
Introductory editorial

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Abstract: This editorial introduces this special issue on the governance and governability of societal system transitions towards sustainability. This debate recently seems to be dominated by a wave of studies that more or less are inspired by the ideas of the so-called transition management approach. In order to broaden this debate, authors from various countries and a variety of theoretical and practical backgrounds are invited to explore sustainability transitions and their governance from a theoretical and/or empirical perspective. This editorial presents some core concepts, theoretical notions and problems that underlie the thinking on sustainability transitions. Next, it introduces the contributions that are part of this special issue and the research questions that they address.

Keywords: societal systems transitions; transition governance; transition management; sustainability transitions.

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1 Introduction

The challenges facing developed countries in the coming decades require a fundamental reorientation and re-conceptualisation of our current socio-economic fabric. Resource scarcities, climate change concerns, ageing populations, economic shifts and globalisation are examples of trends that are increasing the pressure on various institutions and society in general, and will inevitably involve drastic changes. Necessary, and perhaps imminent, transformations in energy supply, production and consumption, welfare and health-care systems and mobility pose a significant challenge for governance scholars to develop an understanding of how such transitions arise, and how they may be influenced to engender more sustainable futures.

It is therefore not surprising that sustainability has increasingly been introduced into the language of policy makers and in different policy agendas as a normative orientation. Sustainability as a guiding notion, together with sustainable development as an alternative development pathway, provides an alternative to a system that serves welfare targets while externalising both future generations' demands and environmental impacts. As potential crises loom, societies are looking for a new developmental paradigm or pathway that can safeguard societal, environmental and economic welfare. This entails dealing with trade-offs between a variety of values such as intergenerational justice, short-term action and future visions, environmental integrity and continuity of growth, societal cohesion and equity (World Commission on Environment and Development, 1987).

From a sustainability point of view, the need for radical changes in different domains of our society is widely accepted. The inherent complexity of this challenge is manifold: sustainability itself is inherently contested and ambiguous (Rotmans et al., 2001); further, it implies fully integrated and multi-actor processes, it includes developments at different levels of scale across different time horizons and it requires a high level of experimentation and entrepreneurship. The need for an integrated approach to dealing with sustainability challenges, and the potentially radical changes needed to address currently unsustainable systems, builds on public and scientific recognition of the contributions of these unsustainable systems to anthropogenic climate change, environmental degradation, congestion, and vulnerability of critical public infrastructures (Fukasaku, 2000).

Awareness of the negative external effects of modern society has grown steadily over recent decades. Since the 1970s, scholars have postulated a possible limit to growth and have predicted severe crises unless current development trajectories are diverted. While truly major crises have not yet occurred, there are many signs that fundamental problems are looming: the impacts of anthropogenic climatic change, scarcity of resources and

conflicts over them, inequality of distribution, social unrest, and so on. Beck (1992) and a growing community of scholars argue that these problems are inherent in our societal structures and cultures and are interwoven into the very fabric of our societies, so we cannot solve these problems from within existing structures and cultures. These problems are therefore called ‘persistent’, and most solutions that seek to address their symptoms only deepen the crises over the long run (Smith et al., 2010). The shift from current modern society towards a truly sustainable society (which can perhaps only be defined as a society in which negative external effects are remedied) thus requires fundamental systemic shifts, namely: *transitions*.

Along with growing recognition of the need for transition over the last decade, based on insights of studies in technological transitions on the one hand (Geels, 2005) and governance on the other (Kooiman, 1993; Pierre, 2000), ideas about the management or governance of system transitions have been developed (Kemp and Rotmans, 2009; Loorbach, 2010). These ideas have been applied in the Netherlands, and in other countries such as Belgium, Canada, Australia and Japan in domains such as energy, mobility, built environment and resource management.

Insight into the governance and governability of system transitions can be gained through analysis of system transitions in these different national and domain contexts; and such analysis can be usefully informed by considering the lens of the transition management approach as well as that of wider theories on change and its manageability.

The question thus arises of how the transition management approach (Loorbach, 2010) relates to other accounts of transitions, or wider theories on change and on how this change is governed.

