

Discovering sustainability: A transition approach towards sustainable development

Derk Loorbach¹, Niki Frantzeskaki² and James Meadowcroft³

1. DRIFT – Dutch Research Institute For Transitions, Faculty of Social Sciences, Erasmus University Rotterdam, Burgemeester Oudlaan 50, P.O. Box 1738, 3000 DR, Rotterdam, e-mail: loorbach@fsw.eur.nl

2. Faculty of Technology, Policy and Management, Delft University of Technology, Jaffalaan 5, 2628BX Delft, The Netherlands, e-mail: N.Frantzeskaki@tbm.tudelft.nl

3. Canada Research Chair in Governance for Sustainable Development, Carleton University, Ottawa, Canada. E-mail: jmeadowc@connet.carleton.ca

Abstract

The concepts of transition and transition management offer a fruitful context for cooperation and debate among scientists, policy makers, and corporate actors. Transition management and transition approach in general provide an integrative approach to analyze and formulate an unconventional pathway towards sustainability. Transitions' approach is not to achieve fixed goals, but to gradually work towards common ambitions through innovation, integration, and co-evolution. A transition to sustainability is an open-ended societal process of fundamental change in structure, culture and practices that comply with the sustainability values. In this paper we address not only what is a transitions' approach, but also what transition management can offer to policy makers who position sustainability at the core of the development. Process-oriented tenets of transition management as well as propositions in face of global and local challenges to sustainability are analyzed.

1. Introduction

Over the last decade, sustainable development has become a central concept guiding scientific debates and policies related to complex and persistent problems (Jansen, 2003; Meadowcroft, 2000; Scott and Gough, 2004). Sustainable development aims to ensure economic welfare, social equality and ecologic quality across society, generations and into the future. Along with the changing fabric of our modern society into a network society, the nature of problems also changed. The network society, with its high degree of interconnectedness and availability of knowledge, simultaneously offers opportunities for new ways of conceptualizing societal change and for influencing change. In a network society, transitions are societal processes that depict the interplay between societal structures, individual actions and technological innovations leads to changes that periodically can lead to fundamental structural change (Rotmans et al, 2001).

The vast majority of societal transitions were not steered in a collective way but emerged as a societal outcome. In our current era, transitions as fundamental changes are suggested as means to deal with persistent problems and are required/introduced at all levels: at a global level to address and put in perspective issues such as climate change, poverty and equality, and at national and regional levels to change societal systems such as agriculture, mobility, healthcare, urban planning and energy provision. Though it is clear that ongoing processes of change need to be oriented towards more sustainable system's states, not all transitions result in a sustainable system state. This is partly the outcome of the context bounded definition of sustainability. In this paper, we focus on

sustainability transitions or transitions to sustainability that concern the continuous process of fundamental change that reorient and restructure a societal system towards a sustainable system state that satisfies sustainability values.

Sustainability has been discussed and used in different systems and in a great variety of contexts. However, the complexity and overarching character of the sustainability should not be a burden in envisioning system transitions towards sustainability and in researching ways to enable such transitions. The key research question of this paper is the following: *What can transition's approach and transition management offer to policy makers who position sustainability central to the development process?* Our main message in this paper is that instead of a prescriptive and deterministic way to draw ways in achieving sustainability, we suggest and adopt a transitions approach that is receptive and reflective to societal context thus allowing a variety of societal innovations towards discovering sustainability. More particular, we elaborate on the transitions approach that adds to the broader discourse on how to achieve sustainability and the transition management approach as a technique for governing actions that enhance and stimulate processes of societal change by incorporating multiple actors, interests and domains.

2. Sustainability discourse

Sustainability as a concept entered the political agendas and discussions in late 1980s and changed the way development pathways were drawn not only in states but also in corporations. In this section, we present the evolution of sustainability thinking and interdisciplinary research streams that are linked to sustainability and sustainable development. Transitions' approach and transition management belong to those interdisciplinary approaches that are linked to sustainability and built on insights for an unconventional reach of sustainability.

2.1. Sustainability and sustainability thinking

Following the Brundtland report *Our Common Future* (WCED, 1987), sustainable development came to be defined as redirection of social development in ways that combine prosperity, environmental protection with social cohesion. In this report, sustainable development was defined as a development that meets the needs of the current generation, without compromising the needs of future generations (WCED, 1987). This definition is normative since future generations should have the same possibilities, subjective since it requires an assessment of what these future needs are, and also ambiguous since these future needs are determined by cultural, ecological and economic developments that can be weighted in more than one way (Martens and Rotmans, 2002; UN, 1997).

However, we can derive some basic characteristics that are attributed to the concept of sustainable development that occur in almost all definitions. The first is that sustainability is an intergenerational phenomenon. This means that a long-time horizon, at least one or two generations (25-50), has to be considered. The second characteristic 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 a multitude of scale levels. The third common characteristic is the different domains that have to be considered in sustainability.

Sustainability encompasses a certain context-specific balance between ecological, economic and socio-cultural values and stakes (Kates et al., 2001; Pezzoli, 1997; Rotmans, 1994). In short, Sustainable Development is a long term, multi-level, multi-actor process.

