# Imagining sustainability: the added value of transition scenarios in transition management

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**Abstract**

**Purpose** – *To address lessons that specify the impact and contribution of current scenario methods when focused on facilitating transition management processes.*

**Design/methodology/approach** – *Comparative literature review based on transition management and scenario development.*

**Research limitations/implications** – *Need of further systemic thought about the required criteria of transition scenarios and the embedding of scenario use in transition management processes.*

**Practical implications** – *Processes of transition management are in need of transition specific scenarios.*

**Originality/value** – *Because transition management implies a complex and long-term steering paradigm with which current scenario applications are not familiar, conclusions are drawn on the (changing) requirements of scenario development processes in transition management and on the need to innovate current scenario methods in the context of transition management.*

**Keywords** *Transition management, Sustainable development*

**Paper type** *Literature review*

## Introduction

While the concept of sustainable development has stimulated considerable debate on specific interpretations, it is clear that inherent in the notion is a concern for the long-range future over at least several generations (Gallopin *et al.*, 1997). This is because our complex society deals with long-term persistent problems that are deeply rooted in our structures and institutions and for which no tailor-made solutions are available (Dirven *et al.*, 2002). These problems of sustainability in relation to the rapidly changing societal environment and the existing lack of possibilities for steering, force us to structurally reorientate our thoughts and actions (Rotmans *et al.*, 2005). Projections of trends may be legitimate over the short-term, but not as time horizons expand from months and years to decades and generations (Gallopin *et al.*, 1997). What seem to be promising or optimal choices in the short term might turn out to be sub optimal or even destructive in the long term (van Asselt *et al.*, 2005).

Transition management (TM) is a systemic approach, postulated as a new governance model which is concerned with steering and coordinating large-scale system innovations towards greater sustainability. An important part consists of envisioning sustainable future trajectories. On a strategic level, we use creative processes of scenario building for this. The most prominent function of the so-called transition scenarios (to be further defined later) is to strive for a fundamental, irreversible reframing of our current paradigms (Rotmans *et al.*, 2005). While the transition scenarios will be renegotiated and reshaped as the process unfolds, they provide a long-term perspective as an orientation for short-term action. The participative engagement of actors with diverse backgrounds will lead to new insights into the nature of the problems and the underlying causal mechanisms. This will offer actors freedom and breathing space to come up with new directions for solutions to persistent

problems. These insights form the prelude to a new way of thinking which serves the basis for alignment, enrolment and mobilization of collective action necessary to initiate and maintain sustainable system innovations (Kemp and Rotmans, 2001, cited in Berkhout, 2005; Rotmans, 2005).

Although the TM model has only recently been introduced, it has already been adopted in several projects. Two examples are:

1. the Energy Transition, which is initiated by VROM (Ministry of housing, land use, planning and environmental management) and Senternovem (Agency for sustainability and innovation); and
2. Parkstad Limburg.

Purpose of the former is to generate a sustainable energy system in The Netherlands by giving high priority to tackling persistent problems like climate change and the growing dependence of oil and gas from politically instable regions.

Government has a leading role in this process of renewal by facilitating necessary interactions between business, societal organizations, consumers, knowledge institutions and herself. Actions are directed at focused and ventured innovations in the energy system within the orientation of a long-term vision (Advies VROM-raad and algemene energieraad, 2004). The latter, region Parkstad Limburg paid too little attention to the suppression of inter municipal competition and to the positioning of Parkstad Limburg in Europe. Therefore, visions were developed that stimulated focus and direction for future development trajectories towards a more embedded region (Report of the core group Parkstad Limburg (Advies kerngroep Structuurvisie Parkstad Limburg 2030, 2003).

Besides this optimism, there are also several drawbacks. Although it is recognized that scenario development processes can provide direction and focus in TM processes by reflecting upon structural changes in society and developing long-term images of sustainable worlds, the use of these methods within TM is still rather limited. Reason lies in the fact that transition experts assume that current scenario methods cannot handle the complexity and dynamics of a transition, and that adjustments in the prevailing scenario methods are necessary (Rotmans, 2005; Elzen *et al.*, 2004; Berkhout, 2005). This assumption builds on the notion of Wiek *et al.* (2006) who address the relevance of scenario use within processes of TM. We take this notion a step further by not only addressing their relevance but also questioning their quality when instrumental for TM. Given this assumption, a first task is to give systemic thought to required criteria of scenario development processes when assisting TM. In a later stage these criteria can be further developed into scenario methodologies. The latter is not within the scope of this article but the relevance needs to be addressed. Until now, most scenario applications have been carried out in isolation, serving the goal of policy making. Therefore, they have a strong orientation towards content aspects (Berkhout and Hertin, 2002; van der Heijden, 2005; Schwartz, 2005; Ringland, 2002). Transition scenarios on the other hand are embedded in a TM trajectory, i.e. they build on and refine the conditions of sustainable visions by developing these further into concrete storylines. The resulting transition scenarios then provide direction and focus for the identification of sub themes that can be developed into transition pathways, eventually leading to experiments. For these reasons, more attention has to be paid to process related aspects of scenario development.

