

# Transitions and Strategic Niche Management: Towards a Competence Kit for Practitioners

Paper accepted for the special issue on Social Innovation in the International Journal of Technology Management *Guest Editors*: Prof Patrick Dawson, Prof Jane Farmer, Dr Lisa Daniel

Full reference:

Raven, R.P.J.M., van den Bosch, S., Weterings, R., 2010. Transitions and strategic niche management: towards a competence kit for practitioners. *Int. J. Technology Management*. Vol 51 (1), 57-74

## **Rob Raven**\*

Eindhoven University of Technology  
Department of Technology Management  
PO Box 513  
5600 MB Eindhoven, the Netherlands  
e-mail: [r.p.j.m.raven@tm.tue.nl](mailto:r.p.j.m.raven@tm.tue.nl)  
tel: 0031 40 247 4413  
fax: 0031 40 244 4602

Suzanne van den Bosch  
Dutch Research Institute for Transitions,  
Faculty of Social Sciences, Erasmus University  
PO Box 1738  
3000 DR Rotterdam, The Netherlands  
e-mail: [vandenbosch@fsw.eur.nl](mailto:vandenbosch@fsw.eur.nl)  
tel: 0031 10 408 9787  
facL 0031 10 108 9039

Rob Weterings  
BU Innovation and Environment TNO  
P.O. Box 49  
2600 AA Delft, The Netherlands  
e-mail: [rob.weterings@tno.nl](mailto:rob.weterings@tno.nl)

## **Biographical notes:**

**Dr Rob Raven** is a part time Assistant Professor in the section of Technology Studies and Sustainability at the Eindhoven University of Technology. Rob also works part time at the Energy research Centre of the Netherlands (ECN) where he works on energy transitions and innovation. His main interests are in system innovations, societal embedding of new technologies, co-evolutionary processes of technology and context, renewable energy and energy policy. Rob's current work is to contribute to further enhancing transition and strategic niche management theories.. He has a strong interest in translating these theories into useful tools and methods for practitioners such as a competence kit on transition experiments. Rob participates in the Dutch Knowledge network on System Innovations (KSI) and is a member of the European Association for the Study of Science and Technology (EASST) and the Eindhoven Centre for Innovation Studies (ECIS).

**Suzanne van den Bosch** is a Ph D candidate at the Dutch Research Institute for Transitions at the Erasmus University Rotterdam. Her research focuses on transition experiments as one of the instruments of the transition management approach aimed at stimulating transitions to more sustainable modes of development. Suzanne's main interest is to contribute to theory development in co-production with practitioners. She currently participates, together with

---

\* Corresponding author

other researchers and practitioners, in transition programs on sustainable mobility and health care. Suzanne is part of the Dutch Knowledge network on System Innovations (KSI) which aims to better understand, identify and influence the process of transitions. In her PhD-research she works together with TNO (Netherlands Organization for Applied Scientific Research) to translate scientific concepts into practical tools and methods.

**Dr Rob Weterings** is a senior scientist and team leader in the Business Unit Innovation & Environment of TNO. An ecologist by training, he has been involved in multidisciplinary research on the relation between science, technology and society since 1984. His broad interest resulted in a PhD thesis on Strategic Use of Information on Health and Environmental Risk in Policy making (1992). In recent years, Rob Weterings focused on systems innovation and transitions. He specialized in tools for practical application of sustainable systems innovations in industrial clusters and networks. He and his department have co-operated with companies and authorities in a wide variety of system innovation projects. At present Rob Weterings is heading the TNO-wide Program on Sustainable System Innovation. He is a member of the KSI network, and program leader of the Dutch Competence Centre for Transitions.

### **Abstract**

Structural problems in modern societies, such as climate change and congestion problems, require 'transitions' towards a more sustainable fulfilment of social needs. Recent research shows that experimenting in niches is crucial for learning about social challenges and stimulating transitions. Through a series of 'transition experiments' in different niches, social innovations can be improved and eventually replace dominant practice.

This article reviews the literature on transitions and strategic niche management and argues that it has a strong analytical core, but less effort has been made to develop a managerial perspective. The authors aim to contribute to such perspective by developing a 'competence kit': a learning module that provides practitioners (e.g. policy makers, companies, intermediary organisations and NGO's) that are involved in transition experiments with an analytical framework, guidelines and tools, and recognisable examples. The results from the first workshop with practitioners to explore potential applications of the competence kit are promising.

*Keywords: Transition, experiment, transition management, strategic niche management, competence kit*

## 1. Introduction

Many sectors in modern societies face structural problems. The mobility and energy sector for example face problems related to oil dependency, security of supply and climate change. Although the environmental performance of these sector has greatly improved over the past thirty years (e.g. higher efficiency, lower emissions), scientists, policy makers and industry increasingly acknowledge the limitations to technological fixes and end-of-pipe solutions and acknowledge the need for more structural change. In the Netherlands this has facilitated the emergence of research and innovation programs on 'transitions' towards a more sustainable fulfilment of social needs (Geels, 2002; Rotmans, 2003; Kemp and Loorbach 2006).

Social innovation plays a crucial role in transition research and practice in two ways. In the most direct sense research on social innovation increases the understanding of 'innovating the social' or 'non-technical innovations'. For example new management or organisation models may have major effects on environmental performance of present-day sectors – e.g. through efficiency gains – without radical alterations in the technological basis. More likely, however, is that in the case of transitions towards sustainability technological and social innovation co-evolve. Technological innovations induce social innovations and vice versa. Innovation is not just social but socio-technical and co-evolutionary (Geels, 2005). Social innovation is also a fundamental part of transitions in a normative way. Research and innovation programs on transitions have a normative goal of improving the way social needs such as the need for mobility and energy are met. In this case social innovation refers to innovations that minimise negative social effects and improve issues like equity between social groups, more democratic decision making and less stress on the natural environment. Often such types of innovations are found to originate from or be influenced by civil society organisations, grassroots and other social movements, new businesses and other types of 'outsiders' (Van de Poel, 2000; Mulgan, 2006).

So in the context of transitions, social innovation refers to innovating the social (in co-evolution with the technical) and to innovating with social goals (to improve the way social needs or functions are fulfilled). Such thinking has been at the core of recent policy developments in the Netherlands and was expressed for the first time in the fourth National Environmental Policy Plan (NMP4) in 2001. Simultaneously and in co-production with the developments in the policy domain, social scientists have developed a conceptual perspective to better understand, identify and influence social transitions (Rotmans et al., 2001; Rotmans, 2003; Nooteboom, 2006, Loorbach, 2007).