After the initial optimism during the 1990's 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. Sustainable development is considered as a continuous process in which societal values and interests are represented, negotiated and balanced. This means that sustainability in itself can never be defined objectively beforehand, but that process-conditions and contextual factors should be derived from an equal representation, pluriform debate and informed discussion.

This is a distinctive characteristic of sustainable development as a new development process: the goal of sustainability exists but its target level (and even definition) changes over time given its redefinition by every generation (Mulder, 2006, p.74). As Meadowcroft (1997, p.37) phrases this perspective: "each generation must take up the challenge anew, determining in what directions their development objectives lie, what constitutes the boundaries of the environmentally possible and the environmentally desirable, and what is their understanding of the requirements of social justice".

Arguably, sustainable development as a broad notion of an integrative and balanced, yet flexible societal development should be used as guiding principle for future-oriented governance. This means that the challenge of sustainable development can be formulated in terms of the quality and the characteristics of a continuous governance process that enables representation of various perspectives, values and interest and creates space for experimentation, innovation and learning. Perhaps this can be considered as the next phase in the modernization process in the industrialized world: a reflexive modernization process (Beck, 1994) in which current societal systems are re-evaluated and reinvented through innovative processes of anticipation and adaptation. This would require a fundamental shift in thinking about the process of social development and accordingly a fundamental change in the way that this process is dealt with (Voss et al, 2006).

2.2. Interdisciplinary approaches for sustainability

Sustainable development is a possible normative orientation that provides a frame of reference to discuss and direct differences in perception, ambition and understanding between actors. The rationale behind this is that alternatives for Sustainable Development can only be called sustainable when they are (co-)developed, implemented and sustained by societal actors (Clark, 2003). This means that scientific knowledge related to Sustainable Development is not a goal in itself, but rather a means to achieve progress. From this perspective a modest and vulnerable position of scientist in the process of Sustainable Development is required than the position of provider of objective truths or that of outside reflector producing policy-advice as an end-product of his or her research. The objective position of research(ers) related to policy and in general the science-policy interface has already been the subject of debate for decades (e.g. Hisschemöller & Hoppe,

1996; Wildavsky, 1979), but has been revived in the context of Sustainable Development, where not only scientific knowledge, but political and social knowledge are ambiguous as well as the actions and outcomes (Hisschemoller et al, 2001).

A field closely related is that of sustainability science (Clark et al, 2005; Kasemir et al, 2003; Kates et al., 2001). Stemming from the field of science and technology, ‘*sustainability science*’ has emerged as a (somewhat controversial) term depicting those developments within scientific disciplines that deal with sustainability issues and increasingly do so in cooperation with practitioners. Sustainability Science is more or less a general term for a development in science as a whole towards more multi- and interdisciplinary research related to complex societal issues (Loorbach, 2007a). Sustainability Science mainly refers to the field of global environmental and sustainability research and also emphasizes the importance of the involvement of stakeholders in the knowledge development process. This participatory role has been theorized and methodologically underpinned over the last decade. In fact, participatory knowledge development aimed at integrating practical/tacit and scientific knowledge, has become a new field of research in itself (Kasemir et al, 2003; Van Asselt and Rijkens-Klomp, 2002). The central issue in this field is that participation in practice is often unstructured and ad hoc and that methods and tools for both participatory policy making and participatory (integrated) research need to be developed and tested (Van de Kerkhof, 2004, pp.52-53).

Complementary to the development of the sustainability discourse and to the introduction of governance frameworks for sustainability, a scientific debate has emerged around the core question whether objectivity is something to be achieved by scientific inquiry, and whether scientists (especially social scientists) should pursue ‘objective truths’ in a classical scientific manner, meaning as outsiders observing and analyzing social issues for over two decades. This debate was strongly influenced by so-called ‘Post-Normal Science’ (Funtowicz and Ravetz, 1994; Ravetz, 1999). *Post normal science* questions the achievability of objectivity, in fact legitimates the involvement of diverse knowledge sources in science for policy through calling for extended peer communities and emphasizing the inherent uncertainties and values in policy-related science. A key notion in Post-Normal Science and in the related field of Integrated Assessment (IA) (Rotmans and Van Asselt, 1996; Rotmans and Weaver, 2006) is the acceptance of uncertainty and ambiguity, which necessitates a participatory research approach or at least a structured form of interaction between researchers and societal actors to produce policy-relevant knowledge. Obviously, transitions are complex societal processes that can only be understood (or better, interpreted), through integration of scientific and practical knowledge.

Although participatory methods (e.g. focus groups, consensus conferences, scenario exercises, gaming etc.) have a long history, they have been reinterpreted in the context of Integrated Assessment with regard to the profile of the participants, the goal of participation and the degree of participation (Rotmans, 1998). So far, participation has been mainly used in the context of policy-making (to generate public support) and has been underdeveloped in scientific research as a means to generate knowledge with a

higher relevance for society. Key notion in these processes of knowledge co-production is that of *phronesis*; practical, context-relevant wisdom and knowledge (Loeber, 2004) produced in a participatory process. Knowledge for sustainability by definition needs to be context specific and participatory developed. A major drawback of most existing participatory methods is that they do not start explicitly from a collective goal but often from a specific policy problem, and that they do not demand any specific abilities from participants.