In light of the above, “the aim of this special issue is to broaden the debate by inviting academics from various countries with various theoretical perspectives and varied practical backgrounds to present theoretical and empirical explorations regarding the governance and governability of sustainability transitions”.

This special issue seeks to advance the discussion, together with the understanding of transitions to sustainability and their governance, in three ways:

- a by investigating how that transition approach relates to other accounts of transitions, or wider theories on change and its manageability
- b by presenting empirical accounts on the way transition towards sustainability or other directions evolve and on the role of management and governance therein
- c by exploring the operational side of the governance of transitions, by exploring specific methodologies and strategies and their effects.

The variety of views presented in this special issue aims to enrich our understanding of the governability and governance of transitions in a sustainable direction, by making the underlying assumptions and normative implications of the approach more explicit and thus, more open to interpretation and critical reflection.

This editorial introduces some basic concepts, ideas and problems of system transitions towards sustainability and their governance. In doing so, this editorial serves as an introduction to the various contributions, also offering a frame of reference, and a preview of the explorations that follow.

The editorial is structured as follows: in Sections 2 till 4, the concepts of social transitions, transition governance and sustainability are introduced respectively. Section 5

identifies a number of gaps in our understanding of how and to what extent sustainability transitions can be governed. Section 6 introduces the various contributions that make up this special issue, and ends by capturing the identified knowledge gaps in the five research questions. These questions will structure the comparative analysis in the concluding editorial with which the special issue will close, and that may serve the reader as a guide when reading the contributions that make up this issue.

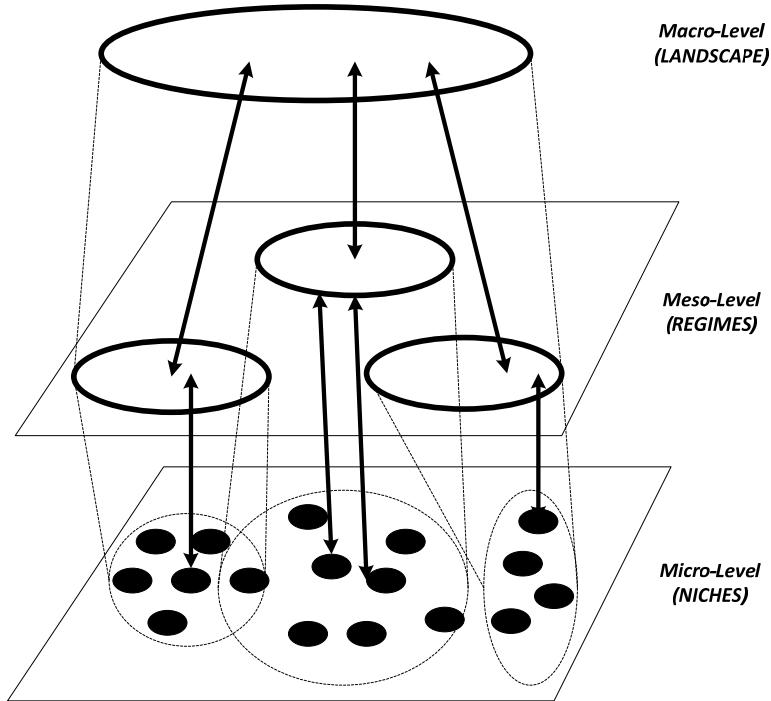
2 The concept and nature of societal transitions

Transitions literature draws attention to fundamental, non-linear shifts in societal systems moving from one dynamic equilibrium to another (Rotmans et al., 2001). Classic examples can be found in the area of socio-technical transitions (e.g., from horse-drawn carriages to automobiles and from sailing vessels to steamships) and societal transitions (e.g., from societies based upon extensive agriculture to those based upon intensive agriculture, from societies fighting water to those harnessing and utilising water) (Geels, 2005; van der Brugge and Rotmans, 2007). Societal transitions are more far reaching than the mere development and embedding of innovations: they comprise co-evolving changes in the ecological, economic, socio-cultural, institutional and technological domains. Transitions are often defined as a fundamental change in the dominant culture, structure and practices of a societal subsystem (Frantzeskaki and de Haan, 2009): they include a cascade of innovations including innovations from the product and process level all the way up to systemic innovation.