Transitions can be defined as major shifts in 'socio-technical regimes' or the dominant way in which social needs such as energy supply and mobility are fulfilled (Rip and Kemp, 1998; Geels, 2002). Transition scholars emphasise that transitions are long-term and complex processes (often lasting several decades), because regimes tend to be stabilised and resist to any fundamental change. This lock-in occurs at three dimensions. Institutional structures (both formal ones like laws, regulations and public financing schemes and informal ones like cultural values) are often very rigid, preventing the breakthrough of social innovations. Second, actors and social networks represent incumbent organisational capital and institutionalised power, which make them 'blind' for alternatives and lead them to support an old system even when alternatives have improved social, environmental and economic characteristics. Third, technological artefacts, production technologies and infrastructures also give certain 'hardness' to a regime and often represent large vested interests of incumbent actors. Thus, regimes tend to be institutionally, socially and technologically locked-in (Geels, 2005; Van der Vleuten and Raven, 2006; Cowan and Hultén, 1996)

Transition research has a strong analytical core based on historical socio-technical case studies (Elzen et al., 2004; Geels, 2005). These case studies show that experimenting in niches is crucial for learning about social challenges and stimulating transitions. In the 1990s and 2000s social scientists and policy makers have also developed and applied notions such as 'Transition Management' (TM) and 'Strategic Niche Management' (SNM) with the goal of developing instruments for governing transitions into socially desirable directions (Schot et al., 1994; Kemp et al., 1998; Van der Laak et al., 2007; Kemp and Loorbach, 2006, Loorbach, 2007). Both notions contribute an important role to 'transition experiments', which refers to innovation projects in which actors in society learn about social challenges. But there are also differences. In TM, experimenting is the third of in total four activity clusters (Figure 4). Each cluster represents a distinctive set of activities that together form a cyclical and iterative process. These activity clusters are 1) structuring the problem in question and establishing and organizing a multi-actor network; 2) developing a sustainability vision, transition agenda and deriving the necessary transition paths; 3) mobilizing actors and establishing and executing transition experiments; and 4) monitoring, evaluating and learning (Rotmans and Loorbach, 2006). Experiments are thus explicitly part of a wider set of TM instruments. SNM attributes a more central role to experiments and elaborates upon setting up niches through 'smart experimentation', although increasingly SNM scholars acknowledge the need for systemic instruments on other levels as well. Another difference is that TM is positioned as a tool for social transitions, while the entry point of SNM is often technical. Nevertheless, in SNM the development and implementation of technological innovations are not seen as a *goal* as such, but as a *means* to enable the shift towards new (and hopefully more) sustainable *practice*.<sup>1</sup> So, the focus in SNM is socio-technical, i.e. on the alignment between the technical and the social. Similarly, while TM is positioned as a tool for social transitions, technological innovations often play a key role in TM.<sup>2</sup>

The transition experiment concept has been theoretically elaborated by analysing historical case studies on sustainable innovation journeys as well as contemporary projects (Hoogma, 2000; Van Mierlo, 2002; Raven, 2005). And although notions such as Strategic Niche Management and Transition Management promise an instrumental view on managing transition experiments actually little has been done for practitioners involved in social innovation projects (Mourik and Raven, 2006, Caniels and Romijn, 2006). This article documents the first steps of the authors towards the development of a learning module ('competence kit') based on SNM and TM that specifically targets practitioners. We use the term practitioners to refer to any type of actor that is interested in transition experiments from a practically-oriented (non-theoretical) point of view. This may include policy makers involved in developing transition policies, companies interested in innovating with a social goal, consultants interested in assisting others in transition experiments and intermediary organisations. We will do so by discussing the relevant notions in literature on transition experiments and how transition experiments can be used for guiding social change (section 2). We then continue with introducing the idea of 'competence kits' as a way to make theoretical notions transferable to practitioners and describe the first experiences with the competence kit

---

<sup>1</sup> The core of this argument emerged from a more fundamental (almost philosophical) view on contemporary societies that technology is everywhere and such a fundamental part of our culture that an attempt to realize a sustainable society without technology is an empty if not impossible attempt.

<sup>2</sup> A more fundamental difference between TM and SNM is that they have emerged from quite different views on the dominant 'motors of change' in long-term socio-technical change processes. TM can be characterised as a teleological perspective in which change is goal-oriented and driven by future visions. SNM emerged from a more evolutionary perspective on change, where long-term change processes are attributed to variation and selection processes with more emphasis on learning, contingencies and the role of historical circumstances. These different perspectives on change can still be traced in literature, although increasingly both approaches are mutually learning and borrowing concepts and ideas.

on transition experiments (section 3). Based on a first workshop with practitioners we explore the potential applications of the kit and identify the conditions for successful application. We end with conclusions and discussions in section 4.

## 2. Transitions and transition experiments

### 2.1. Multi-level perspective on transitions

In the introduction we have argued that the notion of transitions has recently gained attention in science and policy as a way to understand – and possibly guide – shifts towards more sustainable 'socio-technical regimes'. This field is still an emerging and dynamic one and many notions and concepts are in active development and – consequently – have a variety of meanings.

One important notion that has become widely used in transition research is a multi-level perspective on transitions (Rip and Kemp, 1998; Geels, 2002). It has been developed through a large number of case studies on historical transitions to understand long-term socio-technical change. The multi-level perspective distinguishes three analytical concepts: niches, regimes and the landscape (see Figure 1). The central concept is the regime, but is used in a variety of contexts and has several meanings in transition literature: 1) a coherent set of rules and institutions that enables and constrains the choices and behaviour of regime actors (including firms, users, policy actors, scientists etc);<sup>3</sup> 2) the meso-level in technological and social change; 3) the dominant socio-technical system or the 'establishment' that represent power, is resistant to fundamental change and has a long history of existence; 4) a constellation of structures, culture and practices that is dominant in the way social needs are fulfilled; 5) the selection environment for innovations. The regime concept is often used in a negative way to explain why new innovations do not breakthrough. The regime rules and institutions guide regime actors in a specific direction and make them 'blind' for alternatives or even discourage or punish the development of alternatives. The literature pays less attention to the fact that current regimes have actually developed from a positive and legitimised way of doing things, e.g. to deal with persistent problems in the past (Van der Vleuten and Raven, 2006).