In general within the hybrid, interdisciplinary field of research related to sustainable development, there seems to be an emerging consensus that in the context of complex societal problems, we need to accept the fundamental uncertainties and the subjectivity of scientific knowledge. Both the nature of problems and possible solutions are subject to continuous debate and claims to objective truths are no longer feasible. Also, lay or tacit knowledge has become increasingly valued in the context of sustainability issues: in order to properly understand specific problems of an integrated nature and to reflect upon possible alternatives, the necessary practical knowledge about root causes of problems, local dynamics and actor networks is fundamental. The subjectivity and incompleteness of science for sustainability suggests that research for sustainable development by definition needs to be participatory. This implies a process of co-producing relevant knowledge and alternatives in a learning-by-doing and doing-by-learning manner (Rotmans et al, 2004).

3. Transition perspective on sustainability

As indicated in the introduction, the transitions approach implies an integrative, yet contestable, concept of sustainability, which is capable of incorporating multiple domains, levels of scale and spans a long-term. Transitions' approach and transition management belong to those interdisciplinary approaches that are linked to sustainability and built on insights of different fields. The most prominent analytical frame available is that of complex system thinking (Gell-Man, 1994; Kauffman, 1995; Midgley, 2000; Sawyer, 2005), a relatively recent offspring of general system theory (Von Bertalanffy, 1956).

3.1 Foundations of transitions thinking

In the early 1990s complex systems theory was introduced, focusing on the co-evolutionary development of systems. The establishment of the Santa Fé institute in New Mexico in the US in 1984 functioned as incubator for a new research movement, which laid the basis for complex systems theory (Holland, 1995; Kauffman, 1995). Although the theory is far from mature, it has attracted a great deal of attention and has many applications in diverse research fields: in biology (Kauffman, 1995), economics (Arthur et al, 1997), ecology (Gunderson and Holling, 2002; Kay et al, 1999) and public administration (Teisman, 1992). The basic idea is that complex interactions between different elements can be understood in a systemic sense: through their interaction, elements within a system co-evolve with each-other and with their environment, new structures and novelties emerge and new configurations appear through self-organization. Although systems thinking presumed predictability and full knowledge about a system, complex systems thinking starts from uncertainties, surprise and limited knowledge.

The complex adaptive systems' approach sheds light on the evolutionary dynamics and patterns of change in systems as result of co-evolution, emergence and self-organization. Complex adaptive systems can be used as a basis for understanding systems of quite different nature. Societal systems has similar characteristics with and seem to behave as complex adaptive systems given that societal domains consist of numerous interlinked elements, there is a high degree of uncertainty about their interactions and feedback and they have an open and nested character in organization. Therefore, similar patterns as for example emerging structures, co-evolving (policy) domains and self-organizing processes can be observed.

Arguably, this complexity has increased over the last decades as a result of increased interaction, integration and interdependence. One of the weaknesses of complex system thinking is that it either leads to reasoning about uncontrollability and 'unknowability' of social issues or it leads to overly complex analyses that do not provide any basis for choice and/or action. The use of complex systems thinking as a solely descriptive framework resulted in poor insights on tipping points of such complex systems.

3.2 Transitions perspective on systems innovation

Transitions are societal processes of fundamental change in culture, structure and practices. History has witnessed numerous transitions in economy, agriculture, mobility, and energy, but also in areas such as education, health care, and social structure (Geels, 2004; Rotmans et al, 2001). In these domains, relatively long temporal stretches of stability alternated with relatively short periods of rapid social change. These changes can be analyzed in terms of multi-level (distinguishing between dominant structures/regimes, upcoming innovations/niches and landscape development (Geels, 2004)) and multi-phase (in terms of predevelopment, take-off, acceleration and stabilization (Rotmans, 1994)).

Transitions are processes of 'degradation' and 'breakdown' versus 'build up' and 'innovation' (Gunderson and Holling, 2002) or of 'creative destruction' (Schumpeter, 1934) of societal structures. The central assumption is that societal structures go through long periods of relative stability and optimization that are followed by relatively short periods of structural change. In this process, existing structures (values, institutions, regulations, markets etc.) fade away while new ones emerge (Geels, 2004; Loorbach et al, 2003).

3.3 Transitions perspective on systems' sustainability

Historically, transitions have been primarily driven by changes in social subsystems that initiated large-scale changes such as demographic growth, technological innovation or economic expansion. In a sense, these historical transitions (such as those part of the industrialization era, the post-war emergence of mobility, intensive agriculture or fossil energy systems), also partly dealt with societal problems such as poverty, inequality, education and so on. While individuals might now have availability of cheap energy and mobility, it has co-produced for example pollution, exploitation of resources and congestion. In that sense, the transitions leading to our current modern society have had as side-effect the current environmental problems. That gives rise to new transitions that

will take place and be required. They need however to be dealt with in a more anticipatory and exploratory manner.

The transition perspective on sustainability is therefore that while transitions are occurring, we need to try to better understanding their dynamics and trying to influence their pace and direction, while remaining adaptive to external events and alternative innovations. On the one hand, a process-philosophy of sustainable development seems very useful in order to accommodate concrete action and implementation. A process-oriented approach allows for plurality in both actor's and objectives and for flexibility of the outcome. On the other hand, it raises discussion issues about democratic legitimacy, accountability and control (Hendriks and Grin, 2007; Ostrom, 1993). Hence, a process-oriented steering needs to be designed and managed as democratic and accountable as possible so as to benefit from the openness and plurality it creates while inhibiting non-ended or non-substantial or non-legitimate outcomes.

