Transition Management:

reflexive governance of societal complexity through searching, learning and experimenting

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Abstract

This chapter presents a new governance model for addressing 'persistent societal problems': transition management. The model of transition management is based on common notions from complex systems theory and new forms of governance that are folded into a new management paradigm. This management paradigm starts from complexity and uncertainty as triggering mechanisms of societal innovation, not as obstacles that have to be fully controlled. An essential feature of transition management is the explicit coupling of content and process embodied in a cyclical, iterative, interactive and participatory stakeholder discourse process. This article deals with the

theoretical grounding of the model of transition management, by discussing in more detail its theoretical roots in complex systems theory and new modes of governance. Finally a research agenda is sketched for the coming years to further explore lacunae in ongoing theoretical and empirical research into transition management.

Introduction

Our society faces a number of persistent problems whose symptoms are becoming more and more apparent. Persistent problems are *complex* because they are deeply embedded in our societal structures, *uncertain* due to the hardly reducible structural uncertainty they include, *difficult to manage* with a variety of actors with diverse interests involved and *hard to grasp* in the sense that they are difficult to interpret and ill-structured (Dirven, Rotmans and Verkaik 2002). Persistent problems are the superlative form of what Rittel and Webber (1973) refer to as 'wicked problems'. Examples of persistent problems are: the energy problem with anthropogenic climate change as manifestation, the agricultural problem with symptoms such as animal diseases such as bird flu, mad cow disease and foot-and-mouth disease, the water problem illustrated by major floods and periods of drought and the mobility problem with traffic congestion and air pollution due to increased mobility. Persistent problems could generally be considered to be symptoms of an unsustainable society.

These persistent problems cannot be solved using *only* current policies (Ministry of Housing, Spatial planning and Environment 2002; Social and Economic Council of the Netherlands 2001). Persistent problems are related to the system failures that crept into

our societal systems which, contrary to market failures, cannot be corrected by the market or current policies. Existing policies are necessary but not sufficient: much more is needed. In order to combat system failures a restructuring of our societal systems is required: transitions. A transition is a structural change in a societal (sub) system that is the result of a co-evolution of economic, cultural, technological, ecological and institutional developments at different scale-levels (Rotmans et al. 2000). Transitions cannot be steered in command and control terms, because they are too complex phenomena with many uncertainties and surprises. However, transitions can be influenced and guided, in terms of influencing the speed and direction of these processes. The latter we call transition management, which will be described below.

Transition management

The hypothesis is that the management of transitions can best be described by using the transition management concept. In the context of societal transitions, the term 'transition management' was used for the first time in a background study for the 4th National Environmental Policy Plan, in which it was finally used as "leitmotiv" (Rotmans et al. 2000). Transition management is a new management concept that assumes complexity and uncertainty and is sometimes also known as 'co-evolutionary management': adjust, adapt, and influence (Rotmans 2003). Transition management concentrates on influencing persistent societal problems. The assumption is that there is not necessarily full control and management of these problems, as in classical management, but more the organization of a joint searching and learning process, focused on long-term sustainable solutions. Transition management is not directly focused on a solution, but is explorative and design-oriented. Transition management

experiments with various relevant aspects of a range of management and policy forms and attempts to integrate and combine the accompanying instruments. The experiments mainly relate to the integration of short and long-term processes, different scale levels, people from various domains, perceptions of the problem by diverse actors, a wide range of possible solutions, a variety of learning processes and different types of instruments. The integration of aspects of diverging management forms results in a new management paradigm that takes account of complexity and uncertainty in time, space and domain. The essence of transition management is that it focuses on the content as well as the process by organizing an interactive and participatory stakeholder searching process aimed at learning and experimenting.

The concept of transition management is rooted in two different strands of science. First the strand of complex systems science and second the new forms of governance. Both will be discussed in greater detail below.

Complex systems theory

Complexity theory, otherwise known as complex systems theory, continues to embroider on the general systems theory that Von Bertalanffy (Von Bertalanffy 1968) dveloped in the 1930s and 1940s. With the establishment of the Santa Fé institute in New Mexico in the US in the early 1980s a new research movement emerged, which laid the basis for complex systems theory (Holland 1995; Kauffman 1995). This new research, which is currently attracting a great deal of attention, has many applications: in biology (Kauffman 1995), economics (Arthur, Durlauf, and Lane 1997), ecology (Gunderson and Holling 2002), public administration (Kickert 1991; Teisman 1992) and policy analysis (Geldof 2002; Rotmans 2003). Primary focus is on complex,

adaptive systems, in other words those systems with the following characteristics: (i) they are open, that is they interact with their surroundings; (ii) they consist of components that are linked via their mutual interactions; (iii) they contain positive and negative feedback loops with an amplifying or damping effect of the system *response*, respectively; (iv) their behaviour is strongly non-linear, they are nested and encompass various levels of aggregation; (v) there is a variety of components and interactions between components; (vi) there is emergence, in other words patterns emerge 'spontaneously' as a result of interaction between components; (vii) they have various attractors, i.e. a variety of preferred states (Krohn, Küppers, and Novotny 1990) in which direction the system could move of its own accord; and (viii) the system is able to react to and adjust itself to changes in its environment. Essentially complex, adaptive systems can be defined by the following key characteristics: *co-evolution*, *emergence* and *self-organization*. Co-evolution indicates that that a complex, adaptive system co-evolves with its environment (which in turn consists of complex, adaptive systems), where both competition and cooperation have a role to play. Emergence is the 'spontaneous' development of patterns in the system from within and self-organization is the ability to develop a new system structure as a result of the system's internal constitution and not as a result of external management (Prigogine and Stengers 1984).