Also on a more global scale, in Agenda 21[1], the need for a systemic approach like TM in relation to future thinking was explicitly recognized. However, they also mark that there has not been remarkable progress since. It is recognized that scenarios pursued in sustainability science should be conducted at all scale levels using a systemic approach. They should be comprehensive, participatory and anticipative as well as adaptive. Useful scenarios for TM must stress integration, recognize uncertainty, appreciate irreducible normative aspects, and engage the public in discourse on sustainable development (Raskin *et al.*, 2002). The Earth Summit in 1992[2] also marked the recognition that environmental, social, and economic concerns are closely connected and must be pursued jointly. Yet structures of power and habits of mind change slowly. Many scenario development efforts are still

narrowly focused, and effective scenario methods for more integrated approaches to sustainable development are still lacking (Gallopin *et al.*, 1997). Action is needed to develop appropriate methodologies (Raskin *et al.*, 2002).

Summarized, TM is a promising governance model with regard to the drive towards a more sustainable world. Promising projects have been initiated, but theory and practice about how scenario development processes can be embedded in TM can and must be brought a step further.

### *Outline*

Main purpose of this article is to address the question whether current scenario methods need adjustments in order to be useful in facilitating transition management processes. However, before we can give an in-depth insight in potential innovations for scenario methods it is useful to first explain the origin and the concept of TM and the added value that scenarios can have within TM. Based on these insights, process and content criteria for transition scenarios can be derived. In order to address the required innovations in current scenario methods, it is useful to give a state-of-the-art of past and current scenario methods. As will be seen, changing requirements of scenario methods over time follow an ever-growing perceptional increase in the complexity of the environment over time. Based on these insights, a comparative literature review will be made between the prevailing scenario methods and the required criteria of scenario methods when instrumental for transition management. This in order to address lessons that specify the impact and contribution of current scenario methods when focused on facilitating transition management processes.

## Transition management

### *Origin and concept of TM*

Over the past decade environmental concerns have increasingly been integrated into the management routines of both states and corporations. Since the mid 1990s there has been an impressive growth in the literature of sustainability challenges (WCED, 1987; Gallopin *et al.*, 1997; Raskin *et al.*, 2002, Meadowcroft, 2005). Sustainability research defines a fascinating new program of scientific research. It is the basis for an early warning system that can alert decision-makers and the public on future perils and provide guidance on ways to respond. This paragraph will reflect on a recent development in this field.

### *Origin of TM*

In addition to what has been said earlier about the concept of TM, it is a governance model aimed at the creation of micro-level initiatives that will structurally transform a regime through a process of scaling up (Rotmans, 2003). The long-term transition scenarios foster direction and focus for initiating and realizing this societal transformation towards sustainability. The ideal outcome is a transition, a non-linear process of societal change in which the structure of a societal system transforms (Rotmans, 2003). Transition management has its roots in complexity theory, governance theory and social theory. As it is not the purpose of this article to describe into depth the underlying theories of TM and its associated assumptions, the basic notions will be briefly highlighted in order to better understand the origin of TM. Complexity theory has its primary focus on the dynamics of complex, adaptive systems (Krohn *et al.*, 1990) with which the dynamics of a transition are comparable. Complexity theory lends us the insight that complexity must be viewed as a means of leverage for steering. Anticipative – as well as adaptive steering mechanisms must be combined in order to transform a complex, adaptive system from one state to another. Governance theory is relevant for TM in that it addresses the need to direct complex societal dynamics. Although traditional forms of governance have proven to be inadequate for steering societal challenges with a high degree of complexity ((Mayntz, 1993), (March and Olson, 1995), (Fox and Miller, 1996), (Scharpf, 1999), (Hooghe and Marks, 2001), (Teisman, 2005) cited in Rotmans, 2005), new forms of governance are more in line with the notion of societal complexity and – dynamics. TM contains the main characteristics of these new forms of

governance i.e. network management (Dirven *et al.*, 2002; Kickert *et al.*, 1997), interactivity (de Bruin *et al.*, 1998; Dirven *et al.*, 2002), pluralism (Grin, 2004; Rotmans, 2003), multi-level focus (Rotmans and Rothman, 2003) and social learning (Leeuwis, 2003; Loeber, 2004). Social theory offers a useful starting point for analyzing societal dynamics. In that sense, social theory forms a bridge between complexity and governance in that it describes and explains the co-evolution between actors, structures and practices. Social theory starts from the notion that interactions exist between structures, actors and practices. The assumption is that societal structure is both the result and means of acting: Intended and unintended effects of acting lead to a social structure. Once it exists, it contributes to the determination of rules and means for the actions of societal actors (Giddens, 1984, cited in Rotmans, 2005), (Grin *et al.*, 2003).

A closer comparative analysis between the concepts of TM and these theories reveals also many differences, suggesting that TM shares features to each of these approaches but is reducible to none of them. However, an in depth description of differences and similarities does not serve the purpose of this article. Therefore, we suffice with only mentioning the background against which TM has developed and continue the next paragraph with explaining the main concepts of TM that are relevant in light of scenario development processes.