[FIGURE 1]

The second concept is the concept of niches. Niches are a well known concept in a variety of disciplines and in particular economics and biology. In transition literature the idea of niches has the following meanings: 1) a 'space' or 'location' that is protected from the dominant regime, which enables actors to develop and apply an innovation without immediate or direct pressure from existing regimes; 2) the micro-level of technological and social change; 3) a new and relatively instable set of rules and institutions for innovative practices; 4) (a series of) experimental projects such as demonstration projects and pilot plants; 5) a constellation of structures, culture and practices that deviates in the way social needs are fulfilled; 6) the variation environment for radical innovations. The niche concept is often used in a positive way and as a counterpart for regime problems. They represent 'the things new to the world', radical change and the promise of improvement and progress. In the multi-level perspective, niches are the location where radical innovations are developed and from where they can grow and replace regime practices. Niches therefore enable transition experiments in which visionary actors can innovate with social goals and learn about social challenges.

---

<sup>3</sup> Originally the regime concept emerged from evolutionary economics and is used for indicating a set of engineering- and research routines in R&D laboratories and engineering departments of firms.

The third concept is the landscape. The landscape is a metaphor for the background setting and background developments for regimes and niches. The landscape concept has a variety of meanings: 1) the external and social context that enable and constrain the possibilities for regime change, including structural socio-economic, demographic, political and international developments, but also events like wars or environmental disasters; 2) the source of pressure on the regime to change; 3) a constellation of structures, culture and practices with semi-exogenous and semi-autonomous functioning; 4) the macro-level of social and technological change. So the landscape concept is mainly used in transition literature to characterise relatively autonomous and often slow developments that individual actors cannot influence or change.

## *2.2. The multi-level perspective and practitioners in transition experiments*

One issue following from the variety of meanings of the multi-level concepts is that in the literature on transitions the relation between levels is not always clearly elaborated. We cannot and do not want to close down the discussions on different meanings, but here we address three issues that are important for practitioners involved in transition experiments in relation to the multi-level perspective.

First, one important distinguishing element between the three levels is the level to which they structure the behaviour and decisions of individual actors and 'the options for agency' that an individual actor has on those levels. Regimes generally have a very stable institutional structure that individual actors can influence only very limitedly and indirectly. The landscape can – by definition – not be influenced by individual actors at all, but it can have a major influence on their behaviour and choices; it represents the external environment for actors. The institutional structure of niches, on the other hand, is often very limitedly developed and offers little structure to the behaviour and choices of actors. Niche actors, at the same time, still have a lot of options to develop those institutions according to their own preferences and in interaction (and through discussion and negotiation) with others. The point is that practitioners in transition experiments operate in a multi-level environment, which requires them to act strategically by connecting problems and solutions at different levels.

Second, and this follows from the first issue, is that practitioners will often have different perspectives on what they see as part of the regime, niche or landscape. A new company that aims to introduce a new and sustainable innovation to the market will perceive a change in European legislation as a change in the landscape, because the organisation cannot influence those decisions, while European legislation can have a major influence in the possibilities for the organisation and the innovation. A member of the European parliament, on the other hand, has more possibilities to influence European legislation decisions, but may perceive technological change as an external development. The distinction between the three levels is therefore analytical, and not ontological, i.e. the levels are useful for categorizing and better understanding socio-technical change rather than that the levels are real entities 'out there'. For a transition practitioner in action that means that the multi-level perspective is a useful tool for interpreting the world as he perceives it and to discuss and make explicit mutual relations and relative positions.

Third, an important contribution of the multi-level perspective to understanding transitions is the insight that transitions only occur through the fruitful coupling of developments at all three levels. Transitions only occur when the regime is sufficiently 'open', 'stable' or 'adaptive' to accept radical innovations; when there is sufficient pressure from the landscape for socio-technical change; and when radical innovations have been developed in niches that can be used to exploit the opportunities for change. For a practitioner that means that his or her possibilities for guiding transitions are limited (because of dependence on actors,

developments and events on other levels). It also means that the development of radical innovations in niches is a necessary, but not sufficient condition for transitions.

### 2.3. *Strategic niche management and transition experiments*

So niche development is a fundamental part of transitions and offers opportunities for practitioners involved in transition experiments and social innovation. Niches can be special geographical locations (for example distinct islands or remote country areas), but also specific application domains, which act as stepping stones for learning and wider diffusion. Photovoltaic cells, for example, were first applied in space applications where costs of energy production were less important, but it offered a long-term location for development, learning and improving solar cells. Likewise, Lynn et al. argue that organisations might use niches as a strategy to 'test' the innovation in different market settings – a strategy which has been nicely coined with the term 'probing and learning' (Lynn et al., 1996).

These insights have a strong background in evolutionary thinking and have guided much of the original SNM work (Schot, 1992; Schot, 1998; Rip, 1998). These scholars argued that in particular for sustainable innovations often no clear niche markets exist. In other words, niches do not pre-exist, waiting to be filled, but rather they materialise as the product of organizational action (McKelvey, 1982; Astley, 1985). Sustainable innovations require markets, technologies and institutions to be created in a process of co-evolution. This can be done by creating artificial niches by temporarily protecting the innovation from too harsh selection, for example with public policies such as investment grants, tax exemptions or other forms of 'protection', but also firms may finance innovative technologies without direct profit on the basis of expected markets in the future. Niches can then be used as strategic locations for learning, building new social networks and improving the innovation so that it gains momentum for diffusion to other niches or even replace dominant regime practice.

Several scholars have investigated more precisely how experimental introduction of sustainable innovations in niches can benefit the wider transition process. The SNM framework has been applied, verified and improved with various case studies in the field of sustainable innovations such as wind turbines, battery powered vehicles, fuel cell vehicles, photovoltaic cells, organic food, renewable energy technologies, biogas plants and biomass co-firing.<sup>4</sup> The level of analysis in this literature is often (a series of) experimental projects such as pilot plants and demonstration plants, covering a substantial number of projects over periods up to thirty years. These scholars tend to ask the question why a certain innovation journey was a success or a failure. Although there is variety, many of these scholars explain success and failure through analysing the interaction between what has been labelled 'three internal niche processes' (Raven, 2005).

