Transition management:

Its origin, evolution and critique

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Introduction

Transition management has rapidly emerged over the past few years as a new approach to dealing with complex societal problems and governance in the context of these problems. In the Netherland, UK and Belgium, serious efforts have been and are being undertaken to develop transition policies in areas such as energy, building, mobility and water management. This is the result of a much broader scientific development of transition research as an interdisciplinary field of study in which innovation studies, history, ecology and modeling are combined with sociology, political and governance studies and even psychology. Because of the focus on integrated sustainability problems and the applied nature of transition research, the natural interaction between science and policy has led to a continuous co-evolving theory and practice of transition management.

The emergence of transition management as a new paradigm for governance and research has surprised many researchers and policy-makers, leading to skepticism and doubts as well as enthusiasm and new élan. How was it possible that a new approach that aims to promote transitions, in fact evolutionary revolutions fundamentally altering existing regimes, could be taken up so quickly by policy and was able to simultaneously develop scientifically into a, still very young, discipline? This paper describes the predevelopment phase leading up to the introduction of transition management as national policy in the Netherlands. It will explain the following development as a result of the co-production process between research and policy in which all elements that constitute the transition management approach were brought together. The paper will show that these basic elements were already being developed and implemented for years but had to come together in an active co-production process to become integrated and internalized.

Since its introduction into the policy arena, transition management has been widely debated, challenged, tested, and because of this further developed, enriched and grounded scientifically. The debate concerning the 'manageability' and predictability of transitions has been picked up by Meadowcroft (2005, 2007), Shove and Walker (2007), who warn against possible pitfalls concerning transition management and raise interesting questions regarding scope, effectivity and legitimacy. In their commentaries, they thus touch upon relevant issues, but especially Shove and Walker seem unaware of most of the research and practical experiences of the last years. They for example seem unaware of the social systems approach underlying transition management, the focus on the role of immaterial elements and consumers in transitions, the reflexive use of sustainable development as guiding instead of prescribing notion and the new insights about the role of research and researchers in transition management. In all these areas, important progress has been made.

The paper will explain how the transition management approach further evolved and how it necessarily will continue to do so in the future. We will discuss in-depth major points of criticism and concern as put forward by various authors over the past years.

Transition management: where did it come from?

The term transition is a key term of the fourth National Environmental Policy Plan (NMP4, VROM, 2001), which introduced transition management for the first time as official government policy. The NMP4 can be called a revolutionary policy document, because it broke with dominant policy traditions and practices and created space for innovative policy experiments with transition management. The NMP4 did not set goals but formulated general societal ambitions, which were believed to require transitions, fundamental changes, in functional systems (J. Rotmans, Kemp, & van Asselt, 2001). Transitions and transition management were when they were introduced not only theoretical concepts but also in a sense a mission or belief of policy officials and practitioners. This also provided the basis for further experimentation and theory development.

The question is how this came about. Transition management perhaps was a clear governance philosophy, but not much more than some basic principles were agreed upon. Furthermore no experience in practice was available and, on a more theoretical level, the approach itself could in time be threatening to regular policies as well by promoting 'radical shifts' in thinking and acting. It seems that the process leading up to the NMP4, in which there was close interaction between researchers and government officials, is one of the crucial factors in explaining the success. It took place in the context of increasing awareness, public and political, about sustainability issues and growing concern related to the effectivity of government policies in light of persistent societal problems.

Several long-term developments in the spheres of policy, research, civil society and business seemed to coincide and lead to the awareness that more than regular policies were needed. In fact, the shortcomings of earlier generations of environmental policies were made explicit in light of the call for a new approach (Grin, Graaf, & Vergragt, 2003). The positive 'climate' that this way had evolved in policy and society formed the ideal breeding ground for the NMP4. The NMP4 itself was prepared by a team of departmental officials with various expertise and knowledge. The task of this NMP4-team was to rethink environmental policies in the context of sustainability and to develop a strategic environmental policy agenda. They explored different pathways, among which a number of studies and science-policy debates.

Based on coincidental contacts, the NMP4 team and project leader Cees Moons were triggered to investigate further the possibilities of the transition concept and asked for additional presentations from Jan Rotmans. This set in motion a dynamic process of knowledge development and exchange within the NMP4 team and between Jan Rotmans and his colleague Marjolein van Asselt. In this process a large number of presentations were given (app. 20) and discussions were held. During this period (1999) Marjolein van Asselt worked with the NMP4 team located at the Ministry of VROM for several months. During this interactive process, transitions became increasingly well defined and became an intrinsic part of thinking of the NMP4 team by the end of 1999 and beginning of 2000. Early 2000, Jan Rotmans was formally asked to write a report on transitions, in which he was asked to cooperate with Rene Kemp, senior researcher at MERIT.

The details of this process of policy learning and co-production are described in Loorbach (2007) and will be revisited in a new paper. We like to recall one special moment, a brainstorm meeting between Jan Rotmans, Marjolein van Asselt and René Kemp for the project Transitions and Transition management, the results of which fed into the NMP4. It is about the birth of the idea of transition management, and the initial receptiveness. During the first meetings between Jan Rotmans, Marjolein van Asselt and René Kemp in the context of the 'transitions'-study, Jan Rotmans came up with the concept of transition management as a governance strategy to deal with societal transitions. All three researchers found this term overly suggestive and too optimistic with respect to the possibilities for management in the context of transitions, but Van Asselt immediately saw the policy-potential of the idea. That transition management was not directly received with great enthusiasm is illustrated by the reaction of (energy-) scientists at one of the meetings in which Jan Rotmans and Rene Kemp presented their ideas. They received very direct criticism: the concept was not perceived as new; it would not work and was scientifically considered too shallow. The very direct criticism surprised the NMP4 team and in a crisis meeting in a restaurant, the project was almost cancelled when Jan Rotmans forced a 'stop or go' decision. Nevertheless, the NMP4 team was already enthusiastic about the ideas and felt compelled and already committed to continue with the project.

During the participatory process that unfolded between the researchers and the NMP4 team, both concepts (transition and transition management) were further developed. It is an example of co-production of knowledge between scientists and policy makers, in which a mutual language was developed and the transition approach was gradually internalized by the NMP4 team. In the final report elements suggested by the Ministry were integrated, such as the 'golden tips for policy', which made it a co-produced document. The direct impact of the study by Rotmans et al. (2000) that resulted from the intense interaction and participatory approach is reflected by the choice of words in the NMP4 which remained very close to the text of the ICIS-MERIT report (R. Kemp & Loorbach, 2005).

The NMP4 also borrowed from the ICIS-MERIT report the idea that management of transitions requires the following things:

- To deal with uncertainties, for instance through the use of scenarios.
- To keep options open and deal with fragmented policies: to stimulate knowledge and technological change, to pursue innovation and incremental improvements, to take a multi-domain view with attention to all relevant actors.
- To have a long-term orientation and to use this for short-term policies.
- To pay attention to the international aspects of change processes and find solutions on the right scale.
- A set of specific tasks for the government, namely to stimulate, mediate, engage in brokering services, create the right conditions, enforce its laws and engage in steering.