### *Concept of TM*

Transitions are important in relation to sustainable development as they can open the door to radical improvements in societal performance (Meadowcroft, 2005). Although transitions cannot be controlled in any absolute sense, they can be influenced through intentional intervention. Transition management is a deliberate attempt to bring about long-term change on a system level (Rotmans, 2005). This requires the encouragement of a coalescence of seemingly unrelated bottom-up initiatives that follow on diverse global trends (Raskin *et al.*, 2002). ''Seemingly unrelated'' because these diverse niche-based innovations take place on different societal domains, each domain having its own pace of change. Rapid movements characterize i.e. economic developments while cultural developments can be recognized by relatively slow movements. Therefore, the initiated innovations seem to exist in isolation. However, the reinforcement of the different innovations into a joint project for structural change is a prerequisite for a transition to happen (Rotmans, 2005). This mechanism is time dependent and only occurs when developments in different domains synchronize in one and the same direction. A purpose of TM is to cultivate the right incentives for synchronization to happen. This is also called goal-oriented modulation (Kemp and Loorbach, 2003; Meadowcroft, 2005). The stimulation of different niche-based innovations is intended to nurture sustainable alternatives to existing practices. This may prelude the long-term path towards a regime transformation or a regime shift.

This long-term perspective is embodied in transition scenarios, which are defined as participatory explorations of possible development trajectories that incorporate a structural systems change towards a desired, sustainable future state of the system. The term ''explorations'' in the foregoing definition indicates that the pathway towards a sustainable future can be characterized as an uncertain one, in need of a reflexive process of searching, learning and experimenting. As transition patterns have multiple (often conflicting) determinants such as behavior, culture, technology, economy, institutions, environment and policy, the pathways towards a sustainable system state cannot be outlined and predicted in advance. Also, although people today are working in similar conditions of uncertainty as in former times, the higher risks and uncertainties of larger scale activities (Beck, 1992, cited in Harremoës *et al.*, 2001) and the greater pressure from the mass media (Smith, 2000, cited in Harremoës *et al.*, 2001) make it more difficult to survive and grow in this era of uncertainty. All this means that ''the future'' cannot be treated as an objective fact but needs to be thought of as being emergent and only partially knowable. The focus is on learning-by-doing and doing-by-learning while exploring interrelationships among trends and key uncertainties. In this sense, the future should not be treated as an ''empirical'' reality but rather as a set of only partially viewable alternatives that describe a ''possibility space'' (Gallopin *et al.*, 1997). Focused on transition scenarios, people should strive not only for a

single scenario, which most likely corresponds with their expectations, but instead they should try to acquire multiple scenarios that describe the whole ''window of opportunities'' (Fink *et al.*, 2004). The acknowledgement of a multiplicity of transition scenarios is presented as a strategy to:

- map out the nature and types of uncertainty in order to anticipate on it,
- to avoid a premature lock-in by keeping options open, and to
- create space and ambition for new directions in solutions.

This in contrast to traditional approaches of futuring that tend to seek for a single truth and representation of reality, thereby ignoring uncertainty (Mitroff and Kilmann, 1987). In conclusion, as traditional approaches still seek to develop plausible assumptions about the future, the accuracy of projections within TS has no longer priority. Rather, they aim to provide a imaginative systematic framework to draw out, challenge and refine knowledge about the future (Raskin *et al.*, 2002).

When operationalizing TM, the main instrument is the establishment of transition arenas. The actors within a transition arena take part in a cyclical process, also called TM-cycle, within which problems are structured, visions, transition scenarios and transition pathways are developed, networks are mobilized, experiments are carried out, results are monitored and learning points are reflected on. Within this article, attention will only be paid to the development of transition scenarios. Recent literature on other parts of the TM cycle can be found in Loorbach and Rotmans (2006).

The transition arena should be seen as an innovation network on a strategical level, consisting of forerunners from various backgrounds, confronting and integrating each other's perceptions over persistent problems. These deliberations lead to a new way of looking at reality that manifests itself in the form of a shared problem perception (Loorbach, 2004). Based on these insights actors should come to realize that sustainability cannot be realized by continuing current practices. Habits of mind have to change and developing transition scenarios of long-term sustainable futures onsets this process. By deliberating over desirable pathways towards sustainability, the bridge to be breached from now towards the future comes into focus and creates a sense of urgency. Construction of transition scenarios goes beyond reason generation in that it examines combinations of events that may seem idealistic and improbable from today's perspective – but are possible, and maybe even necessary to achieve goals of sustainability (Raskin *et al.*, 2002). As the development of transition scenarios is integrated in the TM-cycle just mentioned, the condition arises to further concretize and downscale the scenarios in a stepwise manner. This way, transition scenarios can provide support for bringing long-term desirable futures into contact with short-term practices that are of value for today. The long-term images on a system level provide insight in the problems that need to be tackled and the neglected areas that need more attention in the future. Based on this, different themes can de identified and subsequent pathways can be developed on a tactical level. On an operational level, end goals and sub goals can be defined, coalitions can be formed and concrete experiments can be thought of.

### *Added value of scenarios within processes of TM*

Now that the background and the concept of TM are explained and the use of scenario methods within TM is clarified, one could wonder why scenario methods in itself are useful within processes of TM and more specifically why they are more useful than other methods related to future thinking, i.e. forecasts, trend extrapolation etc. This paragraph will deal with these questions.

First of all, recent literature on transition management has placed a great deal of importance on the role of the creation of scenarios for a sustainable future (Kemp and Rotmans, 2001, cited in Berkhout, 2005). Reason lies in the fact that transition management only recently is more and more seen as the pretension that long-term, co-evolutionary processes in society are not an inescapable fact-of-life, to be understood in retrospect rather that be controlled pro-actively. Policy makers are not detached and clinical observers of change, they are

active participants able to onset innovations in the right direction (Bruggink, 2005). Scenarios provide long-term images of sustainable futures on a strategical level. In this sense, they serve as a framework for short-term actions at an operational level. They ensure the enrolment of actors into coalitions for change and strategic conversation within and between these coalitions. This is supposed to result in alignment and mobilization of collective action necessary to initiate and maintain sustainable system innovations.