The dynamics of complex, adaptive systems

A complex, adaptive system is in a certain state of dynamic equilibrium, where there is apparently little change, but on closer examination there is a constant stream of minor mutations taking place (variation and selection) in the structure of the system. This develops itself in the direction of a specific attractor whereby a dominant regime (state of configuration) (Kaufman 1993) emerges. This fundamental configuration of the

system has a relatively stable structure and order: there is a dynamic equilibrium. For a certain period of time the state of equilibrium offers certain advantages to the system: specific objectives can be achieved, tasks can be carried out and consistency can be built up incrementally. These periods of equilibrium therefore last for a relatively long time. However, after a while the system becomes out of sync with its surroundings and all manner of tensions are the result. Internal and external factors contribute to this 'mismatch'. New internal structures emerge which threaten and can eventually destroy the existing deep structure. On the other hand sudden external changes can occur, such as surprises, but gradual developments also occur, such as specific policy or developments in the market. *These internal and external changes create the climate for structural and radical change, but do not actually cause change to take place*.

The change itself can be caused by a small core (nucleus) of agents who are able to erode the existing deep structure and ultimately dismantle and overthrow it. The system is approaching a critical point – at the intersection of two attractors – that leads to a relatively short period of instability and chaos. The system reorganizes itself, creates a new regime in a renewed structure and develops itself towards a new attractor on the way to a new dynamic equilibrium and the cycle begins again, with a higher degree of complexity. Alternatively, the system is unable to react adequately to the radical internal and external changes, cannot renew itself, follows a sub-optimal path and eventually dies out. In this way relatively long periods of equilibrium, order and stability are interspersed with relatively short periods of instability and chaos. There are therefore periods when the system behaves in a relatively orderly manner and, to a limited extent, is predictable. However, there are also periods in which chaos rules and the behaviour of the system is quite unpredictable. The process of transformation is not

characterized by steady and gradual developments, but by periods of relatively drastic, sudden and radical changes, also known as 'punctuated equilibria' (Gersick 1991; Gould and Eldredge 1977). Evolutionary economics can be a useful supplement to complexity theory when one is analyzing the complexity of transition patterns, particularly when describing the transformation processes at the micro level (Bergh et al. 2005).

Transition dynamics of societal systems are in fact a particular case of this complex systems dynamics (Rotmans, 2005). In a transition the complex, adaptive system is successfully adjusted to changed internal and external circumstances and the system thus arrives at a higher order of organization and complexity. In societal systems a small group of newcomers might build up niche regimes that are able to ultimately break down the incumbent regime and ultimately establishing a new regime. Here we define a regime as a conglomerate of structure (institutional setting), culture (prevailing perspective) and practices (rules, routines and habits). Newcomers have not yet been moulded by the existing equilibrium and are therefore able to break though it, but for this they need to be shielded in a protected environment, what we call and arena. The transition path leads to a shift from the dominant regime to a new regime with a new structure, culture and practices better adjusted to the requirements of the environment. However, this is more the exception than the rule: in almost all cases the system gets stuck somewhere; it follows a sub-optimal path, digs itself in even deeper whereby it eventually collapses and dies (Rotmans, Loorbach, and van der Brugge 2005). This is not surprising, because a transition pattern encompasses a far-reaching process of innovation, with all the associated risks and, in a certain sense it follows the most dangerous route.

Managing complex, adaptive systems

What does complexity as described above mean in terms of management? It means that we do not view complexity as a problem or obstacle, but rather as a means of leverage for management. Management – in the context of complexity theory – means influencing the process of change of a complex, adaptive system from one state to another. Then adaptive management means adjusting while the structure of a system is changing, while anticipative management means directing and guiding while taking the possible future behaviour of the system into account. Greater insight into the dynamics of a complex, adaptive system leads to improved insight into the feasibility of directing it. In other words: application of complexity theory can result in a collection of basic principles or guidelines that can be used to direct complex, adaptive systems. It is a misconception to assume that this would result in a deterministic collection of rules for management. Reflexivity is inbuilt with respect to the assumptions presumed as well as the possible effects of such a form of direction. *This results in an understanding of the limitations of and scope for the management of complex, adaptive systems and at the same time provides insight into the opportunities and conditions under which it is possible to direct such systems*.

A Dutch public administration expert (Kickert 1991) has drawn lessons for management of complex, adaptive systems, even though these were relatively abstract and fragmented. In the meantime, complexity theory has evolved further (though the theory is still far from mature) and more empirical knowledge has been gained from practical experience with the management of complexity (Geldof 2002; Rotmans 2003). Based on theoretical knowledge and practical experience with complexity theory, we

present a number of guidelines for management below. These guidelines are partly descriptive, in the sense of basic principles and partly prescriptive in terms of rules for management.

- *Management at the system level is important.* Unintended side effects and adverse boomerang effects can only be recognized at the system level. A system's level perspective helps to get a better insight into spillovers of the complex problem. This implies management at various scale levels: emergent properties might be hidden at a higher (or lower) scale level but are already beginning to emerge at a lower (or higher) scale level.
- *The status of the system determines the way it is managed.* The dynamics of the system creates feasible and non-feasible means for management: this implies that content 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.
- *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.
- *The timing of the intervention is crucial.* The nearer one is to the critical point in the system, i.e. on the dividing line between two attractors, the more effective the intervention. Immediate and effective intervention is possible in both desirable and undesirable crisis situations. Crises are not necessarily negative and they can create room for manoeuvre towards a favourable attractor.

- *Managing a complex, adaptive system means using disequilibria rather than equilibria.* In the long term equilibrium will lead to stagnation and will in fact hinder innovation. Non-equilibrium (period in between multiple equilibria) means instability and chaos, which forms an important impetus for fundamental change. The relatively short periods of non-equilibrium therefore offer opportunities to direct the system in a desirable direction (towards a new attractor).
- *Creating space for agents to build up alternative regimes is crucial for innovation.* Agents at a certain distance from the regime can effectively create a new regime in a protected environment. For this to happen a certain degree of protection is needed (a nucleus) to permit agents time, energy and resources.

On the one hand the challenge lies in a theoretical deepening of these management guidelines and on the other hand in their application in societal systems, particularly in practical situations. The strength of complexity theory is that it uses relatively simple analytical principles to describe and explain patterns in time, space and functionality. A weakness is the homology that is assumed between abstract mathematical systems and concrete societal systems. This requires a one-to-one transposition that is not always realistic. Nevertheless, the elegant analytical principles of complexity theory have been applied to ecosystems and societal systems with increasing frequency in the past decade (Allen 2001; Gunderson and Holling 2002; Walker 2004).