How did it evolve since and what is it now?

Best known is the application of transition management by EZ, but a large number of other experimental projects have been executed, all adding to the growing theory and

practice of transition management. Transition management has been implemented at different levels:

- In Dutch national policy for sectors (agriculture, mobility and energy, recently also health care)
- In Flemish policy (housing and living, and waste management)
- At the regional level for governments (Parkstad Limburg, Provinces of Zeeland and Utrecht)
- At innovation program and project level (Transumo, Transforum, People Movers)

These experiments have been closely related to the development of theory and transition research, mostly the research done within the Knowledge Network on System Innovations and Transitions (www.ksinetwork.nl). In fact, the implementation of the transition management approach and its underlying principles in a wide variety of application domains and at different levels of abstraction has been actively used by transition research as a testing ground for the approach. Together with practitioners and domain-experts, theoretical ideas and assumptions were tested and based on experience and reflection refined, extended or discarded. This way a rapid build up of new knowledge, practical experience and competences became possible and a lively 'transition community' of policy practitioners and researchers emerged (D. Loorbach, 2007).

Transition management is thus a prime example of co-production and a transdisciplinary scientific concept that deliberately evokes debate and experiment as means for progress. It is a flexible and evolutionary approach, which will never become a blueprint or codified. The strength of the approach lies in the basic principles and framework that make possible that competent practitioners and researchers together develop innovative governance strategies and approaches tailored to a specific complex societal problem (Loorbach, 2004). Not from the idea that all complex problems should be solved similarly, but from the idea that all complex problems exhibit similar patterns, mechanisms and dynamics. Based on these, new and more innovative forms of governance can be developed and implemented which in turn leads to new theory development. It is therefore clear that transition management is now defined, underpinned and implemented differently that in 2001, but also that this in turn will continue to evolve.

The transition management model has been described in many publications of us (R. Kemp & Loorbach, 2006; R. Kemp, Loorbach, D., Rotmans, J., 2007; R. Kemp & Rotmans, 2005; R. a. R. Kemp, J., 2004; D. Loorbach, 2007; J. Rotmans, 2006; J. Rotmans, et al., 2001). From that it may be clear that transition management is a deliberative process to influence governance activities in such a way that they lead to accelerated change directed as sustainability ambitions. Transition management is to be viewed as dealing with issues of meta-governance: how do we influence, coordinate and bring together 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 thus about creating space (in a sense: governance niches) for innovative

governance at all levels, as a strategy to develop alternatives to the regime. Transition management anticipates increasing pressures on the regime level (e.g. predevelopment phase) or tries to provide a more fundamental reflection and long term orientation while the process of change in underway (e.g. acceleration phase).

By engaging in the implementation of transition management, an immediate need form more structured and methodological detail became apparent. Over time, a large number of 'systemic instruments' were developed, tested and refined: the transition arena, transition visions, the transition agenda, transition experiments and so on. All these instruments were conceptualized based on a combination of an integration of theoretical insights, practical experiences so far and have been further developed through testing and reflection upon experiences. Examples are the transition arena and transition visions. The transition arena concept is theoretically based upon insights from complexity and innovation theory (on the innovation potential of newcomers), policy sciences (participatory methods and processes) and other disciplines (methodology for participatory processes). It is practice based in terms of which individual competences need to be involved, group composition and size, manageability of such a process etc. Similarly, the transition vision is a governance instrument in the context of the transition management approach and is based on insights from the literature (on scenarios, role of guiding visions/Leitbilder) and from practice (what works, inspires?).

We here do not want to go in depth into the present state of transition management (for which we refer to (R. Kemp & Loorbach, 2006; D. Loorbach, 2007; J. Rotmans, 2006). We will however respond to some recently voiced commentaries and criticism on transition management, offer insight in the latest thoughts on this issue.

Critical self-reflection on transition management

So far the concept of transition management has been received as promising and pointing into the right direction and has been applied quite extensively in the Netherlands. Yet transition management invokes criticism as well, which we will try to address systematically in this section. Most critical points we will treat briefly and point-wise with two exceptions: the extensive criticism of Shove and Walker (Shove, 2007) and the critical reflection of Meadowcroft (Meadowcroft, 2005, 2007) which we will cover separately and in more detail. But first we start with the point-wise evaluation.

An overall criticism that emerges from quite a few authors concerns the claim behind transition management that *deliberate and systemic intervention in pursuit of sustainable goals is possible and potentially effective*. This is a crucial point, and it touches upon the rather small empirical basis underlying the theory of directing transitions. Indeed, research on historical transitions shows that many transitional developments were unintended, not planned or not initially foreseen ('spontaneous change'). But, like Meadowcroft (2005) argues, this does not mean that directing societal processes in order to establish societal goals is impossible. On the contrary, governments have often directed transition processes, e.g. in the fields of energy (D. Loorbach, Van der Brugge, R., Taanman, M., 2007), waste (Parto, 2007), agriculture and water (R. Van der Brugge

& Rotmans, 2005), but usually on a smaller and more modest scale than proposed by transition management. On the other hand, as already stated above, our knowledge on how to govern societal change in a desirable direction has advanced substantively over the past decades. The innovative concept of transition management is embedded in new forms of governance many of which point into a similar direction: pluralistic network approaches where actors from government, the market and civil society participate in an interactive manner (R. Kemp & Loorbach, 2003). So there is both a clear need and sound rationale for transition management, not in isolation but as part of a research stream studying new forms of governance. Nevertheless its value still largely needs to be proven by solidly underpinning the theoretical framework of transition management by a sufficient number of empirical case studies. And although quite a few testing grounds have been set up in the Netherlands, substantially more cases are needed in the near future, which will take a considerable amount of time (5-10 years). As Loorbach (2007) indicates, the theory of transition management is in a hypothetical stage. However, the hypothesis that deliberate and systemic intervention in pursuit of sustainable goals is possible and potentially effective, is partly tested and validated in various case studies and the results are encouraging and support the hypothesis. However, it might take one or two decades, before it can be fully validated that the concept of transition management is effective, i.e. that it "works".

Transition management has been characterized by some as a top-down, blueprint approach or, as contrast, by others as a bottom-up approach. Neither of these perceptions of transition management is correct. Transition management contains both top-down and bottom-up elements: typical top-down aspects are the envisioning process and the agenda building process, whereas experimenting and learning in niches are typical bottom-up aspects. The sustainability vision is translated in long-term goals and transition pathways, but not in a deterministic, blueprint type of manner. Transition management is oriented towards a goal-searching process where social learning might result in adaptation of goals and pathways after every round. The vision is partly inspired by already ongoing innovations and experiments, which are integrated where possible into the process. In addition, the vision and agenda are set to create room for novel initiatives to be self-organized by societal actors based on the inspirational and invitational character of the vision and agenda. The conceptual strength of transition management lies in the synthesis and continuous iteration between these top-down and bottom-up aspects, potentially reinforcing each other. The envisioning process implies a "helicopter view" on a specific persistent problem, where the sustainability vision forms the coherent framework within which the transition experiments can be performed and scaled up. In this co-evolutionary approach it is not possible to indicate where to start, it can go either way: from macro to micro developments and vice versa.