2.1 The multi-level framework

Transitions can be understood as regime shifts. Regimes are defined in different ways, but the concept of regime generally refers to the dominant implicit and explicit rules and structures in a particular societal system (de Haan and Rotmans, 2011; Holtz et al., 2008). In other words, regimes represent the dominant ways of thinking, organising and practicing in a specific context. Regimes operate in a wider societal context and are influenced by what are called 'landscape' factors, e.g., external long-term changes in economy, politics, demography, climate, or other. Simultaneously, regimes are influenced by innovations in what are called 'niches', which involve deviating practices, technologies, organisations or concepts that pose alternatives to the regime, albeit on a small scale. Transitions come about when regimes that tend to improve their internal functioning incrementally are no longer able to adapt to landscape changes and are increasingly challenged by niche-level alternatives. There are many different pathways along which a regime might transform under these pressures (de Haan and Rotmans, 2011; Geels, 2005).

More specifically, transitions can be viewed as outcomes of the continuous change of the actors' practices and the interactions of practices and developments that take place in different levels. In the transitions approach, and especially in the socio-technological transitions writings (Geels, 2005), three levels are identified in which changes take place: the micro level where *niches* are located, the meso level where *regimes* are placed, and the macro level that hosts macro-trends, which constitutes the *landscape* (Figure 1).

Figure 1 The multi-level perspective

Source: Geels (2005)

Given this complexity, it may take 30 to 50 years (Rotmans et al., 2001), and potentially even longer, to change a regime in a fundamental way. The general pattern through which a regime fundamentally shifts is through a long period of pre-development in which the pressure on an existing regime is built up through changing landscape conditions and maturing and clustering niches. Under specific conditions, a regime might be no longer able to adapt, thereby leading to a 'tipping point' where the regime opens up to innovations previously existing only at a niche level. Here, a reconfiguration or acceleration phase occurs in which elements of the regime recombine with novel elements to form a new dominant culture, structure and practices; these in turn stabilise and start to optimise at an internal level, possibly building up to a transition in the longer term.

2.2 Pathways of system transitions

Since every system is viewed as a substantially unique entity, its transition path differs from the transition paths of other systems. Although transition paths lead systems to their new state, characteristics of the end state can be used as foundations for a classification scheme. History has witnessed numerous transitions in economy, agriculture, mobility, and energy, and also in areas such as education, health care, and social structure (Rotmans et al., 2001; Grin et al., 2010). In these domains, relatively long temporal stretches of stability alternated with relatively short periods of rapid social change.

Transition processes are thus not linear, and old regimes do not simply transform into new ones. Like innovations, transitions are often far from successful. Factors influencing the success or failure of transitions include:

- the nature of the transition
- the external developments and opportunities providing beneficial conditions
- the presence of entrepreneurs and a persistent supportive coalition
- the absence or weakening of resistance by actors having vested interest in the old regime
- the degree to which information and knowledge is exchanged
- the legitimacy of the transition, which derives from a broad consensus regarding its urgency and direction.

The development path of transitions can therefore be described as an evolutionary competition between practices and paradigms of transition forces and regime, which may eventually result in a paradigm shift. During transition periods, alternatives arise alongside the incumbent regime. They become stronger as their benefits become more widely acknowledged and support systems grow, even to the extent of including important players and resources of the old regime, as has occurred in the biofuels industry for example, where major petroleum companies are taking an active part. In time, the newly developed practices become more relevant than the old regime, and eventually replace it.

3 The governance of transitions to sustainable development

Now the nature of transitions has been defined, we will discuss the characteristics of governance and management efforts aimed at initiating and guiding transitions to sustainability.

3.1 Transition management and the governance of transitions

‘Management’ and ‘governance’, though easily confused, are not synonyms, since ‘management’ has a more restricted meaning. *Management* refers to conscious attempts at influencing behaviour and interaction of a set of autonomous, but interdependent individuals, groups or organisations within a given institutional setting, for instance by facilitating interaction, providing resources and incentives or discouraging certain actions or persuasion (Kickert et al., 1997). *Governance*, however, includes the establishment of an institutional setting and changing the formal and informal rules that guide behaviour and interaction (Kersbergen and van Waarden, 2004). In public administration, *governance* refers to the collection of steering efforts of public and private parties within networks or systems, often taking the form of negotiations, consensus building, or other forms of horizontal steering. Governance contrasts with *government*, the hierarchical steering provided by a central governmental actor (Pierre, 2000).