Two points need to be brought on the foreground: first, the transitions approach agrees and supports the values of sustainability while allowing variety in ways of pursuing it and second, it claims that current societal *modus operandi* require change and reorientation in order to allow a change towards sustainability. Transitions' thinking agrees with the values defined by sustainability science to be the determinants of the goal while remaining adaptive and reflexive to context particularities. The plurality of context characteristics results in a variety of societal innovations that are possible so as to pursue sustainability. This plurality of societal transitions inputs and encompasses different dynamics and different actors.

Plurality and openness in defining sustainability is revealed by the different translations of sustainability in different domains. The integration of sustainability in policy agendas in the Netherlands resulted in a multitude of definitions for a number of sectoral policies. For water management, sustainability encompasses quality of water, availability of water for various uses and conservation of aquatic systems (wetlands, lakes, rivers, deltas etc.). For energy domain, sustainability translates into reliability of supply, low prices for consumers and environmental friendly energy supply. For health care, sustainability combines effectiveness in dealing with patients' needs, responsiveness in dealing with emergencies and diseases outbreaks and efficiency in capital and operation costs of health care.

Last but not least, transitions' thinking suggests and/or implies that a sustainable development process requires a reorientation and restructuring of the societal system in terms of cultures, structures and practices that comply with sustainability values. Hence, instead of incremental changes that aim at preserving existing functioning, transition thinking focuses on radical changes or "transformation of both (...) systems and social structures and practices" (after Meadowcroft, 1997, p.430).

4. Pursuing utopias: the transition management approach

Transition management and transition approach is based on the understanding of transitional dynamics and mechanisms. The current systems of governance are not

sufficiently able to facilitate transitions: in existing policy and governance frameworks conventional instruments are used for sustainable development. Transition management offers a new approach based on sustainability principles that can be applied in the context of all long-term social issues without a prescriptive or dogmatic content. Sustainable development is taken up in the context of regular policies as a separate subject, and most commonly as part of the environmental agenda. However, through the establishment of new organizations, sustainability programs or sustainability debates, sustainable development remains in a (environmental) niche, without leading to the much desired and needed shift in governance in general.

We define transition management as a deliberative process to influence governing activities in such a way that they enable societal processes of change towards sustainability (Loorbach, 2007b). Transition management is thus defined as a new process-based technique that raises the following issue: how do we coordinate, bring together and influence actors and their activities in such a way that they reinforce each other to such an extent that they can compete with dominant actors and practices? Transition management is about creating space for innovation at all levels, as a strategy to develop alternatives to the regime. James Meadowcroft describes transition management as follows:

‘First, the theory has a modular structure, with several elements being combined to produce the whole. Particular components include: the image of the transition dynamic with the distinct stages of the transition process; a three level analytical hierarchy of ‘niche’, ‘regime’ and ‘landscape’ that provides a framework for understanding transition processes; a basket of future oriented visioning devices (goals, visions, pathways and intermediate objectives); a practical focus for activities (arenas and experiments); and a broad ‘philosophy of governance’ that emphasizes decision-making in conditions of uncertainty, and the gradual adjustment of existing development pathways in light of long term goals’. (Meadowcroft, 2007)

4.1 Process guidelines of transition management

Transition management practice is depicted in the basic tenets that evolved from the limited set of principles initially formulated (a.o. ‘keeping options open’, ‘dealing with uncertainties’, ‘multi-level-approach’, ‘multi-actor strategy’ (Meadowcroft, 2007, p. 4))¹. A brief introduction of these process guidelines² that aim at stimulating societal potential for change is provided here:

1. *The dynamics of the system create feasible and non-feasible means for governance.* This implies that substance and process are inseparable. Process management on its own is not sufficient – insight into how the system works is an essential precondition for effective management. Systems-thinking (in terms of more than

¹ A more detailed empirical and theoretical grounding of the transition management tenets, is addressed in other publications (Loorbach, 2007b; Rotmans, 2005; Rotmans and Loorbach, 2008; Frantzeskaki and Loorbach, 2008).

² Process-oriented guidelines or process-oriented propositions relate to the process design towards restructuring the societal system. Process-oriented propositions are not concerned with the definition of targets, or goals but with the design or the framing of the actions that will take place over the course of a transition.

one domain (multi-domain) and different actors (multi-actor) at different scale levels (multi-level); analyzing how developments in one domain or level interact with developments in other domains or levels) is necessary to be able to take into account such possible means and leavers for governance.

The quasi-emergent nature of the transition as well as the changing dynamics of the system over the course of the transition (Rotmans et al, 2001; Rotmans and van Asselt, 2001) imply that systemic and exogenous forces can influence the development of the transition. More specifically, the behavior of the system is captured by its dynamics. The dynamics of the system are subject to the underlying conditions of the system; hence systemic and/or exogenous forces can influence the development of the system that undergoes a transition. In this way, we extend the stimulus-response pattern of complex adaptive systems (Holland, 1995) by incorporating endogenous dynamics of change or to put it simpler: the stimulus for change from within the system. The dynamics of transitions reflect responses of the system of both endogenous (systemic) and exogenous stimuli (Frantzeskaki et al, 2008).