Berkhout, Smith and Stirling (Berkhout, Smith, & Stirling, 2004) are sceptical of the guiding visions as used within the transition management framework. They argue that guiding visions are contested and that the process of consensus building on these visions is problematic. Also, they argue that many historical transitions were not led by overarching visions of the future. In order to address this criticism we need to clarify the role and functions of guiding visions in transition processes. With regard to the functions

of visions Berkhout e.a. (2004) focus on mapping possibilities, target setting, heuristic device and metaphors. However, the primary function of visions in transition processes is its mobilizing potential: mobilizing efforts, resources, ideas and notions of a selective group of stakeholders ('forerunners') involved in a transition arena. The process of envisioning is therefore at least as important as the vision itself, one of the major findings of the VISIONS project (Van Asselt, 2005). Further, transition visions are no fixed end-points but rather evolutionary futures, which means that visions are adjusted in case new knowledge, insights and lessons are learned after each cycle of the transition management process.

Visions in transition processes are not produced by the regime as suggested by Berkhout e.a. (2004), but by forerunners who are supposed to function quite autonomously from the current dominant regime. So transition visions divert from ordinary visions produced by the regime that are meant to support the dominant structures. Also, consensus on guiding visions in transition processes is not necessary, in the sense that multiple visions, consisting of a basket of transition images and related pathways might be developed. We have left the 'blueprint' idea of creating one overall vision and one road onto it behind us. In the early stage of a transition process we need a diversity of transition images and pathways. Later in the process one overarching vision will 'survive' based on what has been learned so far. So visions and transition processes are mutually dependent: visions are guiding in transition processes but transitions do also co-shape the visions developed. Of note, Berkhout e.a. (2004) conclude that 'managed system innovation processes should place incumbent regimes under stress for alternative visions to gain a foothold'. This is exactly the aim of transition management, to pressurize the current regime subtly, by developing alternative visions and an alternative niche-regime within protected environments, transition arenas.

Some scholars have expressed their concern that transition management involves a rather deterministic collection of rules for managing complex societal systems (Hajer, 2005). This touches upon the management paradox in the face of complexity: whilst you realize that complex, adaptive systems are largely unpredictable and cannot be steered in a command and control manner, you still aim to develop rules for governing the system in a desired direction. With management however, we don't mean control, but rather influencing the direction of a complex, adaptive system. Based on deeper insights into the dynamics of such a complex system we have derived basic principles or guidelines that can be used to influence its direction. In these guidelines reflexivity is built-in in different ways: (i) an adaptive element in the sense that while we try to influence the system, the system itself is changing, so we can adapt to the possible effects of such interventions; (ii) an anticipative element which means that we try to estimate the future dynamic behaviour of the system, partly possible in certain stages due to path dependencies in the system, and anticipate on the possible future behaviour of the system; and (iii) the guidelines are adjusted as a result of learning experiences with the guidelines in practical settings. The guidelines themselves have evolved over the past couple of years based upon what has been learned in empirical cases where transition management has been applied in practice (D. Loorbach, 2007). The above elements of reflexivity lead to the understanding that, facing the limitations of and scope for managing complex, adaptive

systems, there are opportunities and conditions under which it is possible to influence these systems in a desired direction. Obviously, the principles underlying transition management do not represent a fixed set of deterministic rules.

Some critics pointed at the peculiar position of the researcher involved in the process of transition management. Indeed, the researcher plays different roles in these processes and needs to be aware of that. On the one hand, the researcher needs to develop a 'helicopter view', analysing the system in question from a certain distance. On the other hand, the researcher needs to develop an actor view, being a change agent as part of a structural change process. And finally, the researcher aims to influence the process by using innovative management concepts to speed up a transition process, e.g. by co-establishing a transition arena or stimulating transition experiments. Loorbach (2007) addresses these different roles of the transition researcher and indicates that in practice it is hard to differentiate between these roles.

And finally, an issue that is often brought up by critics of transition management is that the notion of power is explicitly lacking, whereas a transition is about a power struggle. Indeed, in the early stage of transition research power as object of research was underrated. However, power as research theme has become increasingly important over the past years. Avelino (Avelino, 2007) has studied a variety of conceptions of power in the scientific literature and distilled two power concepts that might be relevant in relation to transitions: structural and innovative power. Structural power has constitutive capacity and is used by the regime to fabricate, manufacture and shape interests and identities of regime parties, forming an intricate web. Innovative power emerges when a group of individuals that act differently will start acting in concert with the aim to create something new. Redefining a transition in terms of power then means a shift in power regime: from structural power to niche power. Transition management is aimed at empowering niches to allow the formation of niche-regimes that can fill up the 'power vacuum' that arises at some point of time during the pre-development phase of a transition. These preliminary ideas of the role of power in transition processes needs to be elaborated theoretically and empirically grounded in the coming years.

Extensive response to Shove and Walker (2007)

In an interesting commentary Shove and Walker (2007) postulate some provocative but thoughtful cautions with regard to the notion of transition management. Before we address these comments we would like to clarify some misconceptions about transition management. In general, they make a caricature of transition management and seem to miss the quintessence of it. They suspect transition management to be some kind of social engineering, presupposing that individuals and organizations can steer complex systems towards predefined, normative goals. These social engineering methods were rooted in classical systems theory, largely avoiding uncertainty and complexity. Perhaps transition management has a suggestion of social engineering but it really is a model for exploring new paths in a reflexive manner. Of course the world is not perfectly reflexive. It is exactly this observation that led us to develop a model of transition management as a

framework for policy: to make policy more reflexive, to deal with issues of uncertainty and complexity. The word "management" in transition management is easily misunderstood: as a tool for transition managers (whoever they may be), instead of as a frame for societal deliberations which it really is. Transition management is rooted in complex systems theory, with uncertainty and complexity as starting points, accepting that interaction processes produce unpredictable outcomes. We were able to connect with the literature on modern governance which emphasizes the impossibilities of top-down steering, looking for new modes of governance for transforming the plurality of interests into coordinated action (Eising, 1999; March & Olson, 1995; Mayntz, 1993) Through forms of network governance. Reflexivity is a key part of these new modes of governance, where transition management fits best in the emerging field of reflexive governance (R. Kemp & Loorbach, 2006; Voss, 2005). So there is much more reflexivity built in transition management than Shove and Walker treat in their commentary.