New forms of governance

Governing societal change in a desirable direction has been the focus for research by public administration and political scientists and other social scientists for many decades. There seems to be an increasing degree of consensus in this hybrid research

field that traditional forms of governance are not suitable for societal challenges with a high degree of complexity. Both classical top-down governance by government ('the extent to which social change can be effected by government policies') as well as the liberal free market approach ('the extent to which social change can be brought about by market forces') are now outmoded as effective management mechanisms to generate sustainable solutions at societal level. Many researchers therefore argue for new forms of governance to reduce, or better still, eliminate this lack of direction. The inadequacies of current forms of governance are exposed when we consider government failures and the need for new arrangements to give direction (see authors such as (Mayntz 1993), (March and Olson 1995), (Fox and Miller 1996), (Scharpf 1999), (Hooghe and Marks 2001), (Teisman 2005) and (Pierre and Peters 2000)). This failure is also emphasized in the light of increased societal complexity and the complex, unstructured nature of policy-making processes (see (Hisschemöller 1993), (Kooiman 1993), (Kickert, Klijn, and Koppenjan 1997), (Sabatier and Jenkins-Smith 1999), (Lindblom and Woodhouse 1993)). All the researchers mentioned above point out the impracticability of classical top-down governance, but at the same time they indicate that there is still a need to direct complex societal dynamics. Although it is not easy to generalize, the new forms of governance they discuss are characterized by a number of central, and in some areas, common assumptions.

First of all, the *network approach*. Our society has become a complex network society (Castells 1996). Societal actors create formal and informal networks, because they have the same vested interests and they are striving towards the same objectives, something that they cannot do well without each other and which they can better achieve jointly than individually. Network management: joint management by all interested parties

within a network has become a common phenomenon (Dirven, Rotmans, and Verkaik 2002; Kickert, Klijn, and Koppenjan 1997). Networks do not have a clear hierarchical structure like institutions and organizations but, after a certain time, they can silt up and develop into institutions or organizations with the same rigid structures (Dijk 2001). Cörvers (Cörvers 2001) also noticed that in network projects problems often arose in agreeing agendas (mutual agreement of different agendas) and there were practical problems (in practice it often transpired that the network objectives were in fact government objectives).

The *interactive approach* has also become widely accepted. As a result, governments work more and more interactively, in order to activate networks and to stimulate them by means of carefully targeted incentives. Besides the government, other societal actors also attempt to direct a process where they have mutual influence (Bruin 1998; Dirven, Rotmans, and Verkaik 2002). Efficient and effective interaction between the most important directing societal actors has also become an essential condition for the new forms of governance that have emerged in the past decade.

Each form of direction that is focused on societal complexity should also take into account the pluriformity of interests, values and prospects of a wide range of societal parties. This demands a *pluralistic approach* that assumes the basic principle of plurality of interests and values for coordinated action in such a way that the compliance of all actors involved is achieved (Eising and Kohler-Koch 1999; Grin 2004). This implies an attempt to clarify the different perspectives (systems of norms, values, motives and perceptions) of the parties involved (stakeholders) (Rotmans 1997).

Agreement can only be reached, when there is a sufficient degree of convergence of the parties' perspectives on a specific solution for a multi-actor issue.

Societal dynamics are characterized by the interference of developments and trends at different scale levels, spatial, temporal and functional. A mono-level perspective of governance is thus inadequate to direct societal or policy complexity. A *multi-level approach* is therefore essential to manage the network as effectively as possible at various scale levels. Unfortunately there are hardly any governance concepts that take the interactions between governance processes at various scale levels into account, in particular the interactions between the functional scale levels themselves (Rotmans and Rothman 2003). A poignant example of this is environmental policy, which is becoming more European in nature, with all manner of problematic consequences for the Netherlands. Another example concerns developments within international water policy. These focus increasingly on river basins that traverse countries and regions, and in which the functional (institutional) scale level is becoming even more important. However, there are currently no proper governance concepts at the river basin level.

Learning about uncertainty and complexity has become an important part of societal management processes, because the uncertainty and the increasing complexity in governance processes are often of a structural nature. This is not so much cognitive learning, but *social learning* – developing interaction with others from an alternative perspective on reality (Leeuwis 2003; Social Learning Group 2001); see section IV. Here, the influence of the social context on learning is central, both in the encouraging and in the impeding sense (Loeber 2004). It is very important here to gain insight into the perceptions of others who are learning at the same time. Only when we comprehend

each other's ideas, motives and vision and we develop a better understanding for each other, will we be able to search together and develop a common agenda.

Transition management as a new management concept contains the main characteristics, as mentioned above, of new forms of governance: network management, interactivity, pluralism, multi-level focus and social learning. Transition management is by definition a multi-actor process with participation from government, societal organizations, companies, knowledge institutes and intermediary organizations. Because of this participation at various levels a multi-level network emerges within which different themes are discussed and tackled (Loorbach 2004). Transition management facilitates a range of processes and points them in the same direction with a combination of network management and self-steering. As such, transition management can be considered as a specific form of multi-level governance (Scharpf 1999), (Hooghe and Marks 2001). The co-evolutionary multi-level perspective is based on the 'advocacy coalition framework' (Sabatier and Jenkins-Smith 1999) and the concept of 'partisan mutual adjustment' (Lindblom and Woodhouse 1993). Various groups with a wide range of interests and ambitions attempt to get their own themes placed on the political agenda. By negotiation, adaptation, co-production and debate, actors change their own vision and redefine their own position and perceive the problem in a different manner.

In addition transition management also has quite some similarities with well-established forms of governance. Transition management has some of the characteristics of the governance school of incrementalism (Lindblom 1979). Notably the focus on uncertainty, learning by doing and doing by learning and the organization

of searching process with several solutions. On the other hand there are also major differences: the means of leverage is different, in transition management this is the complex societal system as a whole and not just managing components, as Lindblom's 'disjointed incrementalism' indicates. Transition management does not always imply an incremental path; in the relatively short-term the path can be rather whimsical, a combination of small and large steps which are designed to break down the system and take over the dominant regime. Transition management therefore focuses on radical and structural (irreversible) change, which is certainly not always the case in the incrementalist approach. And finally, the visionary aspect, which Lindblom considered to be rather repugnant (particularly blueprint thinking), but which plays a crucial role in transition management, in a co-evolutionary form. So we see that on the one hand there are clear similarities, but on the other there are considerable differences between transition management and the incrementalist approach.