Second, Kasemir *et al.* (2003) argue that scenario development is an approach that is well suited to explore a transition towards sustainability. The basis of scenario development lies in surfacing weak signals that herald changes in society, sometimes fundamental in nature, be they political, economic or social. Often it requires a unique combination of elements to initiate the onset of transitions, i.e. subsidies, network support, technology innovation, experiments and paradigm shift. Scenario development, by addressing such combinations, is one of the few methodologies that offer the opportunity to prepare us for transitions.

Third, as already said before, the discussion within the first phase of a transition arena is assumed to facilitate the convergence of different problem perceptions based on the articulation of diverse perspectives of forerunners. This leads to new visions on the nature of problems and the underlying causal mechanisms. The resulting scenarios can prelude the paradigm shift that is necessary for the realization of the transition that is strived for. Processes of scenario development are not only crucial for indicating the gap between now and the future but also for sharply indicating the desired direction of development. This direction creates the space in which future transition activities can be exploited and is therefore an absolute necessary condition for a successful continuation of the trajectory.

The fourth value of scenarios within TM builds on the paradigm shift mentioned in the preceding one. The intended benefit of scenarios is that they stretch as well as focus people's thinking. The presumption is that scenarios on the one hand reduce overconfidence (Lichtenstein *et al.*, 1982) by making available to the mind futures not yet considered (Koriat *et al.*, 1980) as well as challenge those presumed likely (Mason and Mitroff, 1981). In this light, Ringland (2002) argues that the challenge for sustainable development is to understand and imagine the complexity of the future so that we are prepared for the unthinkable. Anchoring is an important psychological factor contributing to the above presumption. Scenarios can shift the anchor or basis from which people view the future, also called ''reframing'' (Berkhout *et al.*, 2002). For most people, the most typical mental anchor is the past and usually they do not adjust their thinking very far from this starting point. However, social learning processes and reflexivity can teach us that the past may be a highly misleading guide to the future (Gilovich, 1981), especially after major discontinuities have occurred such as tax changes, deregulation etc. On the other hand, the value of scenarios lies in the capacity to focus many individually held images. Without this clarity, scenarios cease to have a practical value for society, in the sense of providing a basis for the mobilization of collective action towards sustainable system innovations on the short term (Berkhout *et al.*, 2002). These two characteristics of scenarios – stretching and focusing – are more or less contradictory. Therefore, scenarios need to strike a balance between on the one hand representing a window of opportunities and on the other hand functional clarity and simplicity (Berkhout *et al.*, 2002).

## Transition scenarios

Foregoing paragraphs explained the concept of TM and clarified the use and function of scenario development within TM processes. Based on these insights, it is possible to condense process and content criteria of scenario methods that are required when assisting TM processes. This does not mean that we provide a completely developed methodology for transition scenarios – as this is still work in progress and something that needs further research – we simply point out the process and content criteria that characterize a scenario method instrumental for TM. Based on our literature review, we presuppose that these criteria are useful and necessary when developing transition scenarios. As will be seen later on, some of these requirements are new and distinctive for transition scenarios, some build on existing insights of scenario development in the (recent) past.

*Process – and content criteria of transition scenarios*

The process criteria of transition scenarios refer to cognitive and/or behavioral processes that need be encouraged during the participative engagement of scenario development. The content criteria refer to the characteristics of the contents of the actual transition scenarios.

*Process criteria of transition scenarios*

- It is an explicit purpose to onset a seek- and social learning process for exploring desirable future pathways towards sustainability and translating these into concrete experiments on an operational level. As a transition is surrounded by complexity and uncertainty, we need to stimulate an anticipative and adaptive attitude towards future complexity and changing circumstances in society.
- Generate a sense of urgency that convinces actors of the necessity of a structural change in the societal system. This should also encourage actors to feel free in generating innovative ideas for directions to sustainable solutions.
- Internalize a change in the mindset on a system level, meaning that actors need to start thinking in terms of the complexity of a transition and the associated consequences in time. Therefore, a long-term orientation is needed while being sensible for weak signals.
- Stretching while focusing, as already thoroughly explained in the foregoing paragraph.