The first process is *voicing and shaping of expectations and visions*. Firms, users, policymakers, entrepreneurs and other relevant actors participate in transition experiments on the basis of expectations. Articulating expectations is important to attract attention and resources as well as new actors, in particular when an innovation is still in early development and functionality and performance are still unclear. Expectations also provide direction to development: they act as cognitive frames for making choices in the design process. The process of voicing and shaping of expectations is considered to be good when a) an increasing number of participants share the same expectations (expectations are converging into a shared vision), and b) the expectations are increasingly based on tangible results from transition experiments. For the management of expectations in social innovation and transitions towards

---

<sup>4</sup> See for a list of references (Van der Laak et al., 2007).

sustainability, a third criteria is that the vision that is developed promises a major jump on social and environmental dimensions.

The second process is the *building of social networks*. In particular in early phases of development, the social network is still very fragile. Transition experiments require new combinations of actors, often coming from previously unconnected fields and disciplines. So experimentation in niches requires new actors to get together and make new social networks emerge. Building social networks is considered good when a) the network is broad (including firms, users, policy makers, scientists, and other relevant actors from the science and technology domains, the policy domain and the social domain and including both regime actors and regime outsiders), and b) when alignment within the network is facilitated through regular interactions between the actors. In the case of social innovation in particular the first criterion is important to ensure that outsiders are not excluded from the transition experiment.

A good *learning process*, the third process identified in SNM, is widely recognized as crucial for successful innovation. It enables adjustment of the technology and/or social embedding to increase chances on successful diffusion. A good learning process is a) broad – focusing not only on techno-economic optimization, but also on alignment between the technical (e.g. technical design, infrastructure) and the social (e.g. user preferences, regulation and cultural meaning) – and b) is reflexive – there is attention for questioning underlying assumptions such as social values, and the willingness to change course if the innovation does not match these assumptions. In social innovation learning is guided by specific social goals and can be characterized as ‘social learning’ – a process in which multiple actors interact and develop an alternative perspective on reality.

Initially SNM research focused on individual transition experiments, but recent SNM work has changed the focus from individual to multiple experiments. These experiments can exist simultaneously and build on each other over time through a social learning process. Sequences of local projects can gradually add up to a new trajectory (Figure 2). In this process, rules and institutions, that are initially diffuse, broad and unstable, become more articulated, specific and stable.

[FIGURE 2]

The transformation of local outcomes into generic lessons and rules does not occur automatically, but requires dedicated ‘aggregation activities’. Typical aggregation activities include standardization, codification, model building, formulation of best practices, etc. Also circulation of knowledge and actors is important, to enable comparison between local practices and formulation of generic lessons. Conferences, workshops, technical journals, proceedings and newsletters play a major role therein.

Recent SNM work also shifted the focus to interactions between the three niche-internal processes (learning processes, building of social networks, articulation of expectations) and how this results in (sustainable) innovation journeys. Actors, embedded in networks, are willing to invest resources (money, people) in experiments, if they have a shared, positive vision of a new innovation. This shared vision, together with shared rules and institutions, also provides direction to the projects. Transition experiments, carried by local networks, provide space for local activities. The outcomes give rise to learning processes, that may be aggregated into generic lessons and rules. Outcomes are also used to adjust previous expectations and enrol more actors to expand the social network (see Figure 3).

[FIGURE 3]

This section has outlined the main concepts in use in literature on Strategic Niche Management. It can be concluded that this literature has a strong analytical core that focuses on the role of expectations, learning and social networks and the interactions between these three niche-internal processes. SNM is regarded as both a research model as well as a policy tool (Raven, 2005). In terms of research model, it is used to better understand the role of transition experiments in emerging alternative trajectories and for this predominantly used in historical case studies. In terms of policy tool, the SNM framework has been mainly applied for *ex post* analysis of transition experiments in niches to inform policy makers for future sustainability policies. But these studies have yielded few practical guidelines for practitioners that are interested in implementing the notions of SNM to set up transition experiments in niches more systematically (Caniëls and Romijn, 2006), although there are some notable exceptions (Weber et al., 1999; Van der Laak et al., 2007). In the following section we discuss how transition experiments are used in transition management as instruments in guiding transitions towards sustainability.

#### *2.4. Transition experiments as instruments in transitions*

An instrumental perspective on transition experiments has also been developed within the framework of Transition Management (TM). TM is a governance approach that was first defined in 2000 based on the transition concept. In a later phase TM evolved into an operational model (Rotmans and Loorbach, 2006, Loorbach, 2007) and policy practice. Within the model of TM, transition experiments have been defined and implemented as one of the key instruments for stimulating transitions towards sustainability. Transition experiments are part of a portfolio of systemic instruments for TM that has been developed conceptually based on common notions from complex systems theory and new forms of governance, and at the same time has been practically implemented and adjusted based on practice. The systemic instruments for TM include: sustainability visions, transition arena & transition pathways, a transition agenda, transition experiments, a complex systems analysis, monitoring & evaluation and transition coalitions & networks (Rotmans and Loorbach, 2006). An important notion of TM is that transition experiments are used in interaction with other systemic instruments. For example, transition experiments are derived from the sustainability vision and fit within identified transition pathways. Furthermore, monitoring and evaluation of transition experiments can lead to adaptations in the vision or in the coalitions and networks. In the transition management cycle (Figure 4) the different instruments for TM are integrated in four activity clusters. In practice the transition management activities are carried out partially and completely in sequence, in parallel and in a random sequence. The transition management cycle has been applied in several policy domains and regions in the Netherlands (Loorbach, 2007), and can be characterised as a joint searching and learning process, focused on long-term sustainable solutions.

[FIGURE 4]

Currently several policy domains in the Netherlands are using transition experiments as an instrument for stimulating transitions to a more sustainable fulfilment of social needs such as energy and mobility. Examples of these so called ‘transition programs’ are: the Energy Transition, Transumo (focused at the transition to sustainable mobility), Transforum (focused at the transition to sustainable agriculture) and the Transition Program in Health Care. Within these programs a variety of transition experiments, exploring different transition pathways, are executed and often connected to a long term vision on sustainability and supported by a broad social network. It is important to note that the innovation projects that are executed in

these programs are not always explicitly named an ‘experiment’. This can be explained by the fact that actors participating in these projects have high expectations regarding the potential success of the project and are aiming for concrete results. What distinguishes these projects from conventional innovation projects is that they are guided by a broader social challenge and aim to contribute to a transition. Related to this aim, the practitioners that participate in these transition programs have expressed a need for practical guidelines for stimulating the contribution of their transition experiments to transitions<sup>5</sup>. Examples of questions from practice are: How to set up a good learning process within the experiment and between experiments? How to stimulate interactions with other experiments within the same transition pathway? and How to stimulate the broader social embedding of transition experiments?

