Governance for Sustainability Through Transition Management

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by

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Abstract

The paper discusses the concept of "Transition management" that has been adopted by Dutch policy makers for working towards sustainability. The purpose of the paper is threefold: First, to describe the conceptual model of transition management. Second, to examine how the concept sits with concepts of comprehensive planning, adaptive governance, interactive governance, and multilevel governance from policy science, something that has not been done so far. And third, to describe and discuss policies for transition management undertaken by the Dutch Ministry of Economic Affairs. Whilst practical details of transition management as goal-oriented incrementalism still need to be worked out the model is an interesting model of governance, employing an integrative and multi-scale framework for policy deliberation, choice of instruments, and actions by individuals, private and public organizations, helping society to escape lock-in while avoiding new evolutionary traps.

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1. Introduction

In 2001, 5 Dutch ministries adopted the new governance approach of transition management, which was presented in the fourth National Environmental Policy Plan (NMP4).[2] The NMP4 constituted a discontinuity in Dutch environmental policy plans by looking 30 years into the future (instead of 4 years) and by taking stock of what had been achieved the past 30 years. It also looked different: It was a very colourful report of an unusual size (30 x 30 cm), with oddly-sized photos of plants, landscapes, and people from different countries spread over the pages, and the use of coloured rectangles in the text. The title "A world and a will"(Een wereld en een wil), highlighted the worldwide focus and emphasized determination and will-fullness.[3] A central message of the NMP4 is that policy has not been futile but that a different approach was needed, one that was more long-term, more integrated and innovation-oriented. To deal with problems of sustainability, transitions were needed.

In the Netherlands, the concept of sustainable development and transition did not play an important role in policy decisions up until recently. Why then did Dutch authorities embark on sustainability transition policies where other countries didn't? The explanation is not easy to give. It certainly has to do with the forward-looking nature of policy and planning tradition in the Netherlands.[4] The Netherlands was the first country to introduce a comprehensive national environmental policy plan in 1989. The plan set the course for environmental policy until the year 2010 (a. o. emission reduction, energy use, waste management) and outlined the strategy, goals and policies for the 1990-1994 period. The overall aim of the plan was to foster sustainable development in the Netherlands but the focus was on environmental issues. The plan was the joint responsibility of 4 ministries: Environment[5], Economic Affairs, Agriculture, Transport and Water.

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[2] Ministry of Housing, Spatial Planning and the Environment (co-ordination), Ministry of Agriculture (sustainable agriculture), Ministry of Foreign Affairs/Development Aid (Biodiversity and natural resources), Ministry of Transport, Public Works and Water Management (sustainable mobility), Ministry of Economic Affairs (sustainable energy).

[3] Frans Vollenbroek, member of KETI, one of the groups that supported the NMP4 team, talked about *homo volens.*

[4] A good description of the evolution of Dutch environmental policy in the 1970-2000 period is given by Grin et al. (2002) and by Keijzers (2000), the former head of strategic planning of the Environment Directorate of the Ministry of Housing, Physical Planning and Environment (VROM). According to Keijzers three important lessons were learned after the first NMP: the need to integrate environmental issues into regulator policies of stakeholders (*external integration*), the need to integrate various environmental policies (*internal integration*), better procedures for enforcement. In the 1990s they engaged in a different type of policy making by engaging stakeholders not only in formulating implementation plans, but also in defining environmental targets, taking account economic and other issues (Keijzers, 2000: 189). One tried to super-optimise environmental goals with other goals, through a target group approach (doelgroepenbenadering). The Ministry was taking a broader look on environmental management, which "should not only be about reducing pollution [but] … should be about proper management of natural resource stocks, seeking an open discussion and consideration of all interests and risks."(Keijzers, 2000: 190). The NMP4 aiming for sustainability transitions is predicated on these views. In the views of (Grin et al (2002) the fourth NMP is an example of what they call the third generation of environmental policy, in which the Netherlands left the approach of the NMP1 of selfregulation within boundaries which belonged to the second generation of environmental policy.

[5] Environment is a Directorate of the Ministry of Housing, Physical Planning and Environment (VROM).