*Content criteria of transition scenarios*

- The transition scenarios need to be as open as possible in exploring desirable pathways towards the future because we need to build in a reflexive attitude towards future complexity and uncertainties. Due to the fact that TM strives for sustainability, the explorative notion is guided by a normative framework of sustainability.
- In order to create a feeling among actors (in an arena) that they are working in concert towards future ambitions of sustainability, a transition scenario needs to be focused on a societal transition challenge. Therefore, persistent problems on the short-term need to be translated into sustainable ambitions on the long term.
- As transition scenarios are developed at a strategic level, they need to deal with the complexity and the dynamics of the whole system and not only a subsystem. Also, overarching transition concepts like i.e. multi-scale, co-evolution, modulation and scaling up need to be captured.
- Transition scenarios are instrumental in the TM-cycle. Therefore, besides being of value for the strategic level at which they are developed, they also need to be of value for the tactical and the operational level. This implies that the storylines, giving insight in the unfolding societal developments over a period of one or two generations, need to be the framework and orientation for short-term actions.
- The transition scenarios need to have a utopian character because when striving for a societal transition, we inherently strive for a structural change in a systems' structure, its processes and its culture. Therefore, when transition scenarios would result in optimization strategies we would have failed in realizing this structural change that we believe is necessary for reaching future sustainability. This implies that the future images in transition scenarios need to be derogative from our prevailing perception of reality, impossible to reach by sufficing with optimization strategies. However, in order to bring about long-term commitment, the current perceived reality of actors needs to be captured. Therefore, the transition trajectories which lead to the images need to be based on informed imagination.
- Finally the storylines need to be integral, consistent and coherent. Integral, meaning that the storylines describe complex patterns that emerge from the dynamics yielded by mutual action-reaction patterns. Consistent, meaning that the elements of the storyline build progressively on one another and are not contradictory. Coherent, meaning that all the parts of the transition scenario fit well together and form a united whole.

In order to retrieve the distinctiveness of these criteria, and thus the need for innovations/specifications in existing scenario practices when used for facilitating TM, it is useful to first give a state-of-the-art of scenarios.

## Scenarios

### *State-of-the-art*

Research on the future has heterogeneous traditions and strands, including scenario planning, ''La prospective'' and strategic management. It did not develop in a linear way but has been influenced by a number of schools – the RAND Corporation, Stanford Research Institute (now called SRI International), Shell, SEMA Metra Consulting Group, and many others (van der Heijden, 2005). This intellectual history of futures research is complex but basic stages can be recapitulated based on societal developments in the world (Schoemaker, 1993).

In its broadest sense, scenario thinking is as old as prospective story telling. However, as a tool for future thinking, its formal roots trace back half a century, to early systems thinking in the 1940s and the use of computer simulation in the Manhattan project. In 1942, atomic physicists such as Lawrence, Oppenheimer, Teller and Compton were unsure whether a full-scale explosion of the atom bomb might literally ignite the skies (Davis, 1968, cited in Schoemaker, 1993). Computer simulations were used to estimate probabilities of the atmosphere and the planet catching fire. The subsequent flourishing of scenarios seems to reflect three relatively independent research strands. First, the development of computers enabled simulated solutions for otherwise intractable problems. Second, game theory (von Neumann and Morgenstern, 1947, cited in Schoemaker, 1993) provided a rich theoretical structure for the study of social interaction and conflict (Dresher, 1961; Shubik, 1964, cited in Schoemaker, 1993). Third, the post-war defense needs of the USA required war games in which humans and machines interacted. The RAND Corporation played a central role in bringing these strands together for military purposes (Kahn and Mann, 1957, cited in Schoemaker, 1993). Kahn and Wiener (1967), who were part of the RAND Corporation, explored possible consequences of nuclear proliferation, defining scenarios as ''hypothetical sequences of events constructed with the purpose of focusing attention on causal processes and decision points''. More specifically, Herman Kahn coined the term ''scenario'' when he introduced his technique of ''future-now thinking''. This resulted in his famous book *The Year 2000* which combined detailed analysis with the use of the imagination to produce a report that people living in the future might have written (Berkhout *et al.*, 2002; van Notten, 2005). Kahn reasoned that imagination had always been integral to the contemplation of the future, and that scenarios were a way of stimulating and disciplining imaginative thinking (van Notten, 2005).

### *First generation of scenarios*

Influenced by Kahn and Wiener, the first generation of scenarios can be traced back to the 1950s and 1960s when Western countries faced the prospect of uninterrupted economic growth, structural transformation of the economy accompanied by rapid urbanization and a strong consensus to develop the welfare state. A major focus in these scenarios was technological and economic forecasting using hard methods, i.e. trend extrapolation, cross-impact analysis, simulation and technological forecasting models (Khakee, 1999), leading to feasible and relatively surprise-free futures. Scenarios were not more than statistical predictions of end state descriptions (Schoemaker, 1993) whereby probability distributions of possible future outcomes were estimated to improve the quality of decision-making (Ringland, 2002). The break in the economic growth trend, following the oil crisis in 1973, came as a shock and resulted in a loss of faith in trend extrapolations and other economic and technological forecasting approaches which dominated the planning practice at that time (Khakee, 1999). Also, due to the lack of integration between scientific knowledge and intuitive knowledge (Khakee, 1999), long-term forecasting has increasingly become discredited because more often than not predictions have proven to be incorrect (Berkhout *et al.*, 2002). Scenarios tended either to overestimate the potential of modern technology and the pace of change (Kahn and Wiener, 1967) or to underestimate the role of

technology and adaptive behavior by people, organizations and societies (Cole *et al.*, 1973; Meadows *et al.*, 1972). These studies also overstated the reliability of their predictions.

*Second generation of scenarios*

The 1970s saw a second wave of interest in scenario planning, especially in corporate strategic planning. The traumatic effect of the ''oil crisis'' in 1973 drew attention to the possibility for major unexpected changes in the international economic system (Godet, 1987). The new climate reinforced a shift from forecasting approaches to exploratory and prospective approaches that provided a mechanism for searching for potential discontinuities (Berkhout *et al.*, 2002). These more recent approaches recognize that the future cannot be extrapolated through data and relationships of the past, because drivers of change in social systems are not only multiple but also interact in different ways and at different speed. Although change in social and economic systems is often ''directional'', path-dependent or ''locked in'', novelty and surprise are also inescapable features (Dosi, 1984; Nelson and Winter, 1982; North, 1990).