2. *Long-term thinking (at least 25 years) as a framework for shaping short-term policy in the context of persistent societal problems.* Since societal transformations take long-time periods and long-term system dynamics are more important for understanding the nature and direction of transitions, the link between long- and short-term is inevitable. This means processes of back- and fore-casting: the setting of short-term goals based on long-term goals and the reflection on future developments through the use of scenarios.

3. *Objectives should be flexible and adjustable at the system level.* The complexity of the system is at odds with the formulation of specific objectives. With flexible evolving objectives one is in a better position to react to changes from inside and outside the system. While being directed the structure and order of the system are also changing, and so the objectives set should change too.

4. *Creating space for niches in transition arenas and transition experiments.* A niche is a new structure, a small core of agents, that emerges within the system and that aligns itself with a new configuration. The new alignment is often the emergent property of the system. An emergent structure is formed around niches to stimulate the further development of these niches and the emergence of niche-regimes.

5. *A focus on frontrunners.* In this context we mean with frontrunners agents with peculiar competencies and qualities: creative minds, strategists and visionaries. These frontrunners are active at different levels of scale and in very different areas, be it within business, government, science, societal organizations or in everyday life. Frontrunners are able to generate dissipative structures in complex systems terms and operate within these deviant structures. They can only do that without being (directly) dependent on the structure, culture and practices of the regime.

6. *Guided variation and selection.* Diversity is required to avoid rigidity within the system. Rigidity here means reduced diversity due to selection mechanisms which means

that the system cannot respond flexibly to changes in its environment. Rather than selecting innovative options in a too early stage options are kept open in order to learn about the pros and cons of available options before making a selection. Collective choices are made “along the way” on the basis of learning experiences at different levels. Through experimenting we can reduce some aspects of the high level of uncertainty so that it leads to better-informed decisions.

7. *Radical change in incremental steps.* Radical, structural change is needed to erode the existing deep structure (incumbent regime) of a system and ultimately dismantle it. Immediate radical change, however, would lead to maximal resistance from the deep structure, that cannot adjust to a too fast, radical change. Abrupt forcing of the system would disrupt the system and would create a backlash in the system because of its resilience. Incremental change allows the system to adjust to the new circumstances and to build up new structures that align to the new configuration. Radical change in incremental steps thus implies that the system heads for a new direction towards new attractors, but in small steps. To reconcile these seemingly incompatible aspects of radical versus incremental change is at the core of transition management.

8. *Learning-by-doing and doing-by-learning.* Social learning (Social Learning group, 2001) is a pivotal aspect of societal transition processes, aimed at ‘reframing’, changing the perspective of actors involved. Two important components are learning-by-doing (developing theoretical knowledge and testing that by practical experience) and doing-by-learning (developing empirical knowledge and testing that against the theory). Social learning in transition processes stimulates the development of visions, pathways and experiments that form a new selection environment.

9. *Anticipation and adaptation.* Anticipating future trends and developments, taking account of weak signals and seeds of change acting as the harbingers of the future, is a key element of a pro-active, long-term strategy as transition management. This future orientation is accompanied by a strategy of adaptation, which means adjusting while the structure of the system is changing.

4.2 Translating process guidelines: The transition management cycle

The challenge with transition management is to translate these relatively abstract principles into a practical management framework without losing too much of the complexity involved and without becoming too prescriptive. We have attempted this by designating transition management as a cyclical process of development phases at various scale levels. The core idea is that four different types of governance activities can be distinguished when observing actor behavior in the context of societal transitions: strategic, tactical, operational and reflexive. In short, these different types can be described as:

- **Strategic:** activities at the level of a societal system that take into account a long time horizon, relate to structuring a complex societal problem and creating alternative futures often through opinion making, visioning, politics

- Tactical: activities at the level of sub-systems that relate to build-up and break-down of system structures (institutions, regulation, physical infrastructures, financial infrastructures and so on), often through negotiation, collaboration, lobbying etc.
- Operational: activities that relate to short-term and everyday decisions and action. At this level actors either recreate system structures or they choose to restructure or change them
- Reflexive: activities that relate to evaluation of the existing situation at the various levels and their interrelation of misfit. Through debate, structured evaluation, assessment and research societal issues are continuously structured, reframed and dealt with.

These types of governance are present without active transition management. These activities exhibit specific characteristics (in terms of the type of actors involved, the type of process they are associated with and the type of product they deliver) which makes it possible to (experimentally and exploratively) develop specific ‘systemic instruments’ and process strategies (see also Loorbach 2007b). These instruments and the process strategy in which they are embedded are captured in the so-called transition management cycle, which consists of the following components³: (i) structure the problem in question and establish & organize the transition arena; (ii) develop a transition agenda, a vision of sustainability development and derive the necessary transition paths; (iii) establish and carry out transition experiments and mobilize the resulting transition networks; (iv) monitor, evaluate and learn lessons from the transition experiments and, based on these, make adjustments in the vision, agenda and coalitions. According to our experiences so far, there is no fixed sequence of the steps in transition management as the Figure below suggests and the steps can differ in weight per cycle. In practice the transition management activities are carried out partially and completely in sequence, in parallel and in a random sequence.