As a response to these questions from practice and also theoretical questions regarding developing a more managerial perspective to transition experiments, recently within transition management literature three basic steering notions for transition experiments have been distinguished: *deepening*, *broadening* and *scaling up* (Rotmans and Loorbach 2006, Van den Bosch and Taanman, 2006). For each notion specific guiding principles for transition experiments have been developed that can be applied by practitioners working at the level of transition programs and the more operational level of transition experiments (Kemp and van den Bosch, 2006). *Deepening* comprises all activities aimed at learning as much as possible from a transition experiment in a specific context. In transition processes, especially higher order learning is important because this type of learning is more reflexive and as a result changes existing frames of references. An example of higher order learning is that during the transition experiment expectations regarding the nature of the problem and the possible solutions are adjusted. Guiding principles are to take in account uncertainties, create space for intermediate adaptations, formulate learning objectives in advance and build upon learning experiences from other experiments. *Broadening* comprises all activities aimed at repeating a transition experiment in different contexts and linking the experiment to other functions and domains. For example, an experiment with a new sustainable mobility concept with the aim to learn about new ways for commuter transportation, can also be linked to other functions such as recreation. Broadening implies that experiments that are successful in a certain context are repeated ‘smartly’ in different contexts, by incorporating previous lessons learned and continuously adapting to the new context. Guiding principles are to set up experiments with high potential to be repeated in a broader context, use a sustainability vision for providing direction and binding to a portfolio of experiments and organize feedback loops between the experiments and the transition pathways and visions. *Scaling up* comprises all activities aimed at embedding the experiment in the structure, culture and practices at a higher scale level (the regime). Scaling up does not refer to geographical or market scales, but refers to the levels in the Multi-Level Perspective (Figure 1); scaling up occurs when transition experiments in niches eventually contribute to replacing the dominant regime structure, culture and practice. Guiding principles for scaling up are stimulating institutional embedding, gaining structural support, involving key players from the regime, overcoming (institutional) barriers and making the experiment part of a broader process of change.

Likewise Strategic Niche Management, Transition Management holds the promise of being able to manage transitions towards more sustainable and socially desirable goals but there is still major effort to be done to make the many valuable insights from both notions transferable to practitioners without a scientific background in evolution and complex system theories. The authors believe that the insights and guiding principles for transition experiments need to be translated in more detailed and practical “how to do it” guidelines and that there is a need for a learning module that aims to increase the experimentation competences of practitioners

---

<sup>5</sup> This need for practical guidelines is expressed during various practitioner meetings facilitated by the Competence Centre for Transitions. ([www.transitiepraktijk.nl](http://www.transitiepraktijk.nl))

that are involved in transitions. The next section discusses the first steps towards such a 'competence kit' which explicitly builds upon insights from the transition and strategic niche management literature discussed above.

### 3. Competence kits

Strategic niche management and transition management are theoretical notions that have strong bearing on transition initiatives in practice. They offer guidance to practitioners involved in the deepening, broadening and scaling up of transition experiments. Having said that, however, it is not self evident that practitioners know, understand and value these notions. As it is not self evident that scientists know, value and answer the need for practical guidelines as expressed by practitioners. Even in the field of transition research, in which the development of theory and practice is closely interrelated, the translation of relevant notions into practical guidelines implies hard work for all involved.

It is the main objectives of the Dutch Competence Centre for Transitions (CCT) to enable transition professionals to develop and transmit their competences in managing successfully sustainable system innovations. CCT was established in 2005 as a joint initiative of the Dutch Ministry of the Environment, the Dutch Knowledge network on System Innovations (KSI - [www.ksinetwork.nl](http://www.ksinetwork.nl)), the Netherlands Organization for Applied Scientific Research TNO and the SenterNovem Agency for sustainable development. Since 2005 CCT has initiated and supported many initiatives to define, articulate and make accessible competences vital for success in transitions and system innovations.

The CCT definition of competences comprises both explicit knowledge (i.e. theoretical notions, methodology) and tacit knowledge (skills and experience), combined with the underlying personal drivers and motives. Building upon previous work by previous authors (Grin and Weterings, 2005; Loeber, 2003; Rotmans, 2003) six clusters of specific competences have been suggested by Andringa and Weterings (2006). Each of these clusters is related to a specific key element of transitions and system innovations:

- *System analysis and problem structuring*: concepts, tools and skills that provide insight in dominant patterns and structures of social subsystems
- *Re-orientation and visioning*: envisioning new, innovation trajectories from a long term perspective on sustainability
- *Establishing and executing transition experiments*: the building of coalitions of actors that recognise the benefit of joining forces in performing innovative experiments
- *Broadening and scaling up transition experiments*: the broader social embedding of transition experiments through interaction with other experiments, initiating similar experiments in other contexts and anticipating favourable conditions for scaling up
- *Monitoring, evaluating and learning*: concepts and tools for monitoring and evaluation of ongoing innovation processes and reflexive abilities of transition professionals
- *Transition management*: an all embracing cluster of competences, enabling the transition professional to do what is necessary at the right time, in the right place with the right partners.

For each of these clusters a so-called competence kit will be developed, which aims to articulate and make accessible the competences that are vital from a practitioners perspective. The first competence kit under construction is the kit on 'Establishing and executing transition experiments'.

### *3.1 Competence kit on transitions experiments*

The competence kit on transition experiments is a learning module targeting policy makers, project managers, program managers and other actors involved in the establishing and executing of transition experiments. In its present version, the competence kit takes the shape of a booklet of somewhat over 100 pages. It consists of three layers:

- a practical layer, providing guidance for practitioners and suggesting useful tools, skills and best practices based on experience
- an illustrative layer, describing one illustrative example of a transition experiment
- a theoretical layer, presenting a summary of relevant theoretical and methodical literature on strategic niche management and transition experiments

It is up to the practitioner to decide whether he will take notice of one, two or all three layers. In addition, through references in the practical layer, it is shown where more information can be found in the theoretical layer. In this way the practitioner can decide to what level he wants to elaborate on key notions. Last but not least, the practical layers comprises some practical exercises, inviting the reader to learn more on specific issues by using either the example experiment or an experiment from personal experience.