In the early 1970s, Ian Wilson at GE, Pierre Wack at Shell and Peter Schwarz at SRI International redefined scenarios as descriptions of future conditions rather than accounts of how events might unfold. From then on, scenarios offered a set of distinct alternative futures to emphasize that the business environment was uncertain and could evolve in totally different ways (Millett, 2003). Scenarios were not mere end state description, but they especially highlighted dynamic interactions. Furthermore, they aimed to reflect a variety of viewpoints so as to cover a broad range of future possibilities (Wack, 1985a, b). Note that scenarios, in this sense, do not focus on single line forecasting nor on fully estimating probability distributions, but rather on bounding and better understanding future uncertainties. This treatment of uncertainty is quite different from more traditional methods which usually present one model, with uncertainty nested within it (de Geus, 1988). The scenario methods popularized by GE, Shell and SRI International emphasize creativity and imagination. The practitioners of this method assert that a discontinuous future cannot be reliably forecasted, but can be imagined and ''lived in'' as a means of learning from it. Following this development, a shift can be seen from building scenarios for best estimates to using them for measures of dispersion (Ringland, 2002).

Despite the fact that both streams of scenarios were meant for strategic planning, no evaluation is available of how the results of the scenarios influenced decision-making. Generally, few efforts were made to link scenarios to policy making by means of specific strategies (Millett, 2003). This problematic relationship between long-term scenarios and short-term action was supposed to improve in the upcoming years.

*Third generation of scenarios*

After the Brundtland Report (WCED, 1987) and the Earth Summit in 1992, a third wave of global scenarios was launched in the context of the sustainability challenge. The attention for sustainability is encouraged by the fear that humanity will not find a path to a desirable form of global development (Raskin *et al.*, 2002). From then on long-term, complex and uncertain processes in society would no longer be seen as an inescapable fact-of-life, to be understood in retrospect rather that be controlled pro-actively. Policy makers are not detached and clinical observers of change (Bruggink, 2005), they are capable of shaping their futures and of acting reflexively in response to new knowledge about what the future may hold.

Based on this belief, Inayatullah (2002) assumes that in the upcoming years future studies will evolve through changes in several areas. The first factor shaping the future of the field is the move from single point forecasting (accurate and precise predictions) to scenario planning (alternative futures) to foresight (institutional capacity building) to creating a future-oriented and learning society. With the increased rapidity of change as well as epistemological debates about the nature of knowing, living with uncertain futures instead of creating a certain world has become far more important. Associated models favor participatory, interactive, knowledge and transcendent-based associations. This new perspective is concerned with using the future to create people that are reflexive of how

current policy decisions impact future generations and how the conscious and unconscious image of the future guides the organization. Basically, this perspective is oriented towards action learning, seeking to question the future and asking questions of preferred, probable and possible futures at all levels. The second factor shaping the future is the move from reductionism to accepting complexity. It requires accepting that there are many factors that explain change and that there will always be some unknown factors. Complexity also assumes that the novel may emerge in our scenario studies. Our findings must therefore be open ended and ready to be discarded if a new or multiple paradigm(s) provide(s) more elegant, informative and explanatory insights. Finally, complexity includes emergence, that is, the new can emerge from the old. This helps to account for wildcards. Favoured methods used in accepting complexity in future studies are environmental futures scanning processes and incorporating insights that come from arenas outside official power – not just political power but official formulations of what is normal, what is sane, what is conventional or acceptable reality. Third, there will be a return to long-term research. Macro thinking and explaining the big picture remains the elusive grail of futures studies. While some argue for the new story, others believe that traditional worldviews – critically modernized – already offer the big picture of who we are, where we are going to and what is important in the long-term. The central feature of macro thinking is that there are generally grand patterns of social change. While there are discontinuities, the past and future as a whole is patterned, even if the ''laws'' are soft. Finally, scenario development will become more and more concerned with moral futures. This means that scenarios of the future cannot just be idealized pictures of the future without taking into account who are the losers of any particular future as well as who is privileged to create particular futures. However, this latter move in futures studies is not a done deal.

## Positioning transition scenarios in a typology

By the time the sustainability challenge was introduced in scenario development processes, the application of scenario practice had become very diverse, fragmented and widespread. We will use the scenario typology of van Notten (2005) to give an impression of the various scenario methods that were, and still are, in use in this third generation. More important, we will use this typology to position transition scenarios, leading to insights about their distinctiveness. Based on this we will draw lessons on the required innovations or specifications in third generation scenario processes when dealing with TM processes. The typology of van Notten (2005) is adequate in doing this, because it captures the widely differing understandings of contemporary practice. This in contrast to most scenario and foresight typologies, i.e. Amara (1981), Masini (1993), Mannermaa (1986), Inayatullah (1990), Tapio and Hietanen (2002), that focus on particular aspects of scenario development.