The first environmental policy plan (NMP1) of 1989 was followed by the NMP-plus one year later, the NMP2 in 1993, and the NMP3 in 1998. After the third NMP, Dutch authorities decided to look further into the future (30 years ahead) while also looking back at what had been achieved through 30 years of environmental policy (during the 1970-2000 period). It was concluded that several successes were achieved: the quality of surface water had improved considerably, several emissions to air (not all) had fallen leading to an improvement of air quality, waste management had been upgraded (80 % of the waste is now reused), and the use of several harmful pesticides and other persistent substances had been phased out. Nuisance from noise was constant despite the growth of road traffic and a start had been made with cleaning polluted soils. In many areas environmental pressure had been reduced despite the growth in GDP.

Trends were not reassuring in all areas and there were several types of risks—even some we do not know yet. There remained big structural problems for the future, some of which were global problems. These problems were not perceived as acute but were considered to pose a risk or, given present trends, were expected to become pressing in the future, therefore requiring policy attention. The problems were generally of a different nature, and difficult to address. It was argued that the problems required a different policy approach: a long-term, integrated approach addressing problems of uncertainty, complexity, and interdependence. The problems were seen as intrinsic to fundamental system design aspects instead of related to particular technologies, which meant that the resolution of the problems required quite fundamental changes in underlying systems of production and consumption. They required what was called "system innovation", a concept coming from people working on innovation issues (NRLO, 1999) and adopted by Dutch policy makers under the overarching term 'transition management'.

One of the ministries that adopted transition management was the Ministry of Economic Affairs (responsible for industry and energy). This ministry has been very active since 2001 in developing transition policies for the transition to a sustainable energy-supply system in 2050 (see: www.energietransitie.nl). In 2001, the Ministry of Economic Affairs started consulting various stakeholders (companies, researchers, NGO's) to assess whether they saw possibilities for the transition, and if so, what these chances were. Based on these conversations and an intensive scenario-study, they selected five 'robust elements' or subprojects in the transition to a sustainable energy-system, with a time-horizon of 2030:
- Biomass International
- New Gas Services
- Sustainable Industrial Production
- Toward a Sustainable Rijnmond
- Policy Renewal

In 2002, the Ministry started the Project Implementation Transition management (PIT) that had to investigate whether the selected subprojects would meet enough support, enthusiasm and commitment from the relevant stakeholders to create a climate in which they would be willing and able to work together. The project was initially financed with 35 million euros and supported by an 8-person staff. Main conclusions from this phase were that the transition-approach proved to be appealing to the majority of the stakeholders and they would be willing to invest (time and

money) and commit themselves to such a process under the condition that the transition management approach would be made more concrete and the government would support it both financially as well as process-wise. In addition, some actors indicated that some of the necessary means and competences to participate in transition management were lacking (such as personnel, knowledge etc.). Also, some of the necessary preconditions seemed missing, such as commitment, predictability and reliability of government policy and room for experiment (also regarding rules and legislation). The government was asked to provide these means in order to create a level playing field in the transition arena (or as much as possible).

Based on these findings, the green light was given for implementation of phase 2 in 2003. The objectives of this phase were to develop a long-term vision on energy in general and for each of the subprojects, supported by all relevant actors, to have these actors committed to the process, to map the barriers and necessary preconditions for the transition, to set up plans for knowledge-development and –sharing and communication, to chart international developments and finally to develop transition-experiments. At the end of 2003, these steps should have been taken so that from 2004 on, the transition experiments could be carried out. In order to meet all these demands, a specific process was developed and set up for each selected subproject.

2. The need for transition management

According to the NMP4, there remained seven big environmental problems society (the term used is "we") has been unable to handle, despite the fact that they are known for some time and are widely acknowledged (nationally and internationally) as serious problems. These problems were: loss of biodiversity, climate change, depletion and overexploitation of natural resources, public health threats, nuisances impairing liveability, external safety, and future risks. About these seven identified environmental problems, the paper says that they are system inherent 'weaving faults' and that the solution lies in creating different systems or transforming existing ones. The challenge is to bring about a transition from present functional systems towards more sustainable systems. Glasbergen (2002) says about the plan that unlike past plans, sustainability issues are now societally situated, bringing into focus the issue of how complex societal processes can lead to sustainable development.