Next to this social engineering misinterpretation we treat some other misconceptions point-wise. First, Shove and Walker focus on socio-technical transitions whereas transition management so far has been applied to much wider social transitions, not focusing on technological innovation but on transformations of societal sectors (such as the energy, water or health care sector). This is of vital importance because it leads to a different conceptualization of transitions but also to different case studies and different management strategies. Second, they criticize the rigidity of analyses of historic transitions, e.g. stating that 'one consequence is that studies of systems in transition are typically distanced, even voyeuristic, making few claims about how individuals might, or should act to affect the processes in question or to steer trajectories towards predefined, normative goals'. This may hold for socio-technical case studies such as from Geels (Geels, 2002), in which patterns and pathways underlying socio-technical transitions are described and explained. In transition management cases, however, the explicit focus is on the role of individuals and institutions in transition processes, studying their behavior in terms of attempts to influence these transition processes by certain interventions (Loorbach, 2007). Thirdly, Shove and Walker observe differences in intervention strategies: (i) picking one trajectory or another, (ii) agents shaping or making niches and paths or (iii) managing critical processes of variation and selection. Obviously, transition management involves all three of the above elements. Because there are no pre-defined solutions the process starts with exploring a potential solution space (in terms of sustainability), define pathways (*multiple paths*) onto potential sustainable solutions, set out a wide range of small-scale experiments (*variation of niches*) and learn about them in order to scale up the most promising (*selection*); searching, learning and experimenting. This is all documented in more detail by the developers of transition management, see (R. Kemp, Loorbach, D., Rotmans, J., 2007; D. Loorbach, 2007; J. Rotmans, et al., 2001; J. Rotmans, et al., 2000).

And finally, we address the four cautions as formulated by Shove and Walker (2007).

Caution 1: who are managing a transition, on what authority and on whose behalf? What are the everyday politics of transition management? And who wins and who loses as transitions are managed?

Shove and Walker presuppose that a transition is managed by transition managers. A transition, however, cannot be managed in the classical command-and-control, top-down sense. With managing we mean creating space for frontrunners and first movers and empower them gradually. Creating space involves diverse activities: a long-term, ambitious vision creates time for new, challenging ideas within the incumbent regime; a joint agenda creates thrust among parties involves; financial incentives create possibilities for niche-players to develop innovative ideas; innovative, small-scale experiments create diversity at the niche-level; empowering niche-players by providing them with knowledge and removing barriers; and scaling up experiments enhances the emergence of a break-through. This palette of activities falls within the scope of transition management (J. Rotmans, 2006).

In day-to-day practice these activities co-evolve in no particular order, not based on a grand design. These activities are undertaken by a variety of players, without a clear hierarchy and without a clear demarcation who is inside and outside "the system". These players are not so much 'transition managers' but each of them plays a particular role in the transition game. Some are playing at the strategic level, building up authority and legitimacy among high-level politicians and policy-makers within the regime. Some are forming new coalitions involving new parties whereas others are linking up existing experiments. Some 'transitionize' ordinary innovation experiments, others are developing new arrangements to remove existing barriers. Some are involved in bureaucratic activities, whereas others develop practical guidelines for practitioners. So the everyday politics of transition management forms a tangled ball with no clear management structure (Loorbach, 2007).

So far all transition trajectories in the Netherlands and Belgium (see also: Paredis, 2007) operate under the flag of the government. The government initiated those trajectories, and has adopted transition management as an official policy line, linked up to the 4th National Environmental Plan. That means that transition policy is authorized by the Dutch Parliament and that the transition process is accountable to the Dutch Parliament. The potential disadvantage of this is that the process can be encapsulated by the regime and that the radical character becomes diluted. Other forms are therefore also possible, where NGOs or business branches take the initiative for a transition trajectory. Actually, the concept of transition management expressly leaves open the door for other initiators of transition trajectories than the government (Rotmans et al., 2001).

Indeed, every transition involves winners and losers. Who these winners and losers are is hard to say in the initiation or pre-development phase. In this phase the transition process is meant to be inclusive, in the sense that enough niche-players should be on board, rather than only the usual suspects of regime-players. In practice, however, regime-players use their power to influence the admission process. In the take-off and acceleration phase of

the transition process becomes tougher and more selective. In that phase it becomes more obvious that transitions are about power changes and the tensions among the different parties increase. After having created a diversity of coalitions around which diverse sets of projects and experiments have been started, a selection needs to be made after a couple of years: which projects to continue, which projects to be scaled up and which ones to stop? This is a crucial step in the currently ongoing transition trajectories that they haven't faced yet.

Caution 2: what is to be monitored and how frequently? How to identify early signals of trajectories that take decades to unfold? And how to respond when relevant dynamic processes speed up or slow down?

Transition trajectories are whimsical processes with alternating fast and slow dynamics. Much of that complex dynamics remains hidden for quite some time after which it comes to the surface. The waves are visible and seem to show the dynamics of a transition, while the undercurrent really determines the rhythm and direction of a transition. The art is to recognize the seeds of transitional change already in an early stage by tracing the emergent properties of a system (J. Rotmans & Rothman, 2003). A closer look reveals that transition configurations contain patterns and underlying mechanisms (de Haan, 2007). So in analytical terms it is essential to monitor the dynamics of a transition: the different stages of a transition, the undercurrent and related seeds of transitional change, the patterns, pathways and mechanisms.

Quantitative indicators are needed too. Economic indicators, such as economic productivity, efficiency and effectiveness, ecological indicators as pollution and emissions and social indicators as reliability and affordability are important signals in a transition process and need to be monitored. And finally, in process terms vital transition signals are: new coalitions formed, emerging networks, new types of discourse and a new language, a change in perspective, behavior and actions of actors involved, long-term and short-term objectives, vision and related pathways, outcomes of experiments and project results, measures and instruments, different forms of learning (technical, conceptual and social learning).

This kind of reflexive monitoring (Taanman, et al., submitted) is meant to give continuous feedback to people and parties involved in a transition process. In particular for people trying to "manage" the process this feedback in terms of process and content is indispensable. The cyclical and iterative concept of transition management is intrinsically a process of continuous adjustment. Based on learning experiences in the first iteration of the cycle, the shared problem perception is re-evaluated and if needed adjusted. The same holds for the sustainability vision and the related pathways that might be adjusted and as a matter of fact also for the experiments and projects. Adjustment based on learning is evident in transition management, but adjustment based on changes in the external circumstances is business-as-usual. In the case of the energy transition in the Netherlands an acceleration of the process has taken place under influence of a growing sense of urgency due to anthropogenic climate change. Also a change of the Dutch cabinet that took place by early 2007 caused unrest and commotion, with the result that the energy

transition was placed at the heart of the cabinet's environmental policy. The minister for the environment is now directing the energy transition process instead of the minister for economic affairs. This kind of uproar cannot be foreseen or avoided and has its own autonomous dynamics. Macro-changes, calamities, disasters or political fuzz can cause a lot of unrest and there is no recipe how to respond to it.

Caution 3: How to respond to transitions that are heading for an unsustainable direction? Is transition management capable of stemming unforeseen transitions? And how to deal with the 'death' of undesirable systems?

