermediaries between scientists and policymakers can help bridge this gap (Gieryn, 1983; Choi et al., 2005; Hoppe, 2009). However, others express the view that there is no gap but rather a continuous interaction between science and policy (Wesselink et al., 2013). In any case, the interaction between scientists and policymakers is intricate when the specific issue is surrounded by scientific uncertainties. To understand and discuss these interactions, several researchers have presented typologies and theories about the different roles of scientists as policy advisers on complex issues and the factors that influence such roles (Funtowicz and Ravetz, 1990; Hisschemöller and Hoppe, 1995; Weiss, 2003; Pielke, 2007). Although these studies address the possibility of different roles among experts, empirical support is scarce (Hoppe, 2009; Spruijt et al., 2013; Turnhout et al., 2013). Moreover, a comprehensive overview of the published literature on expert roles and their determinants has not been conducted. Such a review is essential as a first step toward using the knowledge about expert roles in practice and improving the interaction between scientists and policymakers. Therefore, we present a systematic literature review conducted to answer the following question: What are the factors that influence the way scientific experts advise policymakers on complex issues?

2. Methods

We conducted the literature search using two digital search engines: Scopus and Web of Knowledge. (Window 1) outlines the literature selection and key words used. Two researchers simultaneously performed the manual refinement. Differences in the assessment by the two researchers were discussed and led in most cases to dismissal of the publications. The three main reasons for dismissal were a language other than English, irrelevant content (e.g., similar keywords but different content, such as computer sciences) and the absence of an abstract (time constraints did not permit us to read full papers without first being able to filter on the basis of an abstract). We reviewed work published between 2003 and 2012 to obtain a workable number of papers. We assumed that influential ideas from older literature were sufficiently incorporated in the literature published during this ten-year period.

Because some major work appeared to not be published in peer-reviewed journals, we expanded our structured search using the snowball method. This approach required us to read and follow the reference lists of the publications identified in the structured search. After excluding duplicates, we found a total of 297 articles, books and book chapters. Fig. 1 shows a flow diagram of the literature selection process.

The final selection of publications was then subjected to a qualitative review. In parallel, a scientometrics analysis was performed to analyze the distribution of the publications