The plan identifies 7 barriers to sustainability. These are:
1. Unequal distribution: poverty causing irresponsible environmental management
2. Short-term thinking (in politics and business)
3. Fragmented policies and institutional deficits
4. Prices do not reflect external costs of environmental degradation
5. Actors causing problems do not own the problem (they are not responsible for the solution of those problems)
6. Solutions involving system changes are surrounded with great uncertainty
7. Insufficient precaution

The first barrier is related to underdevelopment outside the Netherlands. It is not a concern for environmental policy in the Netherlands (there is a link with climate change policy we will not explore here). Arguably the most interesting barrier is barrier 6: solutions involving system changes are surrounded with great uncertainty.

This is believed to be the most interesting barrier of the list because the other five of the barriers to sustainability in the Netherlands—of short term thinking, fragmented policies, prices not speaking the environmental truth, problem ownership resting with the government rather than with business, and too little precaution—are all not new.

The identification of the 6th barrier is evidence that government started to think about system innovation as a solution. This reflects a change in policy thinking. Whereas past policy was concerned with an upgrading of functional systems such as energy, transport and various product chains through the use of technology (technical fixes), now the systems themselves are seen in need of change. It is an example of policy learning, which occurred first within VROM (the Ministry responsible for the environment) and the Agriculture Ministry, and later spread to other ministries: The Ministry of Economic Affairs and Ministry of Transport and Water—Ministries who remain skeptical to the whole idea of instigating system change for the sake of sustainability but who were giving it attention.

System innovation, meaning a fundamental change in functional systems and product chains, thus became a policy option, besides system improvement. It fitted with the idea of co-optimizing economy and environment, an idea that already penetrated people's mind and was the topic of the government green paper "Environment and Economy" which came out in 1997.[6] Policy became thus more concerned with development paths, which constituted a shift in thinking. The co-optimization through system innovation raised a number of fundamental questions regarding coordination and governance. It brought attention to transformation processes and the governability of such processes. Thinking about these issues did not start with the NMP4. Prior to the NMP4 there had been internal discussions on the topic of knowledge, technology and governance. A unique research programme for technological solutions, the DTO programme had been instituted in 1993, followed by EET in 1995.[7] DTO was an interdepartmental research programme for sustainable technologies offering factor 20 benefits, which ran from 1993-1997. From the programme it became clear that such technologies required changes in culture and structure. A knowledge dissemination programme DTO-KOV followed it but did this not address the root problems.

In 1997 the task group Technology was established to facilitate further interdepartemental co-operation on the issue of technology and environmental policy. It seems that this task group played an important role in the discussion of system innovation issues, but further research is needed to ascertain this. The task group was involved in the NMP4, operating under a new name, KETI, the working group Knowledge and Technological Innovation (KETI) looking not just at technology but also knowledge and innovation and also looking at governance issues. It is of note that the people involved in this group were not bonded by departmental rules, they were acting as free individuals. The working group was not used as a platform for

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[6] According to Weale, Wallance, Gouldson and Murphy, the Dutch government had adopted the notion of ecological modernization. Interestingly, however, whilst Dutch environmental policies that are in line with ecological modernization, such as the attention given to prevention and clean technology instead of end-of-pipe technology, the notion itself is seldom use in government publications.

[7] The EET-programme is aimed at developing technologies with substantial environmental benefits and is mainly concerned with major projects. The average size of these technology-development projects is 3,6 million euro. The total amount of subsidy granted for the period 1995-2001 was 240 million euro.

interdepartmental negotiations, which probably facilitated its functioning as a think thank within the government.

In December 1999, KETI organized a workshop about transitions, with innovation experts and social and cultural scientists (but curiously no political scientists). The central questions of the workshop were: what kind of new policy is needed for transitions and what kind of knowledge is needed for transitions? The workshop focused on steering models, the roles for government and to a lesser extent on instruments and knowledge.