Since complex societal systems consist of technologies, actors and their interactions, and the institutions supporting these interactions, these systems have a high degree of

self-governance: the set of interactions and steering attempts of actors within the system that keep the system going. The incapacity of these self-governing systems to deal with new challenges, to address import values, or to prevent negative externalities, may be a reason for governments to try to influence behaviour. Despite this, hierarchical steering is generally regarded as an unsuitable form of governance, with *meta-governance* being held as a more viable method (Jessop, 2003). Such meta-governance is provided by *network governance*: forms of steering building on the interdependencies, pluriformity, self-referentiality and dynamics of multi-actor systems or governance networks. Two types of network governance can be distinguished:

- 1 process management
- 2 network (re-)structuring (Koppenjan and Klijn, 2004).

Process management aims at organising and facilitating interaction processes among interdependent actors within networks in order to enhance collaboration and the realisation of win-win situations. As far as the functioning of the network is problematic and hinders collaboration, network governance may take the form of *network (re-)structuring*: altering the institutional setting of interactions by adapting organisational arrangements, resource allocation, and institutional rules.

Transition management and the governance of sustainability transitions can be considered as forms of *meta-governance*. Governance of sustainability transitions differs from genuine network governance in its objective to stimulate or enable a fundamental system change in a certain direction; network governance does not aim at realising a system shift, but instead aims to improve the quality of interactions within a network (de Bruijn et al., 2010). Network change pursued by network governance may imply a far less fundamental change than a system transition. In general, network governance lacks the commitment to accomplishing a fundamental system transition in a specific direction, in contrast to the governance of transitions.

3.2 Towards governance of system transitions

The perspective of societal transitions brings with it inherent uncertainties, complexities and ambiguities regarding ongoing transitions. This is particularly so in the context of sustainability transitions, where it is highly uncertain and contested whether or not these transitions (e.g., to sustainable water management, energy systems, mobility, food production, built environment, and so on) are actually occurring or going to occur, what pathways they will follow, and what the desired end-states are. This poses a fundamentally new challenge for governance (Loorbach, 2010; Voss et al., 2009): it requires a new conceptualisation of governance, planning, policy and management in the context of structural systemic change.

Many studies deal with the way in which transition processes have historically evolved (Geels, 2005; Utterback, 1994). The transitions studied, however, were often very much technology driven, and it is only with the benefit of hindsight that we can identify them as transitions. In the first instance, these transitions started out as mere innovations, such as the development of the internal combustion engine, or the ability to generate electricity. It may well be that none of the actors involved foresaw the far-reaching consequences of their innovations. For example, did the Wright brothers

foresee the heavier-than-air vehicle as an important component in modern just-in-time logistics strategies or as a contributor to environmental degradation? Yet, many examples exist of inventions that were regarded as one day becoming the standard and shaping the dominant regime, although they were eventually by-passed by other technologies.

Examples of planned or governed transitions exist, such as the collectivisation of agriculture in the former Soviet Union, the central coordination of the British automobile industry in the early 1970s, and the deregulation of financial markets in Australia in the mid 1980s. These were more or less consciously planned, even if their end-states were not necessarily designed, let alone predicted. These transitions may succeed in destroying existing systems, and replacing these with new ones. At the same time, they often fail in realising the utopia they sought. Sometimes transitions are derailed during the process of implementation, or result in system changes that were not foreseen, or even wanted (Pei, 2006). Furthermore, their implementation seems to demand conditions that are more prevalent in authoritarian settings, and are less suitable for modern liberal democracies, which can be typified as network societies that are not governed from the centre, but by the disjointed activities of a variety of public, semi-public and private parties at different societal levels, thereby exceeding existing formal jurisdictions (Rhodes, 1997). The implication of these insights is that blueprints and comprehensive planning are not particularly sensible avenues to follow in governing transitions.