This applies equally to the comparison between transition management and the school of 'adaptive governance' (Gunderson and Holling 2002; March and Olson 1995). Even here, at first glance there are many similarities, but a closer analysis also reveals many differences. The essence of 'adaptive governance' is a form of plan, which is based on the analyses of various types of uncertainty, both structural and non-structural. A strategy is developed which in the short term hardly pays any attention to structural uncertainty, while attempting to reduce structural uncertainty in the long term. This results in a cyclical plan – a combination of short-term steps designed to tackle uncertainty that can be 'managed' and long-term steps designed to tackle structural uncertainty. This can easily lead to 'no regret' strategies, i.e. strategies that will do little damage, irrespective of future scenarios – a kind of low-risk strategy. Conversely,

transition management encompasses a portfolio of experiments, and particularly high-risk experiments, because a great deal can be learnt from these. In addition transition management is not only adaptive but also anticipating (focused on the long term), which does not necessarily assume a reduction in uncertainty, but rather accepts that structural uncertainty cannot be reduced.

A comparison of transition management with traditional and new forms of governance therefore results in a multiform impression. We find transition management – described as a form of governance focused on cooperation in which actors from government, the market and civil society participate in a variety of networks – recurring as the basic principle for many new forms of governance which have developed at a rapid rate during the last 15 years, for example 'multi-level, adaptive, participation, interactive and deliberative governance'. Transition management, which is described as a form of intelligent, long-term planning through small steps based on learning and experimenting, links into the incremental approach and 'adaptive governance'. Actually transition management is a kind of 'perspective incrementalism'.

However, apart from the integration of these governance aspects, transition management also has its own distinguishing characteristics. Firstly, the combination of "visionarity", the very long-term perspective, and sustainability as normative guiding principle is a specific distinguishing aspect compared to other new forms of governance. But more importantly the combination of analytic insight into systems complexity and understanding of the process of governance complexity is new and has resulted in a specific management framework, what we will discuss in more detail in section VII.

Synthesizing Insights

In this section we will try to couple the formalized, deductive abstractions of complexity theory and the inductive, often empirically developed management concepts of governance. As a linking pin between system complexity and management complexity we use concepts from social theory on societal complexity. The rationale for this is that transitions can be viewed as societal processes in which co-evolution between structures, actors and practices occurs. Structure emerges from the (intended and unintended) effects of acting, whereas structure contributes to the determination of practices that form a means for acting of societal actors (Grin, 2004). Giddens (1984), Luhmann (1995) and Beck (1999) all take societal complexity as a starting point although from various perspectives and scale levels. Here we see remarkable similarities between complexity theory, new governance modes and social theory in terms of using similar concepts, although often named differently. Luhmann (1995) studied variation and selection, autopoiese and self-organization, Giddens (1984) discusses emergence and co-evolution, while Beck (1999) focuses on uncertainties, discontinuities and risk. Obviously, we cannot transpose concepts of complexity on a one-to-one basis to societal systems. For this, notions such as power, (un)willingness, fear and emotions play a too important role. However, what we can do is drawing parallels between insights derived from complexity theory, social theory and new forms of governance in a first attempt to synthesize these different insights into a common framework of understanding.

Based on this intercomparison we highlight here some of the parallels that we have noticed: (i) societal change is a complex and uncertain process, but does show

systematic patterns: complexity and uncertainty are therefore logical starting points for governance of societal change; (ii) major societal changes originate partly as a result of interference of interventions at various scale levels: not top-down or bottom-up but as a combination of these approaches; (iii) the regime paradox: the regime forms a crucial link and obstruction for societal innovation while the regime attempts to stimulate this innovation; (iv) the transformation of a regime can take place most effectively through small innovation cores (nuclei or transition arenas) that offer protection to niche actors who are not directly dependent on that regime; (v) management from 'outside' a societal system is not effective: structures, actors and practices adapt and anticipate in such a manner that these should also be directed from 'inside'.

A point-wise representation of the synthesized insights is given in table 1.1 below, displaying key characteristics of complex, adaptive systems which are linked to comparable characteristics of new governance modes and social theory

Insert table 1.1 here

From this synthesis table we have derived a set of starting points that forms the basis for a new governance paradigm:

- Societal change takes place in sudden steps and in a strongly non-linear manner and by definition is full of surprises and discontinuities
- Complexity and uncertainty are not problems or obstacles, but are actually a means of leverage for managing of societal change

- Managing societal change is a reflexive process of searching, learning and experimenting
- All societal actors direct, being aware of the opportunities as well as the restrictions and limitations of directing
- Society can not be fully constructed by government but is partly and shared "makable"
- It is an illusion to think that the process of societal change can be controlled: the most feasible form of control is coordination and influence.

These starting points have led us to the formulation of a set of management principles, called transition management, which we have translated into a management framework. The management principles underlying transition management are built around the management paradox that 'societal change is too complex to handle in terms of managing but still we have formulated relatively simple rules how to influence societal change'.

The rationale for handling this management paradox is that insight into societal complexity by taking a complex systems approach can help in fathoming the possibilities for influencing societal complexity. This logically connects content and process, which are explicitly linked in transition management: the complexity analysis of a societal system under observation also determines the opportunities for managing such a system. Using analytical concepts such as multi-stage and multi-level (Rotmans et al., 2000) provides opportunities for identifying patterns and mechanisms of transitional change. Once we have identified transitional patterns and mechanisms we can determine process steps and instruments how to influence these patterns and

mechanisms. Our approach differs from earlier attempts to use a complex systems approach for management of policy issues (e.g. Kickert, 1991; Kooiman, 1993; Stacey, 1996). These approaches were either too technical, overly deterministic or too abstract for successful application in the policy arena. Our approach is more oriented towards reflexive planning: no deterministic, but reflexive rules. We have formulated rules for managing societal change, but once we apply these rules in a process context we realize they need to be adjusted because the conditions and dynamics (content) will change as a result of applying these rules. Therefore learning, searching and experimenting are crucial in transition management.