It is exactly the balance between the theoretical core and the practical guidelines which, in our view, determines the quality and usefulness of the competence kit. Would the kit only present practical guidelines, it would not provide practitioners with the necessary answers to their question on the ‘what’ and ‘why’. The result would be nothing more than a book of ingredients, lacking the basic know how of the cook. On the other hand, would the competence kit only consist of a concise summary of relevant theoretical and methodical literature, it would not answer most of the ‘how to’ questions practitioners have. In its present design the competence kit provides answers to the ‘what’ and ‘why’ of transition experiments in general, and provides guidelines for answering the ‘who’, ‘when’ and ‘how to’ question in a specific context.

### *3.2 Experience thus far*

The development of the competence kit is still in progress, but is very much a product co-produced by theorists and practitioners. Theorists drafted initial chapters, which were in a very raw form already commented by practitioners involved in the core team. This led to interesting discussions on the usability of concepts and theories for practitioners on the one hand, and on critical reflection of practitioners' experiences on the other hand. We also asked a panel of readers to scrutinize the first full draft version. The panel consisted of several experienced practitioners and several academics. The panel in general appreciated the combination of a theoretical and a practical layer, in combination with an in-depth description of one example. However, members of the panel differed in their preference for either the practical guidelines or the theoretical layer. Also, one of the practitioners doubted whether he would personally make use of it. This led us to two conclusions. One conclusion is that a written competence kit does not easily accommodate to the different competence levels of various practitioners. The second conclusion is that it is crucial to provide the competence kit in a setting in which practitioners are supported in learning through dialogue.

Through use of the present kit in various settings, we hope to learn which content, design and shape is suited most for transmitting the competences presented. At the moment of writing, the authors have tried out the competence kit in a 5 hour workshop setting. During the first part of this workshop, the analytical core of the kit was presented to and discussed in a group of 25 practitioners. During the second part of the workshop, policy makers introduced the general outline of a transition experiment to be conducted in the near future. This case-

introduction was followed by two parallel group exercises in which practitioners discussed various ambition levels and potential designs of the transition experiment, putting into practice some of the practical guidelines in the competence kit. In this setting, the informed dialogue on key notions from theory as well as the practical guidelines of the kit were appreciated, but it also brought to the table a new challenge. Some practitioners argued that even a 5 hour workshop was too short to address sufficiently the full content of the kit, others requested more structure in the second part of the workshop. It was concluded that more thought is needed about different learning *contexts* for different target groups. The kit will be used in other settings in the near future, such as a one-day-learning module of a post-academic course on Transition Management and an in-depth intervision session of practitioners reflecting on personal experience.

One of the key challenges in further developing the competence kit will be to determine the essential content and the optimal design and shape of the kit. Experience will show which content, design and shape enables practitioners best to adopt the competences they value. Thus far, we believe the content and three layer design of the present kit are adequate, although attention is needed for the setting in which the kit is presented to practitioners. With regard to the shape of the competence kit, we expect the present booklet will be followed up by a CD-ROM or website, thus better enabling to connect the description of practical tools with (more than one) illustrative examples and underlying theoretical notions.

#### **4. Summarising conclusions**

This paper has outlined the development of a competence kit for practitioners (e.g. policy makers, companies, intermediary organisations and NGO's) based on the notions of Strategic Niche Management and Transition Management. The following summarising conclusions can be drawn. First, TM and SNM provide good starting points for drafting the kit. Both notions are theoretically rich and based on in-depth and detailed analyses of historical case studies and contemporary projects. They acknowledge the socio-technical and co-evolutionary nature of innovation and contribute a major role to transition experiments in managing social innovation processes towards sustainability. Second, from the start both notions have not only targeted the scientific community but also the policy and social innovation community. Consequently they carry the promise of being socially and practically relevant and can potentially be used to put forward ready-to-use practical guidelines. Third, they are however not directly applicable by practitioners involved in innovation projects, who do not have an academic background in innovation studies, complexity theory, policy science or evolutionary theories on technical change. In the present form both notions still require a major interpretation to translate scientific insights into practical valuable guidelines for specific social innovation projects in specific contexts and for specific target groups. Fourth, to successfully connect theoretical insights offered by academics with demand for practical guidelines from practitioners requires a transdisciplinary approach in which academics and practitioners co-produce new knowledge that is practically valuable and theoretically rich. Fifth, the first step in such a co-production was successfully performed by the development of a competence kit as a combined effort from academics and practitioners through a three-layer approach connecting theory with practical guidelines and recognisable examples. Sixth, preliminary experiences show that the competence kit needs to be complemented with the creation of a learning environment where practitioners and academics meet in a dialogue to learn to work with the kit, are challenged to check the relevance of the kit with their personal experiences, apply the guidelines for designing future transition experiments and learn from the experiences to further enhance the competence kit. Seventh, by doing so the concept of a

competence kit on transition experiments becomes a useable tool that increases the competences of practitioners and academics and improves their ability to learn about social challenges in innovation projects.

### **Acknowledgement**

This research was kindly supported by the Dutch Knowledge network on System Innovation (KSI).