This latter conclusion is not very satisfactory in the light of the major problems currently being faced. It is no wonder, then, that alternatives to comprehensive planning are being actively sought. One alternative is *incrementalism* (Lindblom, 1959). This avoids many of the drawbacks of comprehensive planning since a step-by-step approach provides room for learning-by-doing, and the bottom-up characteristic of incremental processes means that the knowledge and interests of a wide variety of actors can be taken into account. Risk can also be managed more effectively since mistakes can be detected and corrected in a timely fashion. Nevertheless incrementalism has been criticised as being less suitable for the realisation of changes that need to be effected quickly (Kemp et al., 2007) due to its focus on the short term, while transitions are necessarily about long-term development. Incrementalism is also considered to be conservative, reproducing vested interests and hindering innovation since some of the actors involved will have a stake in the existing regime, and so will hold back the transition process, or divert attention to less-than-optimum outcomes.

Transition management approaches seeks to by-pass the weaknesses and combine the strengths of comprehensive planning and incrementalism (Loorbach, 2010). It also embodies mutual adaptation and learning, with a long-term perspective. As a result, it is sometimes referred to as 'directed incrementalism' (Grunwald, 2000). Transition management is primarily focused on creating the conditions for enabling societal innovations for fundamental system change in the long term. More specifically, the primary scope of transition management is to mobilise actors for taking action for change, to explore and develop innovative alternatives that can enable fundamental change, and to experiment (at small scale) with actor-network configurations for visioning and/or committing to actions that relate to sustainability [Kemp and Rotmans, (2009), p.309]. Transition management as a governance approach for fundamental change towards sustainability aims to address a number of challenges, including:

- a vision on the necessary change that is needed to guide the transition process; while noting that the complexity of the systems and uncertainties about future developments make it impossible to work from a blueprint
- the need to overcome the resistance of established interests
- the need to create support for long-term transitions, since transitions take more than one decade; as most actors are oriented towards short-term developments it is difficult to maintain long-term support
- development of a supporting network of actors (a transition arena) to initiate, nurture and maintain the transition process in the short term, without becoming a new regime arena that could stifle the transition
- establishing and safeguarding learning conditions in such a way that new practices will gradually be developed based on experiments, evaluations and information on new developments
- avoiding the ‘lock-in’ of specific technologies that originally seem promising, but prove not to be; through the design of processes of creation of variation and selection.

In dealing with these challenges, transition management requires some sort of multi-level governance in order to provide a long-term direction based on a certain degree of consensus. In addition, it should initiate and maintain an ongoing process aimed at the invention and diffusion of innovations, while also preventing ‘lock in’ to specific technological and institutional solutions. Transition management is thus about the design and management of a long-term trajectory consisting of different transition steps, and including moments of monitoring, reflection and redirection.

4 Sustainability and sustainable development

The latest crises experienced by our society, the energy crisis and the financial crisis, question the state of our society and its current development paradigm. In a search for alternative paradigms for development, sustainable development appears to be an alternative with promising benefits despite the uncertainties and the trade-offs it addresses. Sustainability was placed on the agenda after the publishing of the Brundtland Report (World Commission on Environment and Development, 1987) that brought to the foreground the need for balancing values such as equity, intergenerational justice, social welfare, environmental integration, and quality and continuity. Sustainability as a target value (desirable system state value), together with sustainable development as a process and desirable path, have been addressed in various fields, for instance: energy (Kern and Smith, 2008), agriculture (Grin et al., 2010), water management (Pahl-Wostl et al., 2008; van der Brugge and Rotmans, 2007), housing (Brown and Vergragt, 2008) and mobility (Kohler et al., 2009), and by different disciplines, such as: planning, management, business (e.g., corporate environmental responsibility) and technology.

Three basic characteristics attributed to the concept of sustainable development can be advanced. The first is that sustainability is intergenerational. This means that a long time horizon, at least 25–50 years, has to be considered. The second is the importance of scale. Sustainability occurs at different levels; local or regional sustainability does not necessarily mean national or global sustainability and vice versa. Sustainability analysis thus requires several scale levels. The third common characteristic is that sustainability is related to multiple domains, and encompasses a context-specific balance between ecological, economic and socio-cultural values and stakes (Kates and Parris, 2003).