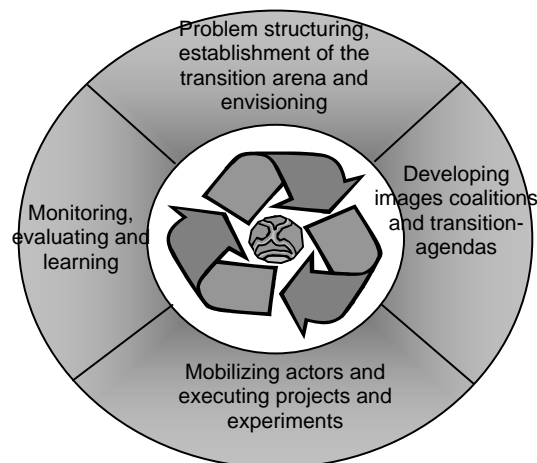


Figure 1: Transition management cycle (Loorbach, 2007b).

³ For extensive description of these activities see: (Loorbach, 2007b; Loorbach and Rotmans, 2006).

In effect transition management comes down to creating space for frontrunners (niche-players and regime-players) in transition arenas, forming new coalitions around these arenas, driving the activities in a shared and desired direction and develop coalitions and networks into a movement that puts societal pressure on regular policy. In the transition management framework activities related to the content (systems analysis, envisioning, agenda building and experiments) are linked to activities related to the process (network- and coalition building, executing experiments and process structuring). The preferred actors to be involved (based on the necessary competencies) and instruments (like scenario's, transition-agenda's, monitoring instruments etc.) are derived from this framework.

In each of the activity clusters, coalition and network formation is of vital importance combined with the systemic structuring and synthesizing of discussions. The transition arena is meant to stimulate the formation of new coalitions, partnerships and networks that together create a new way of thinking. Mostly, coalitions emerge around transition pathways or experiments, or around specific sub themes, where sub-arenas arise. The very idea behind transition management is to create a societal movement through new coalitions, partnerships and networks around arenas that allow for building up continuous pressure on the political and market arena to safeguard the long-term orientation and goals of the transition process.

In managing transitions, the 'what' and 'how' questions are intertwined. This means that the content is explicitly linked to the process itself. Analyzing the dynamics of the complex societal system, trying to grasp its dynamic behavior, unfolds possibilities to influence its dynamics in a certain direction. This leads to opportunities for managing the system, using innovative instruments to use the windows of opportunities created in the system. However, insight into the complex dynamics of a societal system is necessary but not sufficient. We also need to understand how to organize a process with multiple actors (both individual and collective) with different interests from diverging perspectives. New forms of governance deal with this kind of multi-actor, multi-domain and multi-level processes.

5. Challenges for a transition to sustainability

At the international level there is a consensus on the need for sustainable development and key areas in which the next decade significant progress needs to be made: poverty, hunger, health, education, life expectancy, environmental sustainability and global partnerships (UN, 2005). The majority of these problems relate directly to third world countries and indirectly to the industrialized world and their economic structures that are often based on cheap labor, resources. The approach to sustainable development adopted by the UN is to realize overall consensus while allowing for a variation of strategies and solutions to be chosen by individual countries, regions and actors at different levels (UN, 2005). This means that in practice different countries have taken up different strategies to cope with the challenge of 'managing' sustainable development. A lot of countries opted for sustainability councils and the development of sustainability indicators (see Mulder, 2006, p.148-165). In this context, sustainable development has been represented as the

intersection of economic, social and environmental agendas and the need to integrate (predominantly) environmental concerns into regular policies.

Transitions' approach contributes to the way to rethink or discover sustainability as well as to achieve sustainability in face of those global challenges. Taking a transitions' perspective, we suggest that a culture of sustainability needs to be build at a global level. The values of sustainability respond to social welfare in its intercultural context. Globalization of those sustainability values is essential so as to reorient societal systems towards sustainability at a global level.

In addition to this, a transition in culture's perceptions so as to sustain cultural variety is essential (see also Adams and Jeanrenaud, 2008, p.60 and 76-78). Sustainable development at a global level also means intercultural variety and respect. Westernization or homonization of prototypes and cultural aspects offers only a boost towards a consumption model that starts revealing its pathologies. What the developing world needs is a context specific definition of sustainable development with values that go beyond the western-model of development.

At national and regional level, a transition's perspective to sustainability brings in forward to aspects that are linked to the discovery of sustainability: (a) the importance of the societal sphere in achieving sustainability and (b) the linkage of sustainability and innovation. First, achieving sustainability requires coordination and commitment from different actors that work in different levels and different domains. What is important however is not only to create a common vision but to commit to it and coordinate so as to bring about the change needed to achieve the sustainability goals. Second, innovation and sustainability are interlinked. More particular, to develop sustainably means to continuously innovate and redefine existing culture, structures and practices in an evolutionary manner. A focus on sustainability could trigger innovations that comply with sustainability values as well as that these innovations can be the stimuli for initiation of multi-domain processes for societal transitions to sustainability.