Management principles of transition management

Out of the set of starting points we designed a number of interrelated management principles, which serve as basis for the transition management framework discussed later. In arbitrary order the management principles are:

- *Multi-domain approach*

Transitions inherently operate at multiple domains. Input from other domains than the prevailing domain are therefore important. In terms of lessons learned, innovative ideas, actors involved but also in terms of integral policy.

- *Multi-temporal approach*

Transitions cover a long-term period of 25-50 years. This long-term timeframe can function as purposeful context for short-term actions and policy. In this way current policy can be embedded in a long-term perspective. Inspiring and imaginative visions on sustainable futures have an important, mobilizing function and are instrumental to maintaining the long-term focus and energy in the process.

- *Multi-actor network approach*

Many diverse actors are involved in transition processes and every actor is trying to influence other actors. No single actor has the managing capabilities to fully control a transition process in a top-down manner. Networks of actors represent differences in power and perspective and network management aims to direct all actors involved jointly.

- *Multi-level approach*

In any societal system there are different levels of organization with different dynamics, which require different strategies. At each level, specific types of actors participate, specific (policy) instruments are used and different competencies are needed. Each level should work towards the same goal in such a way that they reinforce each other (i.e. modulate*).*

- *Deepening, broadening, scaling up*

Transition experiments need time and resources to develop and mature in niches before they can be embedded in the existing structures of the regime. This requires a sensible and smart strategy that consists of learning as much as possible from a transition experiment (deepening), repeating (with learning effects) such an experiment in a different context (broadening) and trying to apply a successful experiment at a higher scale level (scaling up).

- *Keeping options open*

Selection of innovative options in a too early stage can have profound drawbacks and lead to a backlash (Rotmans et al., 2000). We first need to know more and learn about the pros and cons of available options before we can make a well-grounded decision. Through experimenting we can reduce some aspects of the high level of uncertainty so that it leads to better-informed decisions. To learn as much as possible from transition

experiments they need to be diverse, deviate from standard options and include a certain risk.

- *Focus on social learning*

Social learning is crucial to transition processes, because neither the definition of a problem nor the direction of the solution is unequivocally known a priori. In a transition context social learning is aimed at 'reframing', changing the perspective of actors involved. The learning process has three components: learning-by-doing (developing theoretical knowledge and testing that by practical experience), doing-by-learning (developing empirical knowledge and testing that against the theory) and learning-by-learning (developing learning strategies, applying and evaluating them).

- *Linking content and process*

An essential issue in transition management is that the content is explicitly linked to the process itself. In other words: the complexity analysis of the societal system under observation also determines the opportunities for management and the instruments that can be applied using the framework described.

The above management principles are reflexive in the sense that they interpret managing as searching, learning and experimenting rather than command and control. They reflect a limited degree of managing transitions: not in a top-down manner but rather in a subtle way, by expediting and stimulating transition processes towards a more sustainable state.

The challenge here is to translate these relatively abstract management rules 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 main instrument of transition management is the transition arena: a legitimate experimental space permitted by regular policy in which the actors involved use social learning processes to acquire new knowledge and understanding that leads to a new perspective on a transition issue. This new perspective manifests itself in the form of a shared perception of a problem, a long-term orientation on the future with joint objectives, a common agenda and strategic actions and experiments. By actively involving a range of pioneering actors at various levels in different phases a form of network management can be applied in the transition arena. This creates room for manoeuvre for self-steering and self-organization within the limits set.

Transition management: the framework

The cycle of transition management consists of the following components (Loorbach, 2002; Loorbach and Rotmans, 2006; Rotmans, 2003): (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. In reality there is no fixed sequence of the steps in transition management as Figure 1 suggests and the steps can different 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.

In the management framework we can distinguish three levels that continually influence each other: the *strategic level* (envisioning), the *tactical level* (negotiating) and the *operational level* (executing) (Loorbach, 2004). Depending on the phase of the process, each level of management can be linked to specific types of actors and instruments. This results in a portfolio of approaches and management instruments that can evolve together with the actual progress of the process. The transition management process starts from a strategic, long-term perspective, making a thorough analysis of both alternative routes. As time progresses, the various routes within transition management will cross and intertwine and will influence and strengthen each other.

Insert figure 1.1 here

Strategic: the transition arena

The transition arena is a multi-actor innovation network around a specific transition issue, within which various perceptions of the persistent problem and possible directions for solutions can be deliberately confronted with each other and subsequently integrated. The actors to be involved have their own perception of the transition issue in question from their specific background and perspective. A relatively small number of forerunners from various networks should be involved the transition arena at a *strategic* level. These people participate on a personal basis and not as a representative of their

institution or based on their organizational background. They are identified and selected based on their competencies, interests and backgrounds. There should not be too many actors (10 – 15 is sufficient) and they should not all be the same kind of actor. The competencies expected of them and are: (i) ability to consider complex problems at a high level of abstraction; (ii) ability to look beyond the limits of their own discipline and background; (iii) enjoy a certain level of authority within various networks; (iv) ability to establish and explain visions of sustainable development within their own networks; (v) they can think together; (vi) open for innovation instead of already having specific solutions in mind. These forerunners do not necessarily need to be experts; they can also be networkers or opinion leaders. They should also be prepared to invest time and energy in the process of innovation and to commit themselves to it. And finally, it is important that there are an equal number of forerunners from the societal pentagon: government, companies, non-governmental organizations, knowledge institutes and intermediaries (consulting organizations, project organizations and mediators).

The fundamental issue here is not that the existing establishment and interests (incumbent regime) come together within the transition arena, but that niche actors who can operate more or less autonomously are involved. Indeed, a certain representation from the existing regime is necessary, also with an eye to the legitimacy and financing of the process of innovation. But a transition arena is not an administrative platform or a consultative body, but a societal network of innovation. This demands a critical selection of forerunners, not by a 'gatekeeper' who selects who may or may not participate, but by an initiating core group in which experts on the process and on the transition subject are involved, that considers matters carefully. The arena process is an

open, evolving process of innovation that implies variation and selection: after a certain period of time some people drop out and others join in. Management therefore means creating sufficient space and favourable conditions for the forerunners, such that the envisaged process of innovation begins to take shape. It does not mean gathering together a wide range of bodies around the arena, such as a steering group, a consultation group or advisory board, because that is exactly the recipe for limiting the space for innovation and management that has just been created.