Sustainable development is therefore a normative orientation that provides a frame of reference to discuss and direct differences in perception, ambition and understanding between actors in light of desired changes in society. After the initial optimism during the 1990s about win-win opportunities, it is increasingly understood that there are tradeoffs between different values and interests in any type of development (at least in the short term) and that each development tosses up new problems for society. The rationale behind this is that alternatives for development can only be called sustainable when they are (co-)developed, implemented and formulated by societal actors (Perrings, 2007).

We suggest that sustainable development should be considered as a continuous process in which societal values and interests are represented, negotiated and balanced. At the same time, new alternatives and visions need to be explored and experimented with. Sustainable development is a multi-dimensional, dynamic and plural concept that cannot be translated into the narrow terms of static optimisation, and it is not conducive to strategies based on direct control (Loorbach, 2010; Rammel and van den Bergh, 2003). This is a distinctive characteristic of sustainable development as a new type of development process vis-à-vis economic development: the goal of sustainability exists, but its target level changes over time owing to its redefinition by every generation as different challenges and possibilities emerge [Meadowcroft, (1997), p.37].

So, sustainability is not a strictly delineated, operational concept to be realised by a traditional policy programme, but rather represents a value-set by which an array of societal problems are identified, interpreted and debated. The transition perspective is warranted as a means to conceptualise the systemic nature of sustainability: sustainable development is not about remedying the negative effects of modernisation, but about changing the basic conditions upon which unsustainable societies have developed. In this respect, the concept of sustainability fits in with the notion that transition management constitutes an open-ended process rather than a blueprint. In this sense, it provides direction for an incremental change process, and allows for specifications and alterations over time due to the need to accommodate a variety of problem situations, interests and perceptions.

In light of the above, sustainable development serves as a broad notion of an integrative and balanced, yet flexible societal development that could be used as a guiding principle for future-oriented actions. The point of departure, then, is that there are many changes and actions already occurring to deal with the symptoms of unsustainability. It follows that the worth of transition management in the context of sustainability is that the emerging process around sustainability transitions is influenced in many different and often competing ways, thereby limiting opportunities for smooth transitions that achieve desired outcomes. This requires facilitating processes in which

- 1 collective definitions of unsustainability and sustainability are constructed and structured
- 2 expectations and assumptions regarding the future are negotiated, analysed and exchanged
- 3 space is created to experiment with alternative system designs; and iv) new networks and shared strategies are developed.

5 The governance and governability of sustainability transitions

Despite the empirical observations and quite sophisticated theoretical reasoning underlying the ideas of transition management, the issue of to what extent and how system transitions can or should be governed remains unsettled. This is due to several reasons:

- *Limited empirical evidence:* Although the approach builds on empirical observations regarding transitions, the governance component has a less firm empirical basis. Studies draw mostly on Dutch experience, while experience from other European and non-European countries is currently limited (Heiskanen et al., 2009; Kern and Smith, 2008). The effects of attempts at transition governance will only become clear in the future. Current empirical studies into the effects of governance attempts at sustainability transitions come too early to measure these long term effects.
- *Limited knowledge on the variety of pathways and their success:* When searching for a governance approach for change, transition management is not necessarily the only option. There are various different governance approaches that analyse and propose strategies to bring about innovation and change. The transition management approach (Loorbach, 2010) suggests a specific transition pathway of 'directed incrementalism' with a clear focus on sustainability transitions at system level, but it is far from certain that this route of guided gradualism is the only way to success. Moreover, Pei (2006), talking about economic transitions, suggests that gradualism may result in transitions being trapped half-way. It may be that ideas or tools derived from other approaches or theoretical sources can add to transition management, or that alternative approaches to governance of transitions to sustainable development are more fruitful.
- *Doubts about the assumptions underlying the governance of transition:* Some authors seriously doubt whether transitions can be governed (e.g., de Bruijn et al., 2010). They instead suggest that transitions emerge and cannot be planned. Shove and Walker (2007) indicate that the urgency and consensus on the direction of the transition often may be missing. They also suggest that alternative innovations and transitions, not primarily aimed at sustainability, but for instance on innovation in general or efficiency, may evolve simultaneously. As a result transitions may end up somewhere completely unintended.

