Interactive learning between stakeholders and researchers about complex socio-environmental problems

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Abstract

Environmental governance is both complicated and complex, but methods with highly structured outputs can be used to better understand complex human-environmental systems. This paper describes how methods producing structured outputs, such as agent-based modelling; computer games; participatory GIS mapping; social network mapping; and Q-methodology, can be used to engage stakeholders in environmental governance. It does not set out to compare these methods but rather considers the use of such methods to allow researcher and stakeholders to co-produce a structured 'reality' separate from the reality it represents. Our findings include that it matters little what the subjective matter of environmental governance is – we look at ecosystem services and development; ecology; and disaster risk management and reduction, such methods can be considered similarly as providing learning potential and contributing to better governance. The structured outputs allow stakeholders to 'mirror' their human-environmental system to collaboratively think about gaps, problems, and come up with strategies. The paper further calls researchers trying to improve environmental governance to continue to explore the use of mixed methods, especially those that cope with qualitative as well as quantitative analyses.

Introduction

Environmental governance is complicated and complex. This has long been known. Variously analysts have referred to this – and the problems it causes – as "wicked" (Rittel & Webber 1973); "messy" (Ackoff 1974); or even more recently as "super wicked" (Levin *et al* 2012; Forrester *et al* forthcoming, a). Other analysts have suggested various governance solutions such as "muddling through" (Lindblom 1969), "clumsy solutions" (Shapiro 1988; Rayner 2006), or instead advocated wider stakeholder engagement/involvement under conditions of "post-normal science" (Funtowicz & Ravetz 1991; Forrester et al 2002). Complicatedness simply refers to many possibilities within the system, while complexity relates specifically to issues such as non-linearity, feedback, and unintended consequences. Insights gained from a recognition of complexity (*incl*. wickedness and messiness) – thus requiring particular types of solutions (*e.g*. muddled and clumsy) – led the authors to apply methods producing highly structured output to engage and understanding stakeholders (Forrester et al 2014; Taylor et al 2014; Forrester et al 2015; Matin et al 2015). Creating such a structured appreciation of the 'mess' allows us to derive a better understanding of the relationship between different parts of human-environmental systems and, as a result, facilitate better communication between stakeholders with different or competing understandings of human-environmental systems. It also addresses some of the issues related to the complicated nature of these problems.

Throughout, our research takes an inclusive standpoint on who is a stakeholder (see Forrester, Gerger Swartling & Lonsdale 2008:3). Similarly, we accept a broad definition of the process of learning which includes the acquiring, modifying, reinforcing or synthesis of new or existing knowledge, behaviours, skills, values, or preferences. Learning is tacit or implicit; it may be by the researchers or the stakeholders, or both. We are not here interested in the *type* of learning, but whether *any* learning can be said to have occurred in the cases described below. We document five empirical examples of applied action-research, each dealing with stakeholder or citizen engagement in environmental science process or governance. Our focus is upon the beneficial learning outcomes of using structured-output participatory methodologies to facilitate interactive learning between researchers and stakeholders at multiple levels of governance.

Implicitly, of course, this takes us into the realm of social learning, that is learning which includes interaction between stakeholders or agents and some other 'actor' in the widest Latourian sense (e.g. see Latour 2005), but with the caveat that we were and are looking at the "observable events and interactions between people and objects" (Zeitlyn & Just 2014:9). However, where we depart from traditional social methodology is that by using the output or product of the methodologies we describe (i.e. the formalised co-created 'map' or 'model' representing all of part of the human-environmental system under study) we can avoid the problem of having to "infer what must be in their minds" (Bailey 1991: xiv) because structured outputs have the virtue of apparent *precision* and can be used to clarify understandings that are not easily observable empirically, nor are their descriptions always commonplace occurrences. Further, these outputs act as 'boundary objects' (Star and Griesemer 1989) and facilitate translation across and between social domains. Thus, the learning we will interpret is facilitated not only between the interaction of stakeholders with different understandings but *between the stakeholder and the tool of investigation*: that is the structured output. We will argue that this learning would not have taken place to the same degree or at all if the type of method we describe had not been employed.

The paper describes how five methodologies producing structured outputs can be used. We look at participatory applications of agent-based modelling (***P-ABM***); computer ***Games***; mapping using geographic information systems (***P-GIS***); social network mapping (***SNM***); and ***Q***-methodology. There are growing realizations coming out of 'buzz' topics such as sustainability, resilience and 'the nexus' among others, that in order to foster helpful governance of environment issues we need methods where the full complexity of understanding offered by participatory processes might be understood and harnessed. How this can happen is described using empirical data on the use of these methods in the five environmental governance case studies, and contributes to a growing literature on the beneficial use of multiple methods spanning qualitative and quantitative assessment (e.g. Crossley 2010; Forrester et al 2015; Mallampalli et al 2016).

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