



Position Paper

Modelling with stakeholders – Next generation



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ABSTRACT

This paper updates and builds on 'Modelling with Stakeholders' Voinov and Bousquet, 2010 which demonstrated the importance of, and demand for, stakeholder participation in resource and environmental modelling. This position paper returns to the concepts of that publication and reviews the progress made since 2010. A new development is the wide introduction and acceptance of social media and web applications, which dramatically changes the context and scale of stakeholder interactions and participation. Technology advances make it easier to incorporate information in interactive formats via visualization and games to augment participatory experiences. Citizens as stakeholders are increasingly demanding to be engaged in planning decisions that affect them and their communities, at scales from local to global. How people interact with and access models and data is rapidly evolving. In turn, this requires changes in how models are built, packaged, and disseminated: citizens are less in awe of experts and external authorities, and they are increasingly aware of their own capabilities to provide inputs to planning processes, including models. The continued acceleration of environmental degradation and natural resource depletion accompanies these societal changes, even as there is a growing acceptance of the need to transition to alternative, possibly very different, life styles. Substantive transitions cannot occur without significant changes in human behaviour and perceptions. The important and diverse roles that models can play in guiding human behaviour, and in disseminating and increasing societal knowledge, are a feature of stakeholder processes today.

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1. Introduction

Since Voinov and Bousquet (2010), over 200 papers have been published in Environmental Modelling and Software (EMS) that refer to stakeholder involvement. In preparing this Virtual Thematic Issue (VTI) Modelling with Stakeholders II, we reviewed articles

published in EMS and selected papers that we considered most important in the field. For this position paper, we also considered papers in other journals that advanced the field of participatory modelling (PM) and developed innovative approaches.

Many studies have stressed the benefits, as well as the challenges, of stakeholder participation in environmental modelling (e.g., Carmona et al., 2013; Rockmann et al., 2012; Videira et al., 2009). Experiences with participatory model development have been well documented. However, overview articles and guidance for practitioners are still lacking, particularly regarding the tools, methods, and processes that can be used to meet the challenges of participatory environmental modelling (Videira et al., 2009). This current lack of guidance is, in part, the result of our highly diverse human society that retains a heterogeneous distribution of knowledge and highly localized belief systems. It is also the result

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of the expanding multiplicity of opportunities (and accompanying stresses) created by rapid technological developments in an increasingly hyper-connected world. Indeed, participatory modelling and stakeholder engagement are facilitated by innovative communication media and new data acquisition, and processing tools that can be used for local applications, but that are also increasingly provided to a greater, global, community. Concomitantly, planners and policy-makers struggle to reconcile, or arbitrate, increasingly vociferous activist positions: reaching acceptable consensus, or justifiable decisions, is more difficult than ever. Decision-making was perhaps less contested in a more top-down, less transparent, past when the public generally deferred to the authoritative voices of professionals and political leaders.

The human dimensions of PM are why we still believe, just as Voinov and Bousquet (2010) did, that there can be no unique guidance for PM. Instead, PM needs to emphasize a smart adaptability of processes, based on active knowledge of local project specificities, including the identification of appropriate rewards or compensations that enable the meaningful engagement of all needed participants.

The majority of the articles reviewed for this paper describe case studies that involved stakeholders in resource management and environmental planning. Systems involving environmental/natural resource management are inherently complex. They involve multiple sectors, issues and stakeholders. They include a diversity of human-material interactions and they frequently cross administrative boundaries. The complex problems associated with environmental management typically call for an integrated PM approach (Von Korff et al., 2012).

The growing popularity of PM is exemplified by the marked increase in the number of papers published on the topic in recent years (Seidl, 2015). Stakeholder participation in research and decision-making can be traced back to at least the late 1970s and 1980s (Greene, 1987; White, 1979). It derives from (1) a universal drive towards greater decentralisation and ‘people’s participation’ (Cohn, 2008; Haklay, 2012; McCall et al., 2015; Silvertown, 2009); (2) a growing ‘grassroots’ demand for public engagement in environmental planning and decision support (e.g., Delgado-Galván et al., 2014; Fulton et al., 2015); (3) a realization by decision-makers that new management or policy recommendations are less likely to be acted on if stakeholders are excluded from the policy development process; (4) a realization by modellers that the public can provide considerable knowledge, labor, and skills, and may even help mobilise funding (Leenhardt et al., 2012; Blackstock et al., 2012); and (5) the fast-growing and easy access to technical capacities that enable quicker and broader public involvement, notably through the internet and Web 2.0.