When such a group of forerunners has been brought together to focus on a certain transition issue, an attempt is made to reach a joint perception of the problem by means of a strongly interactive process. By deploying a participative integrated systems approach, the complex problem(s) can be structured and made easier to understand (Hisschemöller, 1993). The convergence of the various problem perceptions is facilitated from the articulation of diverging perspectives of the actors involved, which in turn will lead to new insights into the nature of the problem(s) and the underlying causal mechanisms. These insights form the prelude to a change in perspective, which is a necessary but insufficient pre-condition to realizing a transition. Based on this new perspective and through discussion and interaction sustainability visions are generated. These visions are particularly qualitative, inspiring, challenging and imaginative pictures of the future.

Visions are an important management instrument for achieving new insights and starting points and therefore a change of attractor. The visions created evolve and are instrumental: the process of envisioning is just as important as the ultimate visions themselves. Envisioning processes are very labour-intensive and time-consuming, but

are crucial to achieving development in the desired direction. This direction, as long as a sufficiently large group of forerunners supports it, provides a focus and creates the constraints, which determine the room for manoeuvre within which the future transition activities can take place. Based on the sustainability vision developed, a process can be initiated in which transition paths are developed and a common transition agenda is drawn up. A common transition agenda contains a number of joint objectives, actions points, projects and instruments to realize these objectives. It should be clear which party is responsible for which type of activity, project or instrument that is being developed or applied. Where the sustainability visions and the accompanying final transition-images and transition objectives form the guidelines for the transition agenda, which is to be developed, the transition agenda itself forms the compass for the forerunners which they can refer to during their search and learning process.

Tactical: the transition agenda

The *change in perspective*, described by the visions and the accompanying transition-images of the future, should be further translated to and find root within various networks, organizations and institutions. Focus at this tactical level is therefore the structural (regime) barriers to development in the desired direction. Such barriers include regulatory, institutional and economic conditions but could also involve consumer routines, physical infrastructures or specific technologies. In an expanding transition network stemming from the transition arena this vision is further translated by self-formed coalitions into so-called transition paths: routes to a transition-image via intermediate objectives, which, as they come closer, can be formulated more quantitatively. Different transition paths can lead to a single transition-image and

conversely a single transition path can lead to several transition images. In this phase the interests, motives and policy of the various actors involved (non-governmental organizations, companies, governments, knowledge institutes and intermediaries) come out into the open and there will be negotiations about investments, and individual plans and strategies will be fine-tuned. The actors who should be involved at this stage are those who represent one of the organizations involved and who are willing and able to operate for more than just a short period of time. Within this tactical layer actors should be recruited who, in particular, have sufficient authority and room for manoeuvre within their own organization and who also have insight into the opportunities for their organization to contribute to the envisaged transition process. An important condition for this is that the actors involved have the capacity to 'translate' the transition vision and the consequences of this to the transition agenda of their own organization. When the organizations and networks involved start to adjust their own policy and actions in this way, tensions will arise between the transition arena and the everyday policy agendas. Then the direction will have to be reviewed at a strategic level and if necessary a new arena will have to be established with some of the existing actors, but also with new ones.

Operational: implementation

At the operational level of transition management transition experiments and transition actions are carried out. The practical implementation of a broad new body of thought is quite demanding, because there are very many actors involved who all act from their own perspective, have conflicting interests, and at the same time are embedded in and are dependent on a broader societal web. There is also a diverse application for

transition experiments from the vision and transition paths developed. These may compete, complement each other or investigate various options. Diversity is an important aspect, as long as these experiments at the systems level are in a position to contribute to the envisaged transition.

Transition experiments are practical experiments with a high level of risk (in terms of failure) that can make a potentially large contribution to a transition process. New transition experiments are derived directly from the developed sustainability vision and transition objectives and they fit within the identified transition paths. On the other hand, experiments can be linked to innovation experiments that are already taking place as long as they fit into the context of the transition. Often, many experiments are running concurrently, but these have not been set up or carried out systematically, whereby coherence is missing. Transition experiments in the form of projects also have a higher than average risk to fail, because they are searching and learning processes in which the results might be disappointing. When an experiment has been successful (in terms of evaluating its learning experiences and contributions to the transition challenge) it can be repeated in different contexts (broadening) and scaled up from the micro- to the meso-level (scaling up). This requires a considerable amount of time, approximately 5 to 10 years. Transition experiments are often costly and time consuming, so it is important that, wherever possible, existing infrastructure is used for experiments and that their feasibility is continuously monitored. Efforts here focus on creating a portfolio of related transition experiments that complement and strengthen each other as much as possible, which have a contribution to the sustainability objective that can be scaled up and which are significant and measurable.

In transition experiments, the crux of the matter is innovation in a wide range of areas: these can be technological innovations, but just as easily institutional or cultural innovations. A good example of such a 'testing ground' could be a ‘Vinex’ location (new town development in the Netherlands), which will be designed and organized to be sustainable. Innovations can be applied here in all areas including building techniques and technology as well as institutional, social and economic innovations in various combinations. This means that all those directly involved (citizens, architects, project developers, contractors, water and spatial design experts, mobility experts, policy developers) jointly develop a vision of the design and organization of the new district or neighbourhood. This vision is then translated into a concrete action plan to establish the district or neighbourhood in a sustainable manner, i.e. the combined development of living, working and recreational activities is such that a common and sustainable environment is created. Guiding principles here are not so much efficiency and effectiveness, but issues such as quality of life, quality of the living environment and quality of existence. So these matters are not approached from an economic point of view but from a societal point of view: how do we make a district or neighbourhood fun to be in, lively, safe, clean, colourful, and easy to access, with good facilities and considerable solidarity among residents?

