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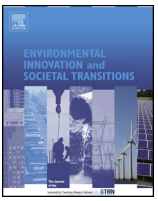

Survey

Prospects of modelling societal transitions: Position paper of an emerging community☆

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ABSTRACT

Societal transitions involve multiple actors, changes in institutions, values and technologies, and interactions across multiple sectors and scales. Given this complexity, this paper takes on the view that the societal transitions research field would benefit from the further maturation and broader uptake of modelling approaches. This paper shows how modelling can enhance the understanding of and support stakeholders to steer societal transitions. It discusses the benefits modelling provides for studying large societal systems and elaborates on different ways models can be used for transitions studies. Two model applications are presented in some detail to illustrate the benefits. Then, limitations of modelling societal

☆ We, the authors, belong to a group of modellers who aim to make modelling of transitions a visible and fruitful subfield of the societal transitions research field. We are related to the Sustainability Transitions Research Network (STRN, www.transitionsnetwork.org) and invite all interested researchers in the STRN and beyond to contact and join us.

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transitions are discussed, which leads to an agenda for future activities: (1) better cooperation in the development of dynamic models, (2) stronger interaction with other transition scholars and stakeholders, and (3) use of additional modelling approaches that we think are relevant to and largely unexplored in transitions studies.

1. Introduction

A societal transition is "a radical, structural change of a societal (sub)system that is the result of a coevolution of economic, cultural, technological, ecological, and institutional developments at different scale levels" (Rotmans and Loorbach, 2009). Societal (sub)systems as referred to in this definition cover key areas of human activity, including our transport, energy, agrifood, housing, manufacturing, leisure and other systems (STRN, 2010). For studying change of these systems societal transitions research adopts a broader perspective than other approaches to sustainable development, and highlights the multi-dimensional interactions between industry, technology, markets, policy, culture and civil society (STRN, 2010). Societal transitions are highly complex processes that unfold over timespans of decades, rather than years, and involve "wicked" problems for societies that require a systems approach to policy (Rip and Kemp, 1998; Grin et al., 2010). The field of societal transitions studies has developed with two main interrelated agendas: (1) scientific progress: to better understand how structural change of large-scale complex societal systems comes about; and (2) impact: to make particular societal transitions happen and navigate developments towards sustainability.

The objective of this paper is to show how modelling can contribute to the agenda of societal transitions research – both for enhancing understanding and for increasing impact. Furthermore, we propose an agenda for future activities in our emerging (sub)community to increase the uptake and effect of modelling approaches in the societal transitions community and beyond. We start from the observation that there already has been modelling work in the field of societal transitions, as demonstrated by a special issue (Timmermans and de Haan, 2008), various conference sessions,[1] review papers (Holtz, 2011; Safarzynska et al., 2012; Zeppini et al., 2014; Halbe et al., 2014) and various PhD theses (Holtz, 2010; de Haan, 2010; Yücel, 2010; Chappin, 2011; Papachristos, 2012). Despite all these activities, model based studies to date have a smaller role in the field than we think they potentially could and should have, and we are of the opinion that the societal transitions research field would benefit from the further maturation and broader uptake of modelling approaches. We develop our argument as follows: Section 2 discusses fundamental characteristics of modelling and the associated benefits that arise for studying large societal systems. In Section 3 we then discuss specific challenges for model use that arise from the scope and perspective of societal transitions research, and outline typical ways how models have been and can be used in the societal transitions field, and how they make use of the previously discussed fundamental characteristics of modelling. In Section 4 we demonstrate the benefits by two examples, which we present at greater length. In Section 5 limitations for the use of models in societal transitions research are discussed. In Section 6 we identify promising avenues for using models to study societal transitions and to increase the impact of transitions studies through their use. In the final section we draw the conclusions from our discussions.

[1] There have been a week-long international workshop on "Computational and Mathematical Approaches to Societal Transitions" at the Lorentz Center at Leiden University in 2007 and sessions at several conferences: ESSA 2008 in Brescia, Italy; ESSA 2009 in Surrey, Guildford, UK; WCCS 2010 in Kassel, Germany; KSI Conference 2010 in Amsterdam, The Netherlands; EGU General Assembly 2013 in Vienna, Austria; IST Conference 2013 in Zürich, Switzerland; IST conference 2014 in Utrecht, The Netherlands.

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