### *The distinctiveness of transition scenarios*

The scenario typology gives an overview of current scenario practice through a comparative review of approximately 100 studies carried out since 1985 (van Notten, 2005). The studies were conducted in a variety of contexts, including businesses such as the British Airways and KPMG; ''inter-company'' cooperative efforts such as the Dutch Management Association (NIVE) and the World Business Council for Sustainable Development (WBCSD); governmental organizations such as the Rotterdam port authority; broad based participatory efforts such as those in South Africa and Colombia; and academic settings such as the Intergovernmental Panel on Climate Change (IPCC) and the VISIONS project. The studies covered a variety of topics, including transport, telecom, nutrition, gender equality, labour market, climate change and leadership (van Notten, 2005). The typology proceeds from three main characteristics comprising central aspects of scenario development:

1. the project goal;
2. the process design; and
3. the scenario content.

Each of those three characteristics can be divided in three sub dimensions, and each sub dimension on its turn consists of a continuum with two poles (see Figure 1). For a more in

**Figure 1** Transition scenarios positioned within the scenario typology of van Notten

| | | | | | | |
|---|---|---|---|---|---|---|
| Goal | *Function* | Process | | | | Content |
| | *Inclusion of norms* | Explorative | | | | Normative |
| | *Subject* | Area/Issue | | | | Institution |
| Process design | *Input* | Qualitative | | | | Quantitative |
| | *Method* | Participatory | | | | Model |
| | *Group composition* | Inclusive | | | | Exclusive |
| Content | *Temporal nature* | Chain | | | | Snapshot |
| | *Factors* | Heterogeneous | | | | Homogeneous |
| | *Interaction* | Integrated | | | | Isolated |

**Source:** van Notten (2005)

depth description of the scenario typology of van Notten (2005), we refer to his book *Writing on the Wall*.

The shaded boxes in the figure represent the desired characteristics of transition scenarios. These can all be inferred from the foregoing sections. The transition scenarios are not positioned within this matrix with the purpose of exhaustively analyzing these scenarios in light of the state-of-the-art. As we are trying to determine the distinctive character of transition scenarios, the focus in this paragraph will be on illuminating those characteristics that conceal the potential for innovation en existing scenario methods. Therefore, a more elaborate description will be given of the hybrid characteristics of transition scenarios, those that cannot be univocal allocated to the matrix. In this respect, the goal of the scenario in relation to its function and normativity receive attention. In discussing this, we will follow on the introduction, in which the relevance of embedding scenarios in a broader trajectory was addressed.

Until now, most scenario applications have been carried out in isolation, serving the goal of policy making. Therefore, they have a strong orientation towards content aspects of a scenario that are of relevance for short-term strategies (Berkhout and Hertin, 2002; van der Heijden, 2005; Schwartz, 2005; Ringland, 2002). Transition scenarios on the other hand also serve a process function as they are embedded in a TM trajectory. Herein, transition scenarios evolve from the first stage of the TM-cycle in which the borders of the system are explored, persistent problems are structured and conditions for sustainable visions are set. Transition scenarios build on and refine this knowledge by developing these further into concrete storylines on a system level. The resulting transition scenarios provide direction and focus for further stages in the TM-cycle by identifying sub themes that can be developed into transition pathways on a tactical level, eventually leading to experiments on an operational level. Thus, within scenario development, the process of seeking, learning and experimenting is at least as important as the product. For this reason, we propose that in the future more attention has to be paid to process related aspects of scenario development.

With regard to the inclusion of norms, transition scenarios distinguish themselves from the majority of scenarios in that they are explorative and normative at the same time. Berkhout and Hertin (2002) give us reason to believe that explorative and normative approaches act under different assumptions and therefore cannot be used in combination when developing a scenario. First of all, a normative approach is based on subjectivity, expressing preferences and adding a positive or negative connotation to a scenario. An explorative scenario in the other hand needs to be as objective as possible in order to map a possibility space and inform decisions of the present. Also, a normative approach presupposes that the future is not only a continuation of past relationships and dynamics but also can be

shaped by human choice and action while explorative approaches take past trends as their starting point (Dreborg, 1996, cited in Berkhout and Hertin, 2002). Transition scenarios combine these two approaches in that they map a possibility space (explorative) within the boundaries of long-term sustainability (normative).

*Transition-specific properties*

Based on Figure 1 and the foregoing about the hybrid characteristics of transition scenarios, we come to the conclusion that current scenario methods are still the basis for the development of transition scenarios. This because there is a strong resemblance between the theoretical claims of the second and third generation of scenarios and our criteria of transition scenarios. However, due to the fact that most of their claims have never fully been realized in practice, there is still a lot of work to do, i.e. in relation to the goal of a scenario, transition scenarios could not be univocally allocated to the typology of van Notten (2005), therefore new combinations in already existing characteristics of current scenario use are required. On top of that, we can extract some transition specific characteristics that are not part of the typology of van Notten (2005). Here lies the potential for innovation in existing methods.

First of all, transition scenarios are focused on a societal transition challenge. The TM-cycle starts off with defining and marking the system that is of relevance for reaching future sustainability. Based on these insights, persistent problems are identified and related consequences are anticipated. To acquire an orientation that is directed towards future sustainability and create a sense of urgency for tackling the problems at hand, a transition challenge is formulated. When developing a transition challenge, persistent problems on the short-term are transformed in desirable future states of the system on the long-term. This process is also called ''transitioning''. In doing this, the context for deliberation is more or less the same but more future oriented. By shifting the accent from problem solving to goal seeking and from negative problems on the short-term to positive ambitions on the long-term, a sense of urgency and a process of reframing are stimulated.