### **References**

- Andringa, J, Weterings, R. (2006) *Competenties van transitieprofessionals*, Utrecht: Competentiecentrum Transitities
- Astley, W.G. (1985) 'The two ecologies: population and community perspectives on organizational evolution', *Administrative Science Quarterly*, Vol 30, pp. 224–241
- Caniëls, M., Romijn, H. (2006) *Strategic Niche Management as an Operational Tool for Sustainable Innovation: Guidelines for Practice*, Schumpeter Conference 2006, 21 -24 June, Nice, France
- Cowan, R., Hultén, S. (1996) 'Escaping lock-in: the case of the electric vehicle', *Technological Forecasting and Social Change*, Vol. 53, pp. 61-79
- Elzen, B., Geels, F.W., Green, K. (2004) *System Innovation and the Transition to Sustainability. Theory, Evidence and Policy*, Cheltenham and Northampton: Edward Elgar
- Geels, F.W. (2002) 'Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case study', *Research Policy*, Vol. 31 (8/9), pp. 1257-1274
- Geels, F.W. (2005) *Technological Transitions and System Innovations. A co-evolutionary and socio-technical analysis*, Cheltenham and Northampton: Edward Elgar
- Geels, F.W., Raven, R.P.J.M. (2006) 'Non-linearity and expectations in niche-development trajectories: ups and downs in Dutch biogas development (1973-2003)', *Technology Analysis & Strategic Management*, Vol. 18, pp. 375-392
- Grin, J, Weterings, R. (2005) *Reflexive monitoring of system innovative projects: strategic nature and relevant competences*, paper presented at IHDP-conference, Bonn, October 2005
- Hoogma, R. (2000) *Exploiting Technological Niches*, Ph D thesis, Enschede: Twente University
- Kemp, R., Loorbach, D. (2006) 'Transition management: a reflexive governance approach', Voß, J.P., Bauknecht, D., Kemp, R. (Eds.), *Reflexive Governance for Sustainable Development*, Cheltenham / Northampton: Edward Elgar, pp. 57-81

- Kemp, R., Schot, J.W., Hoogma, R (1998) 'Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management', *Technology Analysis & Strategic Management*, Vol. 10, pp. 175-196
- Kemp, R., Van den Bosch, S. (2006) *Transitie-experimenten: Praktijkexperimenten met de potentie om bij te dragen aan transitie*, Delft/Rotterdam: Kenniscentrum voor Duurzame Systeeminnovatie en Transitie (KCT).
- Loeber, A. (2003) *Inbreken in het gangbare. Transitie management in de praktijk: de NIDO-benadering NIDO*, Leeuwarden
- Loorbach, D (2007) *Transition management: new mode of governance for sustainable development*, Ph D Thesis, Erasmus University Rotterdam, Utrecht: International Books
- Lynn, G.S., Morone, J.G., Paulson, A.S. (1996) 'Marketing and discontinuous innovation: the probe and learn process', *California Management Review*, Vol. 38, pp. 8-37
- McKelvey, B. (1982) *Organizational Systematics: Taxonomic Lessons from Biology*, University of California Press: Berkeley
- Mourik R., Raven, R.P.J.M. (2006) *A practitioners view on Strategic Niche Management*, Petten: ECN-E--06-039
- Mulgan, G. (2006) *Social Innovation. What it is, why it matters and how it can be accelerated*, Oxford Said Business school
- Nooteboom, S. (2006) *Adaptive Networks. The Governance for Sustainable Developments*, Delft: Uberon Academic Publishers
- Raven, R.P.J.M. (2005) *Strategic Niche Management for Biomass. A Comparative Study on the Experimental Introduction of Bioenergy Technologies in the Netherlands and Denmark*, Ph D Thesis, Eindhoven: Eindhoven University of Technology
- Rip, A., Kemp, R. (1998) Technological change, in: Rayner, S., Malone, E.L. (Eds.), *Human Choice and Climate Change*, Vol. 2, Batelle Press, Columbus, pp. 327-399
- Rotmans, J. (2003) *Transitiemanagement. Sleutel tot een duurzame samenleving*, Assen: van Gorcum
- Rotmans, J. Kemp, R., Van Asselt, M. (2001). More evolution than revolution: Transition management in public policy. *Foresight* 03 (01): 17
- Rotmans, J., Loorbach, D. (2006) 'Transition management: reflexive steering of societal complexity through searching, learning and experimenting', Van den Bergh, J.C.J.M., Bruinsma F.R. (Eds), *The transition to Renewable Energy: Theory and Practice*, Cheltenham: Edward Elger
- Schot, J.W. (1992) 'The policy relevance of the quasi-evolutionary model: The case of stimulating clean technologies', Coombs, R., Saviotti, P., Walsh, V. (Eds.), *Technological*

*Change and Company Strategies: Economic and Sociological Perspectives*, London: Academic Press, pp. 185-200

Schot, J.W. (1998) 'The usefulness of evolutionary models for explaining innovation. The case of the Netherlands in the nineteenth century', *History of Technology*, 14, pp.173-200

Schot, J.W., Hoogma, R., Elzen, B. (1994) 'Strategies for shifting technological systems', *Futures*, Vol. 10, pp. 1060-1076

Van den Bosch, S., Taanman, M. (2006) *How Innovation Impacts Society. Patterns and mechanisms through which innovation projects contribute to transitions*, Innovation Pressure Conference 2006, 15th -17th March, Tampere, Finland

Van de Poel, I. (2000), On the role of outsiders in technological development, in: *Technology Analysis & Strategic Management*, Vol. 12, pp. 383-397

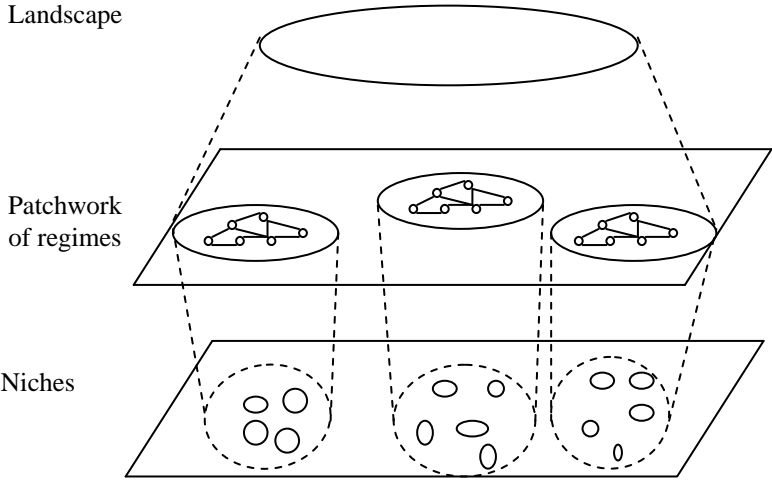
Van der Laak, W., Raven, R.P.J.M., Verbong, G.P.J. (2007) 'Strategic niche management for biofuels. Analysing past experiments for developing new biofuel policies', *Energy Policy*, Vol. 35, pp. 3213-3225

Van Mierlo, V. (2002), *Kiem van Maatschappelijke Verandering: Verspreiden van Zonnecelssystemen in de Woningbouw met Behulp van Pilotprojecten*, Amsterdam: University of Amsterdam