6. Conclusions

Sustainability transition is an open-ended societal process that includes changes in multiple domains and multi-levels: local, regional and global. What transitions approach notes is that the process of pursuing sustainability needs to also comply with the values of sustainability. Hence, a sustainable transition is a process of change that requires coordination of both a sustainable vision and the maintenance of sustainable activities for pursuing sustainability. A transition to sustainability thus, concerns fundamental changes in citizen's practices and routines, empowerment and inclusion of innovation that complies with sustainability criteria and comes from lower levels (bottom-up) and takes into account inter- and intra-generational interests.

Transition management offers an alternative to conventional management by the goal approach for sustainability. Summarizing, transition management suggests radical changes in structures, culture and practices that converge into societal processes that reorient the societal system towards sustainability. Transition management offers a new approach for deliberative steering of multiple actors in different levels aiming at

stimulating societal innovations in different interdependent domains so as to achieve sustainability.

7. References

- Adams, W. M. and Jeanrenaud, S. J. (2008). *Transition to Sustainability: Towards a Humane and Diverse World*. Gland, Switzerland: IUCN. 108pp
- Arthur, W. B., Durlauf, S. N., & Lane, D. A. (1997). *The economy as an evolving complex system*. Reading, MA: Addison-Wesley.
- Beck, U. (1994). The reinvention of politics: towards a theory of reflexive modernization. In U. Beck, A. Giddens & S. Lash (Eds.), *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order*. Cambridge: Polity Press.
- Clark, W. C. (2003). Sustainability, energy use and public participation. In B. Kasemir, J. Jager, C. Jaeger & M. Gardner (Eds.), *Public Participation in Sustainability Science*. Cambridge: Cambridge University Press.
- Clark, W. C., Crutzen, P. J., & Schellnhuber, H. J. (2005). *Science for Global Sustainability: Toward a new paradigm* (No. CID Working Paper No. 120). Cambridge, MA, USA: Harvard University.
- Frantzeskaki, N. and Loorbach, D., (2008). Infrastructures in Transition, Role and Response of Infrastructures in societal transitions, *IEEE International Conference on Infrastructure Systems – “Building Networks for a Brighter Future”*, 10-12 November 2008, Rotterdam, The Netherlands (www.nginfra.nl/conference2008)
- Frantzeskaki, N, van Daalen, E, and Slinger, J.H. (2008). Detecting and directing socio-ecological transitions – A transitions management approach. *International Society of Ecological Economics, 8th International Conference “ISEE 2008 Nairobi: Applying Ecological Economics for social and environmental sustainability”*, August 7-11, 2008, Nairobi, Kenya.
- Funtowicz, S. O., & Ravetz, J. R. (1994). The Worth of a Songbird - Ecological Economics as a Post-Normal Science. *Ecological Economics*, 10(3), 197-207.
- Geels, F. (2004). Sectoral systems of innovation to socio-technical systems; Insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33, 897-920.
- Gell-Man, M. (Ed.). (1994). *Complex Adaptive Systems*: Addison-Wesley, Reading MA.
- Gunderson, L. H., & Holling, C. S. (2002). *Understanding transformations in human and natural systems*. Washington: Island Press.
- Hendriks, C. M., & Grin, J. (2007). Contextualising reflexive governance: the politics of Dutch transitions to sustainability. *Journal of Environmental Policy & Planning*, 9(3-4), 333-350.
- Hisschemöller, M., & Hoppe, R. (1996). Coping with intractable controversies: the case of problem structuring in policy design and analysis. In M. Hisschemoller, R. Hoppe, W. Dunn & J. R. Ravetz (Eds.), *Knowledge and Policy: the International Journal of Knowledge Transfer* (Vol. 8, pp. 40-60).
- Hisschemoller, M., Hoppe, R., Dunn, W., & Ravetz, J. (Eds.). (2001). *Knowledge, power, and participation in environmental policy analysis*. New Brunswick, NJ: Transaction Publishing.
- Holland, J. H. (1995). *Hidden Order: How Adaptation Builds Complexity*. Cambridge, Massachusetts: Helix books / Perseus books.