Evidently, rapid advancements our world has experienced in the last century have not led to a more sustainable world. The latest global study 'Millennium Ecosystem Assessment' indicated that mankind has changed ecosystems much faster and more drastically in the last 50 years than in any other period in human history (Reid, 2005). There is growing awareness that this increasing pressure brought about by man's urge for expansion could lead to sudden changes (discontinuities, surprises), which will pose a serious threat to mankind. Examples of this include the outbreak of new diseases, changes in the regional climate and plummeting stocks of fish. Symptoms of unsustainability in our society become manifest in the form of persistent problems (VROM, 2001). Persistent problems are complex, uncertain, deeply rooted in our societal structures, difficult to manage and hard to grasp. For persistent problems are no read-made solutions and pseudo-solutions soon become part of the problem. Examples of the manifestations of persistent problems include: floods and periods of drought, animal diseases such as bird flu, mad cow disease and foot-and-mouth disease, traffic congestion and air pollution due to increased mobility. Persistent problems cannot be solved by current policies only, nor can they be corrected by the market. Persistent problems require radical system innovations, called transitions. So the very idea of transition management was meant to counter the mainstream unsustainable trend occurring in our present-day society. Some examples are resource-intensive Japanese toilets, long-distance vacation and super size cars as SUVs. A discourse about sustainability helps to articulate those aspects that are less desirable from a societal point of view. This could give rise to the development of configurations that are more sustainable in the view through various processes: cultural disapproval, regulation and economic disincentives for use. A transition involves building up new system's structures. However, it also involves decay of existing system's structures. A new regime will unfold and replace the existing regime. New structures, cultures and practices will emerge, at the cost of incumbent structures, cultures and practices. So the 'death' of (from a transition perspective) undesirable systems is a prerequisite for the 'birth' of more desirable (sustainable) systems.

Caution 4: There is an overly focus on technical systems and infrastructures of provision and supply. This is only a narrow slice of a much wider social systemic change.

Shove and Walker give examples of transition case studies that seemingly demonstrate this technical orientation: transportation systems, water infrastructures and energy infrastructure. In our opinion these examples demonstrate their own bias towards the socio-technical literature. The socio-technical literature indeed is full of technical case studies focusing on the emergence of new technologies and infrastructures (Berkhout, et al., 2004; Elzen, 2004; Geels, 2002). This, however, is not about transition management, at the very most about strategic niche management (Hoogma, 2002; R. Kemp, Schot, & Hoogma, 1998). The case studies underlying transition management are of a different nature. Representative examples of these case studies are described in Loorbach (2007). Regional examples (for instance in Parkstad Limburg) focus on the development of a sustainable region. This involves a broad palette of social systemic change, including the identity, the social services, citizen participation, unemployment, health and ageing, mobility, economic infrastructure and ecosystem services. Next to these regional examples, supplemented by the Zuidvleugel and Zeeland, there are sectoral examples such as the energy and water transition. But these examples have no technological bias at all. The water transition example, for instance, analyzed by (R. Van der Brugge, Rotmans, & Loorbach, 2005) mainly focuses on a change in cultural perspective, as has occurred in the Netherlands during the past decades: 'from stemming water to accommodating water'. Also the energy transition has a broad social focus from a transition management angle. We have warned against a too small and technical focus for the energy transition (J. Rotmans, Kemp, R., van Asselt, M., Geels, F., Verbong, G., Molendijk, K., 2001), taking account of institutional, cultural, demographic, economic, ecological and technological determinants that co-evolve with no a priory ranking of importance. In fact, our transition management approach was developed as an answer to the rather narrow focus of the socio-technical approach.

Extensive response to Meadowcroft (2005 and 2007)

Meadowcroft (2005) puts questions on the open nature of transitions in relation to the closure mechanism: whether or not the transition will eventually, after several decades, draw to an end and the problem is solved. This touches upon the difference between transitions and system innovations. In our definition transitions are related to broad societal systems such as the energy, agricultural or health care system. These societal systems comprise various subsystems. At this level we speak of system innovations: organization-transcending innovations that fundamentally alter the relationship between companies, organizations and individuals involved. Transitions thus require system innovations each of which may have a different speed and rate of progress. For instance, the Dutch agricultural system comprises subsystems such as dairy and crop farming, intensive pig and poultry farming and glasshouse horticulture. Whereas the glasshouse horticulture is moving rapidly into a modern, innovative, more sustainable sub-sector, the intensive pig farming is lagging behind, hardly moving, and resisting structural change.

This indicates that a transition is far from a smooth, uniform shift from state A to B. On the contrary, a transition contains multiple patterns of change for different subsystems at different scale levels. The overall transition never really comes to an end during a period of decades, with some system innovations left hanging while other system innovations really break through and new ones just begin. So if we speak of a successful transition it is usually partially completed, with some representative subsystems transformed into sustainable ones, while other subsystems might stagnate or even fail to become sustainable.

This marks the need for choosing an adequate scale level and system boundaries to analyze and manage transitions. The analysis of which subsystems innovate rapidly and which move slowly or even stagnate forms the basis for developing an appropriate intervention strategy. One of the principles underlying transition management is to focus on rapidly evolving subsystems rather than on lagging subsystems. Fast developing subsystems supposedly have a higher transformative potential, which enhances the chance that their direction and pace can be influenced by applying transition management guidelines. By providing successful examples of transformed subsystems, these forerunners can influence more inert subsystems and expedite their restructuring process. Focused effort and energy on forerunning subsystems turns out to be much more effective than spreading intervention efforts over all sub-systems involved.

Meadowcroft (2005) emphasizes further the international, cross-state character of most transitions. Obviously, the types of transitions sketched above exceed the national state-level. In Rotmans et al. (2000) we already indicated the importance of an international approach towards sustainability transitions, and that it would be fairly useless to stimulate transition processes within a state without embedding this in an international if not global context. On the other hand, it makes sense to experiment with transition processes within the state context, considering that narrow scale level as a relevant niche. Within such a national niche we can learn and experiment with transition management as much as possible. As a parallel track to the national transition activities we need to scale up the lessons learned and insights derived to the international level, in particular to the EU-level. In the Netherlands this international track has become an essential part of the transition policy.

In a recent intriguing and thought-provoking article, Meadowcroft (2007) anatomizes the concept of transition management in particular components, after which he describes the strengths and weaknesses of transition management. He distinguishes three potential difficulties of transition management which we will discuss below.

Transitions and systems

Meadowcroft questions the abstract level of social systems as angle for transition management and the precise orientation of those systems which could go in different directions at the subsystem level.

Transition management deals with social systems (often public systems) rather than socio-technical systems. The rationale behind this choice is that many social (public)

systems, such as the energy sector, construction sector, health care sector, transport sector, water sector and agricultural sector today face persistent problems. The persistency is rooted deeply in our societal structures and need to be addressed at that structural level. Obviously, each of these social systems has its own context, structure and dynamics. However, a critical analysis of these systems reveals a number of common factors that contribute to the persistency of the problems:

(i) the problems identified have been there for a long period, usually for decades;
(ii) many parties are involved in directing these systems, but both the individual capacity and the collective capacity for directing these systems is rather limited;
(iii) parties generally take part in lengthy negotiations about short-term, incremental renewals or improvements of the existing order;
(v) for a long time, problems have been addressed by the same actors, following the same outdated rules of the game, within the same old-fashioned institutions;
(vi) the complexity is not adequately recognized by the parties involved;
(vii) the supplier's interests weigh more than those of the end-users;
(viii) the end-user has no real freedom of choice and say, and
(ix) economic interests and values take precedence over societal interests and values.
(x) there is no coherent vision on the long-term future of the specific system;

From a systems point of view these are all system failures, flaws in our public systems (J. Rotmans, 2006). Due to the persistence and accumulation of system failures, we can speak of a systems crisis (Wijffels, 2002). In contrast with market failures, these system failures cannot be corrected by the market, since there is no correction mechanism. The market-based way of thinking focuses on improving efficiency and maximizing profits, thus bypassing other aspects of sustainability. From a sustainability viewpoint, it would be necessary to articulate future supply and demand of products, which is in many cases difficult to do. As a result, there is no properly-functioning market and there is no functional supply and demand mechanism. These system failures can also not be solved using *only* current policies (Energieraad & VROM-raad, 2004; VROM-raad, 2002). Therefore existing policies are necessary, but not sufficient: a more radical approach is needed, a radical, fundamental shake-up of these systems, breaking down existing structures and building up new ones.