Instruments for transition management

We will now briefly address the specific systemic instruments that have been developed within the framework of transition management. These instruments have been developed conceptually following the management principles, but have at the same

time been practically implemented and adjusted based on practice. So theory and practice do overlap here. These systemic instruments have been the result of conceptual research, practice-oriented research and practical experiments. In this co-production research there is no linear way from theory to practice nor vice versa. It constitutes a membrane with only a thin dividing line between conceptual/theoretical research and practice/practical experiments.

The systemic instruments used within the framework of transition management are presented in Table 2. Transition management draws together a selective number of forerunners (creative minds, strategists and visionaries) in a *transition arena* in the pre-development phase of transitions for the development of a *sustainability vision* and thoroughly analysing the persistent problem(s), making use of *complex systems analysis*. For the further practical development of the transition vision and *transition pathways* in *arenas of arenas* (scaling up through *network forming* and *coalitions*), entrepreneurial and innovative actors at the tactical level are involved; project leaders, programme managers, heads of departments and entrepreneurs, developing a *transition agenda* with *long-term goals*. The same applies to the operational level; the main parties involved here are inventors, go-getters, practical innovators and practical organizations. By conducting *transition experiments* new forms of cooperation, coalitions, networks and arrangements can be developed and stimulated. The priority here is that parties who hardly ever meet will look for new solutions and learn from each other, which need to be *monitored* and *evaluated*. During the transition process the vision as well as the programme of measures will become more and more specific, whereby the focus of attention will (have to) shift to 'regime' actors who represent certain interests within the existing situation. Initially participants will be sought from

this group for regime actors geared to innovation, later in the process more conservative regime actors will have to be brought on board. This also is *monitored* and *evaluated*.

Insert Table 1.2 here

Empirical grounding

The concept and framework of transition management needs to be tested more thoroughly and solidly. A range of empirical research activities has therefore been initiated, varying from ex-post case studies, which are historical reconstructions of transitions to ongoing case studies in which transition researchers actively participate. Some of the participatory case studies have been rounded off already.

At the national level in the Netherlands 5 ministries are experimenting with transition trajectories, among which the energy transition led by the ministry of economic affairs is the most prestigious and most advanced. In the box below is indicated how the various stages in the transition management framework are followed in the Dutch energy transition. That is not to say that they seamlessly follow the process approach of searching, learning and experimenting as proposed by the transition management concept, but the core thinking is still recognizable. In other publications we treat in more detail the energy transition process in the Netherlands (Loorbach and Kemp, 2005, Kemp and Loorbach, 2005), here we limit ourselves to the box below.

The energy transition

In 2001 the Dutch Ministry of Economic Affairs initiated a transition process that is ultimately intended to lead to a sustainable energy supply system in the Netherlands. The Ministry is the initiator, but companies, consumers and non-governmental organizations are also involved. Three themes were chosen: gas, industrial energy efficiency and biomass, because these invariably form part of the scenarios for a sustainable energy supply system in the long term. In addition, the Rijnmond area (greater Rotterdam) was chosen as the 'experimental space'. In consultation with stakeholders, various visions were developed (*where do we want to go?*), transition paths were formulated (*how can we get there?*) and transition experiments were drawn up (*how do we get started?*). In the ultimate vision a sustainable energy system in 2050 is: (a) clean (offers a solution for the climate change problem); (b) affordable (functional and energy-efficient); and (c) secure (dependable, reliable, guaranteed supplies).

This vision for sustainable energy was translated into general transition-images for 2050, strategic ambitions for 2020, and five main routes along which the energy transition policy is defined: (1) efficient and green gas; (2) efficiency in the chain; (3) green raw materials; (4) alternative fuels; and (5) sustainable electricity. For these five main routes 22 transition paths have been worked out in detail, and 16 of them have been authorized. Within the main route for sustainable electricity, transition paths for ‘biomass’ and ‘wind’ have been worked out in detail and within the main route – efficient and green gas – the transition paths ‘energy saving in built-up areas’, ‘micro

and mini combined heat and power', 'clean natural gas', 'green gas' and 'glasshouse horticulture savings' have also been detailed. A total of 70 proposals for potential transition experiments have been submitted for these transition paths. See (EZ, 2004), (Energieraad and Vromraad, 2004) and www.senternovem.nl/energietransitie

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In Belgium two transition processes run at the national level, one on waste management and one on sustainable housing and building in Flanders. The latter has run since 1.5 year during which an integrated systems analysis has been done, a transition arena has been formed, a vision developed and transition coalitions have been formed. A core group of Dutch and Belgian transition researchers guide this process in an intensive manner, which is almost a day-to-day task.

At the regional level in the Netherlands, in Parkstad Limburg, a transition process of restructuring the region has started five years ago. Parkstad Limburg got into a lock-in situation after the closure of the coalmines in the '60s of the last century. After having adopted the principles underlying transition management an intense, cumbersome but very rewarding transition process has been initiated. It took a couple of years to formulate a joint problem perception, to formulate a common agenda and to develop a vision for a sustainable Parkstad Limburg. As one of the more striking results a core group of pioneers has strongly influenced the regional political agenda and created a new élan that has resulted in a greater social basis for the cooperation between eight municipalities forming Parkstad Limburg, see Loorbach (2006). In other regions in the Netherlands similar transition processes are underway, among others in the province of Zeeland and in the network city Zuidvleugel. In terms of managing these regional restructuring processes they are in an initial stage.

At the local level numerous transition experiments have been initiated in niches that are part of testing grounds, in the field of sustainable agriculture, mobility, construction, energy, spatial planning and health care. The major task is to safeguard the coherence between these experiments within a particular field and between these fields and to investigate the potential for scaling these experiments up to a higher systems level. Monitoring these transition experiments and evaluating them in terms of what has been learned has become a substantive task of the Dutch transition network KSI (Rotmans et al, 2004).

Finally, a database of historical transitions is in development. In-depth case studies are conducted which are historical reconstructions based on literature reviews, expert consultation and participatory processes. Examples are the historical waste transition in the Netherlands and other European countries (Loorbach et al, 2003) and the historical energy transition in the Netherlands (Verbong, 2000).