Distinctions need to be drawn between (a) general citizen involvement or participation – i.e. public involvement in asking or declaring needs, opinions, preferences, constraints, prejudices, etc.; and (b) the involvement of people in the pursuit of technical or scientific knowledge, termed Citizen Science (Cohn, 2008; Silvertown, 2009). For us, public participation in producing knowledge means that people are not just used as passive sensors, but are instead active participants in checking, assessing, or commenting on scientific observations – in addition to declaring their specific interests as citizens. This makes PM a form of Citizen Science because PM engages stakeholders in developing new knowledge, even as it solicits – and carefully examines – public needs, opinions, preferences, and constraints. Many forms of stakeholder and public knowledge can contribute, including so-called “indigenous knowledge”, “traditional ecological knowledge”, or “local spatial knowledge” (Agrawal, 1995; Berkes et al., 2000; Emery,

2000; Raymond et al., 2010).

Amongst some practitioners and modellers, an idealised view appears to exist that stakeholders can, or should, be engaged in most stages of environmental modelling. However, the degree to which stakeholders are engaged in environmental modelling can vary. In the literature on participation there are many examples of “participation ladders” or “levels of engagement”, which purport to distinguish between intensities or depths of participation (Arnstein, 1969; De Kraker et al., 2011; Jankowski, 2009; Lynam et al., 2007; McCall and Peters-Guarin, 2012; Shirk et al., 2012; Voinov and Bousquet, 2010). The most passive participatory process is simply to inform people, which does not involve true engagement of stakeholders. The next level of participation is when local stakeholders (in this case better termed as ‘local experts’) provide data to be used by modellers – this is called “extractive use”. Increasing levels of participation involve the collaboration of stakeholders in various aspects and stages of the modelling activities, such as advising on key indicators or appropriate measurement techniques (IAP2, 2006). The most intense participation occurs when local stakeholders – that is, those affected by the use and outcomes of the model – actually initiate the PM process and are engaged in all its stages: from identification of the problem(s), to model design, parameter selection, data collection, data validation, etc. up to application of the model and to decisions about ‘ownership’ – both ownership of the data inputs (especially confidential or culturally-sensitive material), and ownership of the final products and outputs of the modelling activities. In this ultimate situation, local stakeholders are involved in performing the analyses and modelling as well as the decision-making processes.

A game-changer has been the expansion of the Internet in terms of coverage and functionality. The Internet has become part of mobile telephone services with almost global coverage. This has transformed the ways that people are connected – to each other, to sources of information, and to learning opportunities. However, this connectivity does not resolve the uncertainty in our lives and in the local and societal decisions that have to be made. In many cases, the excess of information and connectedness may even increase the level of uncertainty.

This position paper starts with a review (section 1) of the papers on PM that have been included in the VTI, and also examines trends in the vast literature on PM that we find indicative and promising for the future. After discussing new web services and crowdsourcing tools and methods that can help PM to move forward (Section 2), we look at how uncertainties are treated in participatory research (Section 3). We then examine possibilities to go beyond current practice in PM, focusing on visualization and communication tools (Section 4). In Section 5 we argue that participants’ recognition of their own and other stakeholders’ values and biases is an important element in the applications of modelling in policies and projects aiming at a higher degree of participation. Building on the need to identify biases and beliefs to better inform societal decisions and actions, we propose a new framework for organizing PM processes and for making progress on a participatory research and action agenda. We conclude the paper by making some additional suggestions and discussing some principles that we believe will help advance the practice and usefulness of PM.

2. Review

2.1. A classification of components and approaches for participatory modelling

Based on our review of the VTI and other literature on modelling

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