The deeply rooted persistency requires an integrated systems approach at the highest system level, to avoid spill-over effects at lower subsystems levels. However, after having done this overall systems analysis, the transition theme needs to be (re)defined in terms of sub-issues at the systems level. At this subsystem level we speak of system innovation, see the agricultural example above. But the persistency requires also an extremely high ambition level. The future orientation needs to be inspiring, challenging and imaginative to break through the current barriers (system failures) and to provide the system with new attractors. This implies that the underlying transition goals need to be ambitious and challenging and perhaps not always realistic. Less ambitious goals would in many cases lead to incremental improvements of the system or to a lock-in (J. Rotmans, 2006).

Let's take the energy transition example in the Netherlands. In 2001 an extremely ambitious vision was formulated for a future sustainable energy system by 2050 in terms of: (a) clean (offers a solution for the climate change problem); (b) affordable (functional and energy-efficient); and (c) secure (dependable, reliable, guaranteed supplies). The associated goals in terms of CO2-reduction were 20% by 2020 and 50% by 2050 compared to the 1990-level. However, also common themes were chosen: gas, industrial energy efficiency and biomass, because these invariably were supposed to form part of a sustainable energy supply system in the future. No themes were explicitly excluded, but themes such as nuclear energy and coal were supposed to be non-sustainable. So it is important to indicate already in an early stage of a transition process what is thought of as non-sustainable.

The hypothetical descriptions of the energy transition that Meadowcroft (2007) postulates are not really transition descriptions. For instance, a shift from a carbon emitting energy system to a carbon neutral energy system, or a shift from a non-renewable energy system to a renewable energy system, are too abstract and too technical to advocate sweeping change and to inspire people and parties to create a new movement. The description should be transparent, simple and appealing, like formulated above: 'clean, affordable and secure' in combination with high environmental targets: 50% CO2-reduction or more.

The crux of transition management is that for each of these transition indicators (clean, affordable and secure), rather than making definite choices, small scale experiments are set out and done from which much can be learned, so that in a later stage better information is available on the (non-)sustainability aspects of pathways and the related experiments. In this respect better underpinned choices can be made by better-informed actors such as decision-makers. The argument of Meadowcroft that prioritizing energy security could lead to a return of coal does not hold, because if done properly, coal was already excluded from onset on as a non-sustainable option (see (Verbong, 2000) on the Dutch energy transition from coal to gas). Of course, the political arena is capricious and if such an opportunistic option emerges, it is exactly the function of a transition process to point to the non-sustainable characteristics of that option. This is the main difference between the political arena (aimed at the short- and medium-term and incremental changes) and the transition arena(s) (aimed at the long-term and system innovation).

In the Dutch energy transition the overarching energy theme was soon translated into six sub-themes around which arenas (platforms) were established. (1) new gas; (2) sustainable mobility; (3) green resources; (4) chain efficiency; (5) sustainable electricity; and (6) built environment. For these six main sub-themes (transition routes) 28 transition paths have been worked out in detail and have been authorized. For each sub-theme the parties in the platforms have defined specific goals and selected transition pathways, see Table 1 below.

Table 1. The energy transition themes, goals and paths chosen by the platforms

Theme	**Goal**	**Transition path**

New gas	To become the most sustainable gas country in Europe	Decentralized electricity generation
		Energy efficient greenhouses
		Green gas hydrogen
		Clean fossil fuels
Sustainable mobility	Factor 2 reduction of GHG emissions for new vehicles in 2015 and factor 3 reduction for all vehicles in 2030	Hybrid propulsion
		Biofuels
		Hydrogen vehicles
		Intelligent transport systems
Green resources	Substitution of 30% of resources for energy by green resources by 2030	Biomass production in NL
		Chains for biomass import
		WISE Biomass co-production
		Synthetic Natural Gas
		Sustainable chemistry
Chain efficiency	20-30% extra improvement of product chains by 2030	Optimising the waste chain
		Precision farming
		Process intensification
		Multimodal transport
		Clearing house for bulk products
		Symbiosis (closing material loops)
		Micro cogeneration
		Energy efficient paper production
Sustainable electricity supply	To make electricity supply more sustainable	Renewable energy sources
		Decarbonisation and cogeneration
		Electric infrastructure
		Electricity use
Built environment	To accelerate energy improvement programs and stimulate new innovations	Energy improvements in built environment Development and implementation of innovations Removal of institutional barriers

Meadowcroft (2007) argues that 'acute social and political struggles about the character of these transitions seem inevitable.' We partly recognize this but for other reasons than Meadowcroft gives. In our experience there are no acute tensions and struggles in the early stage of a transition management process. In that stage the process itself does not harm anyone, no definitive choices are made and additional money becomes available. The innovative, fresh approach usually creates enthusiasm among people and parties involved. Only in a later stage tensions arise, but not because people involved get concerned with their own place and position within this process. Rather, tensions arise because niche players felt left out by regime players, for instance. Or tensions arise between regime and niche players for instance. Or between regular policy and transition policy, when regular policy becomes more demanding and requires concrete results that can be plugged into their regular policy framework. Or the regime creates new structures around the transition policy in order to keep in control of this inconvenient process, like happening within and around the energy transition process in the Netherlands.

A transition process involves a cascade of system innovations, process innovations and product innovations, all with their own dynamics. A closure of the system as a whole, focusing on a particular end point is impossible (see the arguments above). Analyzing the multi-layered dynamics of complex, societal systems and trying to grasp its dynamic

behaviour is important, because it unfolds possibilities to influence its dynamics in a certain direction. In managing transitions, the 'what' and 'how' questions are intertwined. This means that the content is explicitly linked to the process itself. We therefore attempt to describe the multi-facetted nature of transition dynamics in terms of generic patterns that consist of a sequence of mechanisms that result in irreversible changes in the system. A key pattern is the following: niches emerge and cluster and by empowering a niche cluster a niche regime unfolds; the niche regime becomes more powerful whereas the regime is weakening and finally the niche-regime takes over the incumbent regime that is transformed. A pattern is built up of mechanisms and a manifestation of such a pattern is a pathway. Underlying mechanisms are *variation and selection, adaptation, emergence, clustering, empowering, transformation, decay and building up.* Three variants of this key pattern are developed, see de Haan (2007): (i) micro-meso pattern, where niches emerge at the micro-level, cluster and form a niche-regime that attacks the incumbent regime which ultimately is transformed into a new regime; (ii) meso-meso pattern, where niches emerge at the meso-level and form a niche-regime within the incumbent regime that gradually incorporates the niche-regime and evolves into a new regime; (iii) macro-meso pattern, where a massive, fast change in the landscape leads to a striking pressure on the regime that results in a regime-change. This is not so much related to niche developments but rather to relatively fast top-down changes that profoundly impact the regime. The distinction in multiple transition patterns is important because it provides levers for influencing transition processes and it gives insight into the effectiveness of governance strategies and instruments. In fact, different patterns will lead to different interpretations of transition management.