- *Normative issues:* In governing sustainability transitions, normative issues are at stake. In realising sustainability objectives, other problems may ensue. The costs and benefits of the resulting trade-offs are unknown, nor is it certain whether transition governance will provide institutional arrangements to safeguard an equal playing field when these trade-offs are made. Sustainable technologies may be less consensual and unproblematic than the label ‘sustainable’ implies, as Shove and Walker (2007) suggest in referring to an attempt to rehabilitate nuclear power as an energy source in the UK.

Although these considerations raise questions about the governability of system transitions, they do not prove the reverse, nor imply that attempts at governing systems transitions should be abandoned. Rather, they raise challenges that practitioners need to confront and raise questions for scholars to explore.. This is what this special issue aims at.

6 Introducing the contributions

The eight articles comprising this special issue deal with various aspects of sustainable transitions and their governance. The contributions can be divided into three categories:

- 1 articles investigating the theoretical perspectives
- 2 articles that present empirical studies of transitions and the effects of attempts at managing these in a sustainable direction
- 3 articles that hone in on specific transition governance and management methods directed at sustainable development.

Theoretical explorations of transitions towards sustainability

- 1 Frantzeskaki, Loorbach and Meadowcroft explore the concepts of sustainability and sustainable development and relate their findings to the nature of transition management. The management philosophy and the toolkit of this approach are presented, specifically focusing on the first step of transitions: the initiation and governance of the transition arena.
- 2 Termeer and Dewulf present a variety of theoretical perspectives on the change of complex socio-technological systems and they present a plea for theoretical multiplicity in studying and reflecting on transitions towards sustainability and their governance. They demonstrate the potential of this approach by analysing the Dutch case of the introduction of the energy producing greenhouse system.
- 3 Brown, Furneaux and Gudmundsson investigate the implications of the theory of complex adaptive systems for analysing and governing transitions. They use this perspective to study the transition of the Australian construction sector from a competitive system towards a more collaborative system during the last decade.

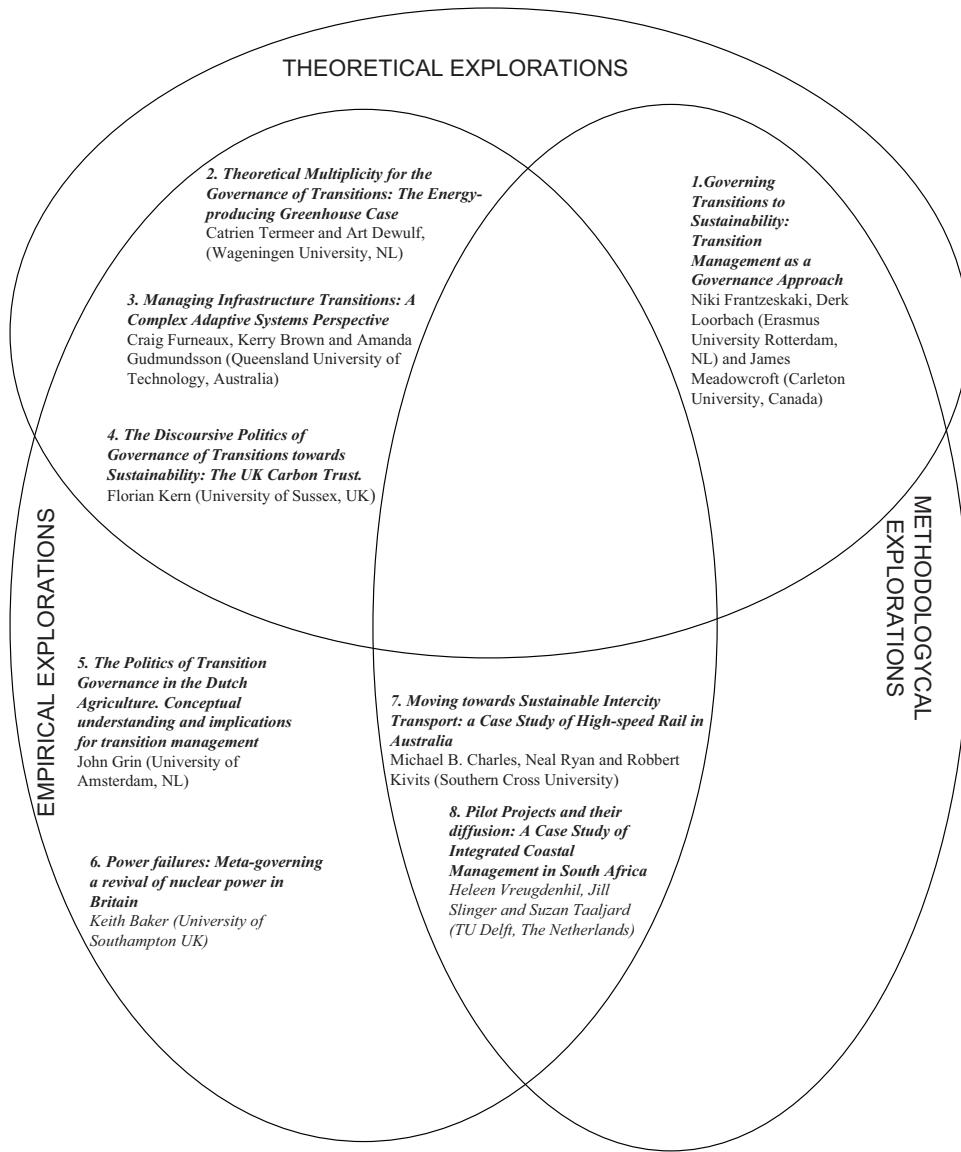
Empirical explorations of transitions and the role of governance