Overall, a diverse palette of case study material on transitions is underway, forming a rich source of empirical material to draw from. And although the empirical basis of transition management is still small and shallow, it is rapidly growing and maturing. This is necessary in order to improve the theoretical framework of transition management.

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, much of this we will discuss here point-wise.

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 if possibly 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 (2003) 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. (2003) 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, Rotmans and Rothman, 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. (2003), 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 be selected 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. Remarkably, Berkhout e.a. (2003) conclude that 'managed system innovation processes need also to work to place incumbent regimes under stress in order to create space to 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.

Another form of criticism is the rather small empirical basis underlying the theory of directing transitions. Indeed, research into historical transitions shows that many transitional developments were unintended, not planned or not initially foreseen ('spontaneous change'). But, like Meadowcroft (2005) argues, that does not mean that directing societal processes in order to establish societal goals is impossible. On the contrary, governments have often done, e.g. in energy-, agriculture or water-driven transition processes (Van der Brugge and Rotmans, 2006), 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. 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.

Some scholars have expressed their concern that transition management involves a rather deterministic collection of rules for managing complex societal systems (Hajer et al., 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 (Loorbach, 2006). 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.

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 (Rotmans, 2005). 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. Transition management aims to involve a selective group of stakeholders, where dissensus is a starting point and divergent and conflicting perspectives are worked out alongside various transition paths over a longer time period.

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, resisting against 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 importance to choose an adequate scale level and system boundaries for analyzing and managing transitions. The analysis of which subsystems innovate fast and which to a lesser extent or not at all 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-sectors involved.

Meadowcroft 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 an interesting 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 up to the EU-level. In the Netherlands this international track has become an essential part of the transition policy.

And finally, an issue that's often brought up in relation to transitions is that of power. Power as object of transition research has become increasingly important over the past years. Avelino (2006) has studied a variety of conceptions of power in the scientific literature and distilled from that two power concepts that might be important 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 the coming years.

Conclusions

In this article we presented a new management framework for addressing persistent societal problems, based on the concept of transition management. This management framework is based on common notions from complex systems theory, social theory and new forms of governance, that are welded to a new management paradigm. In governance terms, transition management could be characterized as a kind of 'perspective incrementalism': a visionary approach towards long-term planning through small steps based on searching, learning and experimenting. What makes it distinguishing from other new forms of governance is the strong link of content and process. Understanding the dynamics of complex, adaptive systems provides insight into the opportunities, limitations and conditions under which it is possible to direct such systems. The combination of analytic insights into systems complexity and understanding of the process of governance complexity is new and has resulted in a set of management principles which forms the basis for the management framework. The

management principles are far from deterministic, however, but rather reflexive: they reflect a limited degree of directing transitions, by furthering transition processes towards sustainability. Applying these principles implies adjusting them to the new conditions and dynamics that will change as a result of applying these principles.

The concept of transition management and the derived framework is promising but needs to largely prove itself empirically. Elements of the concept have already been empirically tested in the many transition experiments that are currently going on. More than that, the management framework itself has been the result of experiences within testing grounds. As such the framework has evolved in the past couple of years. Nevertheless it is a great challenge to empirically validate the partly descriptive and partly prescriptive parts of transition management the coming period, in such a manner that a scientifically well grounded concept and ditto framework can be used and further developed in a broad societal context, certainly also internationally.

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Complexity characteristics	**Analogous social mechanisms**	**New Governance characteristics**
Emergence	Niches and niche-regimes	Adaptive governance
Variation	Differentiation	Keeping options open
Selection	Power, Institutions, Market	Learning-by-doing and Doing-by-learning
Innovation from nuclei	Innovation networks	Focus on forerunners
Co-evolution	Structure and agency	Integral: multi-domain & multi-level
Feedback	Reflexivity	Reflexive governance
Self-organization	Networks	Multi-actor governance
Attractors	Utopian perspectives	Long-term envisioning

Table 1.1 Linking complexity characteristics to new governance concepts and analogous social mechanisms

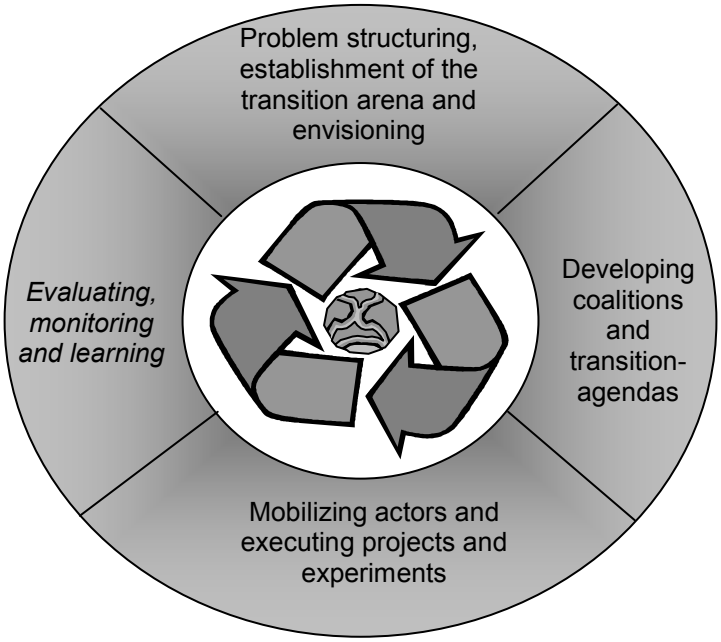

Figure 1.1: The transition management cycle

Complexity characteristics	**Management Principles TM**	**Systemic Instruments for TM**
Emergence	Creating space for niches (arenas, new coalitions)	Transition arena and transition pathways
Variation	Keeping options open	Transition experiments
Selection	Learning-by-doing and Doing-by-learning	Transition agenda / goals
Innovation from nuclei	Focus on forerunners	Deepening, broadening and scaling up
Co-evolution	Multi-level approach Multi-domain approach	Complex systems analysis
Feedback	Reflexive governance	Monitoring and Evaluation
Self-organization	Multi-actor approach	Transition coalition & networks
Attractors	Multi-temporal approach	Sustainability visions / images

Table 1.2 Systemic instruments used for transition management