We agree that it is hardly possible to discern the beginning and end of a transition of a social system. Transition processes are open-ended, and multi-layered, ongoing processes without a real closure. A nice example is the transition in passenger transport from horse and carriages to automobiles, about which anyone will agree this is a transition, as we can observe a change in regimes. But the automobile regime has been changing all along, and the use of horse and carriages still exists as a tourist activity in countries with car-based modes of transport as the dominant mode of transport.

Although transition images as presented by the authors earlier might suggest end points, these are target images rather than fixed end points (J. Rotmans, et al., 2001). And the socio-technical historical transition illustrations may suggest a fixed trajectory from one state to another; the currently studied social systems in transition are of a higher order of complexity. Managing these complex social systems means trying to influence their direction and pace, expediting the ongoing evolution in and outside these social systems. But transition management is not at all about designing a route planner, using a Tom-Tom to achieve a fixed place of determination. That kind of social engineering is outmoded in transition science. In that light sustainable development guides as explicitly normative orientation for transition management rather than a fixed target.

Finally, our definition and interpretation of a regime differs from that of Meadowcroft. We define a regime as the dominant structure, culture and practices with the incumbent power and vested interests in a social system (J. Rotmans, 2006). So although there might

be multiple regimes, only one is dominant at a particular time period. In the energy domain, the fossil fuel regime is unmistakably dominant. In the health care domain the 'evidence-based' regime is dominant, in the mobility domain the automobile regime is dominant, etc.

The scope of transition management

Meadowcroft states that transition management is not synonymous with governance for sustainable development but that it is just one component of a much broader process of governing sustainable development.

We do entirely agree with this statement. We have never claimed that transition management is similar to governance for sustainable development. The latter is a much broader process that encompasses many more and other steps, actions and strategies than transition management. Governance for sustainable development is part of the mainstream political process and e.g. linked up to intergovernmental processes of the United Nations. The UN Commission for Sustainable development was established in 1992 and since then numerous countries have developed national strategies for sustainable development. Also, the World Business Council for Sustainable Development, a CEO-led, global association of about 200 companies dealing with business and sustainable development, is an important partner within the global sustainable development landscape. And finally, the UNEP is worldwide an important player with their global environmental assessments. These are all components of a political machinery around sustainable development, that includes thousands of initiatives at the global, regional and national level. Transition management is not part of that intergovernmental political arena. So, governance for sustainable development includes a wide range of strategies, actions and activities and transition management has only a modest position within this wide range of activities.

By the way, we do not agree with Meadowcroft that "the establishment of societal agreement around common goals, the negotiation of trade-offs among potentially competing goals and constituencies, the distribution of scarce resources among diverse societal spheres, and the enforcement of such decisions necessarily fall outside the direct purview of transition management itself". In the Netherlands these aspects are part of the transition management process itself. However, these issues are raised within a broader political context within which transition management is just one of more considerations.

That brings us to the potential scope of transition management. We have always argued that the scope of transition management is rather limited (R. Kemp & Loorbach, 2003; J. Rotmans, et al., 2001). This is because it is linked to a particular set of problems, namely persistent problems. In Dirven et al. (Dirven, Rotmans, & Verkaik, 2002) we make a distinction of different types of policy problems, based on agreement/disagreement on values and data, varying from technical problems, market-oriented problems to persistent problems. The latter is a relatively small category of problems: highly complex and hard to manage, with disagreement on values and data.

However, persistent problems are not bound to sectors or domains but occur also in regions and cities. Most applications of transition management in the Netherlands are at the regional level. For instance, in Parkstad Limburg, in the South-Eastern part of the Netherlands, a region formed by 8 municipalities that suffered seriously after the closing of the national coal mines and never really recovered from that social crisis. About a decade ago an increasing sense of urgency invoked an attempt to initiate a transition process towards a flourishing regional development of Parkstad Limburg (D. Loorbach, 2007). Other currently ongoing regional applications of transition management are Zeeland and de Zuidvleugel, regions in the South-Western part of the Netherlands, a major part of the densely populated Dutch Delta, which is under increasing pressure from anticipated climate change and water problems in relation to a deteriorating quality of life.

As long as they form distinct societal (sub) systems and they face persistent problems, regions and cities in potency form an adequate source of application for transition management. Under that condition, speaking from a theoretical transition management viewpoint, there is no difference between a region/city and a social sector/branche. In practice, the advantage of a region or city is that people and parties involved in a transition management process feel generally more emotionally involved because it touches upon their daily life and thus are willing to be actively engaged in a transition process.

Lock-in and the hard choices confronting decision-makers

Meadowcroft addresses the two-way approach of transition management in order to avoid a lock-in: pursuing system improvement and system innovation simultaneously. By exploring in detail the example of carbon capture and storage his main criticism is that for some technologies it is unclear whether they contribute to the world of system improvement or to the world of system innovation or to both.

The core of transition management is: (i) to explore the persistence of a problem and to acknowledge that there is no ready-made solution for that problem; (ii) to translate the persistent problem in a visionary challenge with a variety of options and directions; (iii) to experiment in these directions on a small-scale; and (iv) to make informed choices based on learning experiences with small-scale experiments (e.g. which experiment could/should be scaled up). A crucial aspect of transition management is therefore to explore the transformative potential of a transition experiment. A transition experiment is defined here as an innovation project that learns about societal (transitional) challenges, such as how to fulfill the need for energy, transportation, housing and healthcare in a sustainable way (R. Kemp & van den Bosch, 2006). Transition experiments differ from regular innovation experiments in the sense that they potentially contribute to a long-term societal challenge, their outcome is uncertain, they aim at (social) learning rather than technical learning and they are no demonstration projects but exploration environments for searching and learning of transition pathways (D. Loorbach, 2007). Because transition experiments are focused on broad societal needs, these experiments are not only technological by nature, but also institutional, legal, financial or social cultural. So contrary to what Meadowcroft (2007) supposes, transition experiments are broader than

technologies only. Examples of transition experiments in practice are experiments with sustainable ways to fulfill the need for: accommodation and care for the elderly, mobility in urban areas, nutrition for schoolchildren and water management.