- 4 Grin presents a detailed historical analysis of an emergent transition: the transition of the Dutch agricultural sector towards modernity in the first decades after the Second World War. The analysis considers the extent to which historical contingencies permit drawing lessons for next-generation transitions, such as those pertaining to sustainability. He emphasises the political nature of transitions and the need to invest in legitimacy.
- 5 Kern analyses the governance of the transition towards a sustainable energy system through the establishment of the Carbon Trust in the UK. He stresses the role of politics and suggests the use of discourse analysis to further understanding of this dimension of transitions.
- 6 Baker describes the institutional tinkering the UK government used to pave the way for a nuclear renaissance in order to realise sustainability targets. He assesses the specific characteristics of this emergent transition pathway and explains why it was bound to fail.

Methodological explorations of transitions towards sustainability

- 7 Charles, Ryan and Kivits demonstrate the use of actor and scenario analysis to support the development and selection of transition pathways towards a post-carbon transport future by introducing inter-state high speed rail in Australia.
- 8 Vreugdenhil, Taljaard and Slinger reveal how innovations in the area of sustainability can be created by pilot projects and how the diffusion of innovations is influenced by the way in which these pilot projects are linked to the broader system. They illustrate this by discussing the integrated coastal management pilot in Saldanha Bay in South Africa.

This clustering however does not do full justice to the nature of the various articles since some of them address various topics and so could well have been assigned to other categories. In the concluding contribution the editors of this volume seek to compensate for this by highlighting the way articles crosscut this initial categorisation. At this point, Figure 2 provides a visual representation of how the various articles relate to the three categories that are used to provide structure to this special issue.

Figure 2 An overview of the contributions

This special issue will conclude with a contribution of the editors in which they compare the various articles, pinpointing interesting observations and identifying generic insights. This comparison will be guided by five questions that try to grasp the most urgent issues involved in the governance and governability of transitions towards sustainability, as discussed in this introduction:

- 1 Which theoretical perspectives and concepts can be used to analyse system transitions and their governance and what do they add to existing ideas on the governance of transitions towards sustainability?

- 2 What pathways of transitions governance exist and what governance principles are used in practice; what can be said about their effectiveness and how do they relate to transition management ideas?
- 3 What can be learned about the governability of system transitions and the conditions that underlie these?
- 4 To what extent do system transitions towards sustainability differ from other transitions in their governability and governance?
- 5 Which normative issues are at stake in the governance of transitions towards sustainability and how can they be addressed?

We hope these five questions may also serve the reader as a guide when reading the various contributions.

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