Second, transition scenarios take the system level as a main point for describing the dynamics of a transition over a period of one or two generations. This approach is in line with the recognition of Agenda 21, in which the need for a systemic approach was explicitly expressed (Raskin *et al.*, 2002). Normally, a drawback of describing the system as a whole is that the level of detail is rather limited. Also, the further one reaches into the future, the more abstract and the less certain it becomes, the less guidance it can offer for concrete short-term strategies. However, these challenges are faced by embedding scenario development in the TM-cycle. The transition scenarios are developed at a strategical level but continue throughout the TM-cycle to be the framework within which transition pathways on a tactical level are developed and experiments on an operational level are identified. In this sense, transition scenarios become more and more refined when passing through the different phases of the TM-cycle, therefore being able to offer guidance for short-term strategies.

## Conclusions and recommendations

Before we reach conclusions and provide some recommendations for further research, we want to start off with an image of scenario practice that troubles us and needs more attention in the future. This as a run-up to our final conclusions and recommendations.

What is most problematic in our view is that theoretical claims are not a guarantee for accurate translation into scenario practice, i.e. in theory, scenario development is in fact a way to consider future discontinuity. Berkhout (2005) argues that, ''scenarios provide a response to the problems of discontinuity''. However, this theoretical promise might not be reflected in scenario practice (van Notten, 2005). A comparative study of scenarios developed in the 1990s concluded that many scenarios have a business as usual character and assume that current conditions will persist for decades (Greeuw *et al.*, 2000). This criticism is common. Bruun *et al.* (2002) argue that the overwhelming majority of scenarios can be characterized as conventional and trend based. Similarly, Marien (2002) claims that scenario studies often ignore the wild carts of low possibility. Brooks (1986, p. 326 cited in van Notten, 2005) argues that the problem is not that analysts have been unaware of the short-comings of surprise free thinking, but rather that they lack usable methodologies to

deal with discontinuities and random events. Crisis management literature has repeatedly noted the fact that ''long before its actual occurrence, a crisis sends off a repeated and persistent trail of early warning signals'' (Mitroff, 1988, cited in Mendonça *et al.*, 2004). The challenge is to assemble the myriad pieces of information into a meaningful mosaic. If we neither take time to look at them nor consider how they might be anticipated, they are guaranteed to catch us off our guard. Only in retrospection it becomes evident that even those ''all of a sudden'' appearing discontinuities are preceded by so-called ''weak signals''. These signals appear first in less plausible alternatives to current mental models but could have been perceived in the run-up with adequate sensibility (Fink *et al.*, 2004).

The underlying message of this example is that under conditions of higher uncertainty and complexity, the authority of formal methods and experts tends to decline. Many practitioners today argue that a balance of methods is desirable and that efforts should be made to establish better links between them (Fontela, 2000: Greeuw *et al.*, 2000, cited in Berkhout and Hertin, 2002). This argument is common. Mannermaa (2000) argues that we need new methods for understanding our world deeply enough to make well-argued scenarios of the future. In line with this reasoning, the next great challenge in Millett's (2003) opinion is to stimulate synthesis in existing definitions and methods of scenarios into a new composite approach. He believes that scenario methods are ready to evolve to the next level of development. Scenario methods have been practiced for more than 30 years with many marginal improvements but no radical revision. Millett (2003) argues that the next generation of scenario tools should not only combine previous methods, but also actually blend them into a more comprehensive methodology.

### *Conclusions*

Returning to the points of view presented in this article while proceeding on the above discussion, the positioning of transition scenarios within the scenario typology of van Notten (2005) led to the insight that although transition scenarios have their basis in the prevailing scenario methods, univocal allocation was not possible with regard to the goal-oriented characteristics. Therefore transition scenarios can be characterized as a hybrid form of scenario use, combining process and product functions while having both an explorative and a normative orientation. Besides these differences, transition scenarios also contain a few innovative characteristics that cannot be retrieved from the typology of van Notten (2005), i.e. the focus on a societal transition challenge, the description of transition dynamics at a system level, and the very long-term as an orientation for the short-term. Against this background, we plead for a synthesis in existing scenario methods, consisting of new combinations in prevailing scenario methods and innovations in existing methods.

### *Recommendations*

Although we have addressed the need for a synthesis in existing scenario methods, we still face the challenge of providing clear-cut answers. In trying to integrate scenario development processes within TM processes, we stand at the beginning of exploring a new research area. In line with the challenge we face, a few recommendations for further research can be made.

First of all, although the relevance for scenario development within TM has been addressed, research about scenario development within the context of TM has been poor. Further systemic thought in this field is needed in order to get a clear and robust picture of the requirements of transition scenarios, not only in theory but also in practice. This article is a first establishment of the theoretical interpretation of criteria for transition scenarios. Second, more attention needs to be paid to the process aspects of scenario development. While the overwhelming scenario applications have been directed at content aspects of policy making, transition scenarios are more bilateral in that they also serve the process of TM at several scale levels. Research about the embedding of scenario development within the TM-cycle is therefore important. Finally, when the theoretical and practical knowledge base of transition scenarios is well considered and implications for embedding have been contemplated, methods for the development of transition scenarios can be derived.

## Notes

1. Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment. Agenda 21 is adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992.
2. Informal name for the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992.

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