We have developed three mechanisms to 'manage' transition experiments (Van den Bosch & Taanman, 2006). *Deepening* a transition experiment, which means learning as much as possible from an experiment. In substance terms this means that a diversity of experiments is required, with an explicit learning goal formulated in advance with actors (participants) that are willing to learn. In process terms this means that enough reflexivity is built in, learning experiences are documented, a social learning process is organized and that the process builds upon learning experiences from other experiments. *Broadening* a transition experiment means that an experiment is 'repeated' in a different context. In this stage an experiment can be coupled to different functions and domains and to other experiments that are oriented to a similar societal challenge. The overarching vision developed is used for giving guidance to experiments, providing a coherent framework. And finally, *Scaling up* a transition experiment by anchoring it in the regime. This involves the early identification of barriers and possibilities within the regime, exploring the modulation at the macro-level, involving key parties from the regime in experiments, forming new coalitions around these experiments and feeding back the first results with the strategic regime level.

This management strategy for transition experiments by deepening, broadening and scaling up marks the evolution of our thinking over the last couple years compared with the relatively simple 'two world' approach as formulated in Kemp and Rotmans (2005). That is not to say that this integrated management approach unequivocally addresses the ambiguities as denoted by Meadowcroft. Assessments of the transformative potential of transition experiments (even if focused on new technologies) remain part of subjective judgement, uncertainty and risk analysis, but also of power struggles, interests and manipulations. Such a process is only partial rational and predominantly irrational. Nevertheless it makes sense to organize the rational part through a systemic, strategic assessment process around these experiments in order to postpone critical, highly uncertain choices and wait better and more knowledge is available. Such an integrated assessment should not be done by experts only; also other societal actors should be involved. This is far from easy, because e.g. citizens can often only express their future demands in the abstract sense. This is why we need to rely on market forces besides political choice.

Meadowcroft highlights the example of carbon capture and storage (CCS) and how to deal with this option from the viewpoint of transition management. The discussion he invokes is interesting at the theoretical meta-level but has been superseded by practice already in the Netherlands. Within the Dutch energy transition carbon capture and storage (in the Netherlands we call this 'clean fossils') clean fossils has already become a pathway within the energy transition as part of the platform 'New Gas'. A working group reported last year on the pros and cons of clean fossils in a balanced report and based on their recommendations the first real transition experiment around clean fossils is planned to start soon. We would like to share some major findings of the recommendations from

the clean fossils working group to represent the state-of-the-art thinking on this option in the Netherlands (PlatformNewGas, 2006).

Their main conclusion is that underground CO2-storage does not offer a permanent solution to the climate change problem. But it is seen as an excellent opportunity to complement the options of energy conservation and renewable (sustainable) energy option to achieve the necessary reduction of CO2-emissions. In other words: clean fossils is not seen as a sustainable option (offers no solution for the climate change problem) but it is attractive with respect to security of energy supply. It is seen as a third option, supplementary to the policies of energy conservation and sustainable energy policies.

It is stated that the Netherlands can play a leading role in clean fossils and that the Netherlands is placed in a prominent position with respect to technological knowledge concerning gases, gasification and separation technologies and economic and legal knowledge with respect to gas transport and trade. And favourable geological conditions ensure good underground storage in the Netherlands. The working group recommends that there a number of reasons for supporting the first clean fossils activities. Market triggers are an important determinant for whether or not using clean fossils, as well as European government triggers (e.g. to activate this option under the EU emissions trading scheme) and national triggers (active financial and legal support from the Dutch government). The working group urges the government to support the first clean fossils-pilot projects and to become a frontrunner in the international arena.

The working group recommends that four project categories should be defined:

(i) CO2 capture and storage, in combination with coal/gas-fired electricity
(ii) Storing CO2 from pure point sources, such as industry
(iii) CO2-storage of large-scale energy generation based on coal/biomass
(iv) CO2-storage of natural gas extracted offshore.

Specific plans already exist for each of these options:

- SEC: Zero Emission Power Plant, where a mobile unit produces climate-neutral electricity via oxyfuel technology, combined with CO2 storage and enhanced gas recovery;
- NAM: CO2-storage from a pure emissions source in a nearby natural gas field;
- NUON: CO2-separation and use in a coal/biomass power plant;
- Gaz de France: possible continuation and eventual upscaling of CO2-storage in a natural gas field in the North Sea.

The amount of CO2-storage that can be realised in the short term, based on these specific projects or ongoing project proposals in the Netherlands, is about 1-1.5 Mton per year.

Five provisional scenarios have been developed by the working group:

(i) take the easiest option first
(ii) flexible gas route with CO2-storage
(iii) the Netherlands as CO2-hub
(iv) Gasification route

(v) Clean Fossils remain marginal

The working group emphasizes that it is extremely important that de Dutch government should aim for the greatest possible flexibility and thus ensure that the various options are kept wide open in terms of clean fossils technology development. Support should be given to a wide range of pilot projects under the condition of specific criteria and sufficient market involvement.

This all fits naturally within the philosophy and strategy of transition management. Within the context of the recent programme of the new Dutch cabinet it is planned to take soon a decision with regard to clean fossils and to start soon with one or more concrete transition experiments on clean fossils.

International context
As a final issue, Meadowcroft aks: to what extent is transition management typical Dutch? And under what conditions can it be applied in an international context? Many others have asked the same question.

Unfortunately, transition management is often presented as a typical example of the Dutch consensus approach, which supposedly might hinder the application in other countries. Indeed, what is typical of the Netherlands is the 'consensus democracy' and its sublimation in the form of the polder model. In this model, consensus is sought by means of elaborate public inquiry procedures and forms of participation, on the basis of broad societal support. This polder model and the underlying consensus democracy, is corporatist and primarily represents vested interests, as a result of which innovative attempts at introducing reforms almost always fail. Consensus democracy therefore has an enormous ability to hinder and diminish creative power (J. Rotmans, 2006). It has been evident for several decades that the Dutch consensus democracy is not really capable of tackling persistent problems and implementing fundamental changes such as transitions. The concept of transition management aims to offer an alternative to the Dutch consensus model: proliferation of visionary ideas through multi-scale network management and self-steering of small innovation networks which might emerge and co-evolve till larger communities. In fact, this is at odds with the broad, consensus-seeking stakeholder participation of the Dutch polder model and perhaps can be seen to offer an alternative democratic model (Hendriks, 2007). Transition management aims to involve a selective group of stakeholders, where dissent is a starting point and divergent and conflicting perspectives are worked out alongside various transition paths over a longer time period (D. Loorbach, 2007).

Conclusions

TM is not a megalomaniac attempt to remake society but a new governance model for interactions between market, state and civil society, to work towards a sustainability transition in multiple ways, even when the very idea of a sustainability transition is revealed as illusionary. We make our histories but not our future, yet we can do things

that help to achieve better futures, even in the face of uncertainties and perplexing complexity. TM helps to pursue policies for system innovation in a prudent way. It combines advantages of incrementalism (do-able steps which are not immediately disruptive) with those of planning (articulation of desirable futures and use of goals). We have characterized transition management therefore as 'perspective incrementalism for sustainable development'.

We still cannot answer unequivocally the answer whether transition management really works. And it might take another decade before we can answer this question. But the potential and positive effects of the transition management approach are obvious and encouraging. These are reflected in the rapidly expanding practice of transition policies, research and projects. Perhaps we may have underestimated the difficulties that transition management involves in practice and perhaps we have overstated the scope of transition management, but we are confident that it is an attractive and useful model for governance towards sustainable development.

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