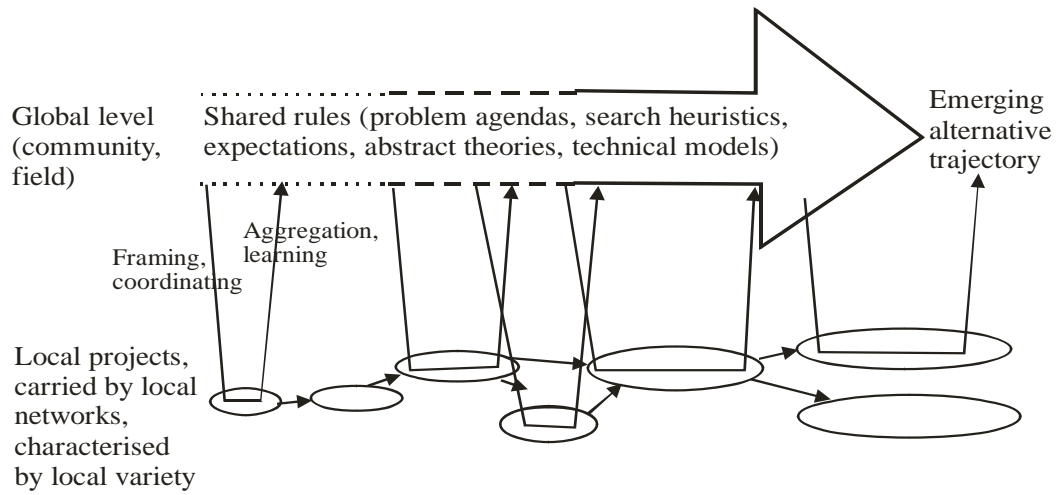
Van der Vleuten, E., Raven, R.P.J.M. (2006) 'Lock-in and change: distributed generation in Denmark in a long-term perspective', *Energy Policy*, Vol. 34, pp. 3739-3748

Weber, M., Hoogma, R., Lane, B., Schot, J.W. (1999) *Experimenting with Sustainable Transport Innovations. A Workbook for Strategic Niche Management*, Sevilla/Enschede

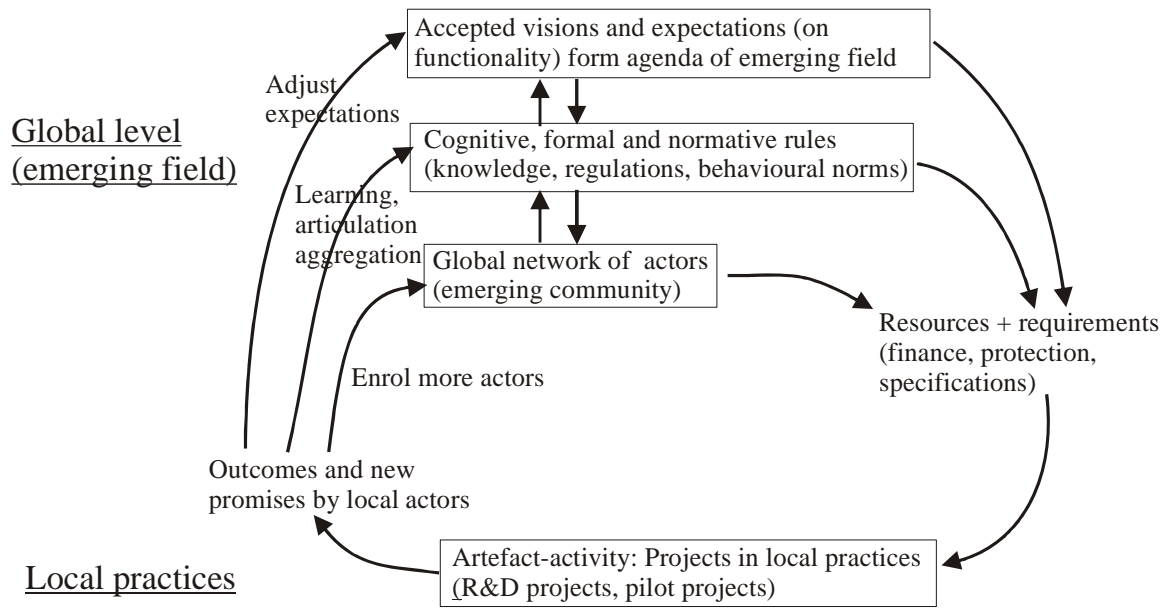
**Figures**



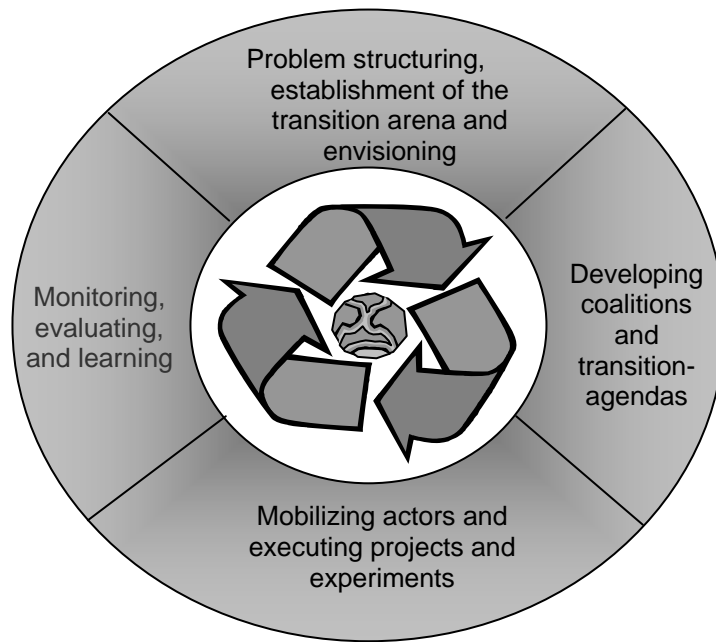
**Figure 1.** Multi-level perspective on socio-technical changes (Geels, 2002)



**Figure 2.** Emerging alternative trajectory carried by local projects (Geels and Raven, 2006).



**Figure 3.** The dynamics of niche development trajectories (Geels and Raven, 2006)



**Figure 4.** The transition management cycle (Rotmans and Loorbach, 2006, Loorbach 2007)