- Jansen, L. (2003). The challenge of Sustainable Development. *Journal of Cleaner Production*, 11, 231-245.
- Kasemir, B., Jager, J., Jaeger, C., & Gardner, M. (Eds.). (2003). *Public Participation in Sustainability Science*. Cambridge: Cambridge University Press.
- Kates, R. W., Clark, W. C., Corell, R., Hall, J. M., Jaeger, C. C., Lowe, I., et al. (2001). Environment and development - Sustainability science. *Science*, 292(5517), 641-642.
- Kauffman, S. (1995). *At home in the universe: the search for laws of complexity*. Oxford: Oxford University Press.
- Kay, J., Regier, H., Boyle, M., & Francis, G. (1999). An ecosystem approach for sustainability: addressing the challenge of complexity. *Futures*, 31(7), 721-742.
- Loeber, A. (2004). *Practical wisdom in the risk society*. Univeriteit van Amsterdam, Amsterdam.
- Loorbach, D. (2007a). In search of governance for sustainable development. *Sustainability: science, policy and practice*, 3(2).
- Loorbach, D. (2007b). *Transition management: new mode of governance for sustainable development*. Utrecht: International Books.
- Loorbach, D., Parto, S., & Kemp, R. (2003). *From Waste Disposal to Waste Management: Transitions in Waste Management in the Netherlands*. Maastricht: Merit-ICIS.
- Loorbach, D., & Rotmans, J. (2006). Managing transitions for sustainable development. In X. Olshoorn, Wiczorek, A. J. (Ed.), *Understanding Industrial Transformation. Views from different disciplines* (pp. 187-206). Dordrecht: Springer.
- Martens, P., & Rotmans, J. (2002). *Transition in a globalizing world*. Lisse: Swets & Zeitlinger B.V.
- Meadowcroft, J. (1997). Planning for sustainable development: insights from the literatures of political science. *European Journal of Political Research*, 31, 427-454.
- Meadowcroft, J. (2000). Sustainable Development: a New(ish) Idea for a New Century? *Political Studies*, 48, 370-387.
- Meadowcroft, J. (2007). *Steering or muddling through? Transition management and the politics of socio-technical transformation*. Paper presented at the Workshop on 'Politics and governance in sustainable socio-technical transitions' 19-21 September 2007 Schloss Blankensee/Berlin.
- Midgley, G. (Ed.). (2000). *Systemic intervention: philosophy, methodology and practice*. New York: Kluwer Academic Publishers.
- Mulder, K., (Editor), (2006), *Sustainable development for engineers, A handbook and resource guide*, Greenleaf Publishing.
- Ostrom, E. (1993). Self-Governance, the Informal Public Economy, and the Tragedy of the Commons. In P. L. Berger (Ed.), *Institutions of Democracy and Development*. San Francisco: ICS Press.
- Pezzoli, K. (1997). Sustainable Development: a transdisciplinary overview of the literature. *Journal of Environmental Planning and Management*, 40(5), 549-574.
- Ravetz, J. R. (1999). What is Post-Normal Science. *Futures*, 31(7), 647-653.

- Rotmans, J. (1994). *Transitions on the move; Global Dynamics and Sustainable Development*. Bilthoven, The Netherlands: Rijksinstituut voor Volksgezondheid en Milieu (RIVM).
- Rotmans, J. (1998). Methods for IA: The challenges and opportunities ahead *Environmental Modeling and Assessment*, 3(3), 155-179.
- Rotmans, J. (2005). *Societal Innovation: between dream and reality lies complexity* (Vol. <https://ep.eur.nl/handle/1765/7293>). Rotterdam: ERIM, Erasmus Research Institute of Management.
- Rotmans, J., Grin, J., Schot, J., & Smits, R. (2004). *Multi,- Inter- and Transdisciplinary Research Program into Transitions and System Innovations*. Unpublished manuscript, Maastricht.
- Rotmans, J., Kemp, R., & Van Asselt, M. (2001). More evolution than revolution: Transition management in public policy. *Foresight*, 03(01), 17.
- Rotmans, J., & Loorbach, D. (2008). Transition management: reflexive steering of societal complexity through searching, learning and experimenting. In J. Van den Bergh & F. R. Bruinsma (Eds.), *The Transition to Renewable Energy: Theory and Practice*. Cheltenham: Edward Elgar.
- Rotmans, J., & Van Asselt, M. (1996). Integrated assessment: A growing child on its way to maturity - An editorial essay. *Climatic Change*, 34(3-4), 327-336.
- Rotmans, J., and van Asselt, M.B.A. (2001) Uncertainty management in integrated assessment modeling: towards a pluralistic approach. *Environmental monitoring and assessment*, 69,101-130.
- Rotmans, J., & Weaver, P. (2006). Integrated Sustainability Assessment. *International Journal of Innovation and Sustainable Development*.
- Sawyer, R. K. (2005). *Social emergence: societies as complex systems*. Cambridge, UK: Cambridge University Press.
- Scott, W., & Gough, S. (Eds.). (2004). *Key issues in sustainable development and learning: a critical review*. London: Routledge.
- Teisman, G. R. (1992). *Complexe besluitvorming, een pluricentrisch perspectief*. 's Gravenhage: Elsevier.
- UN. (1997). *Global Change and Sustainable Development: Critical Trends*. New York: United Nations, Department for Policy Cordination and Sustainable Development.
- UN. (2005). *The Millenium Development Goals report*. New York: United Nations.
- Van Asselt, M., Rijkens-Klomp, N. (2002). A Look in the Mirror: Reflection on participation in Integrated Assessment from a methodological perspective. *Global Environmental Change-Human and Policy Dimensions*, 12(3), 167-184.
- Van de Kerkhof, M. (2004). *Debating Climate Change*. Utrecht: Lemma.
- Von Bertalanffy, L. (1956). General Systems Theory. *General Systems*, 1, 1-10.
- Voss, J., Bauknecht, D., & Kemp, R. (Eds.). (2006). *Reflexive Governance for Sustainable Development*. Cheltenham: Edward Elgar.
- WCED. (1987). *Our Common Future*. Oxford: University Press.
- Wildavsky, A. (1979). *Speaking truth to power. The art and craft of policy analysis*. Boston: Little, Brown & Co.