The notion of transition and possibilities for transition management were further explored in two studies. The first study titled "Transitions: can three people change the world" was by Twynstra Gudde Management, STORRM and Hötte Milieu Management. First and principal author was Harry ten Riele from STORRM, an engineer specialized in societal change issues. The study defined the transition concept and argued that society could be governed, and that one should look for levers, to be identified through causality analysis looking at causality loops. The report was based on a flux model. It did not openly say that three persons can bring about a transition but indeed offered a suggestion to that effect.

The second study, commissioned by the NMP4 team, was a study by ICIS and MERIT, two Maastricht University research institutes.[8] Jan Rotmans director of ICIS and René Kemp researcher at MERIT were asked to further investigate the notion of a transition and examine the possibilities for transition management. Both Rotmans and Kemp had done some work on transitions issues but from a different perspective. Rotmans, a professor of Integrative Assessment, had been involved in climate change assessments, holding a great expertise in dynamic system models. René Kemp, an economist, had worked on innovation and environmental policy issues. With a group of Norwegian historians and innovation experts from PREST in Manchester he had studied the issue of system innovation in a project for the EU called "Technology and the Transition to Environmental Stability", and was the co-leader of a EU project analysing experiments with sustainable transport called "Strategic Niche Management as a tool for Transition to a Sustainable Transport System".

It is hard to tell which study was most important. If we look at the NMP4 it seems that the second study was the most important as the wording of the NMP4 stayed very close to what had been written in the report. According to the NMP4: "To solve the big environmental problems we need system innovation which may take various forms. The [system] innovation may take the form of a societal transformation process that may take one generation or more. For the transformation to happen, economic, social-cultural and institutional changes are needed that reinforce each other. (…) New parties and innovative technologies play an important role. It is not a matter for the government alone but for the whole of society (…) management of transitions requires a form of process management in which uncertainty, complexity and interdependencies are addressed. (NMP4, p. 107)". Most of this was this taken from the ICIS-MERIT report. The NMP4 also borrowed from the ICIS-MERIT report that management of transitions requires the following things:

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[8] The project team consisted of Jan Rotmans, Marjolein van Asselt, Kirsten Molendijk (ICIS), René Kemp (MERIT), Frank Geels (Twente University), and Geert Verbong (Technical University Eindhoven).

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

The almost verbatim use of sections of the ICIS-MERIT report was not accidental. There has been a close interaction between the NMP4 team and the writers of the report. In the 4-month period of the study, the authors of the report met 5 times with the interdepartmental group of the NMP4, and once with a bigger group of people from the ministries, to discuss the notion of transition and the possibilities for transition management. It was an example of government-science cooperation, in which the researchers also had a process role to play. VROM deliberately asked them to do this. They were not told what to write nor were they asked to change what they had written. The interaction helped to create support for the idea of transition management that through internal discussions within the team and with the NMP4 group, gradually took shape.

Neither the NMP4 nor the report of Rotmans et al. (2000) was based on a systematic study of various policy approaches to deal with problems of system failure. The NMP4 was based on the policy diagnosis that a new type of policy was needed for problems requiring system innovation (Glasbergen, 2002). It is unclear where that diagnosis came from. It was not based on penetrating analysis. There is a need to explore the topic of management of transitions and issue of steering more deeply. In the following sections we will examine why in our view transition management is needed for system innovation and how the approach of transition management put forward by Rotmans et al. (2000, 2001) and elaborated in Kemp and Rotmans (2001, 2002) and Dirven et al. (2002) sits with policy theory and with theories of change management.

3. What is meant with transition and transition management?

Before we can answer this question it is necessary first to define the notion of transition. According to the NMP4 and the ICIS-MERIT report "a transition is a gradual process of societal change in which society or an important subsystem of society structurally changes" (Rotmans et al. 2000, p. 19). A transition is the result of the interplay of developments that sustain and reinforce each other. Transitions are not caused by single variables—a price change, policy act or a new technology—but are the result of developments in various domains which sustain each other: technology, economy, institutions, behaviour, culture, ecology, and images/paradigms (p. 20). The process of change in a transition is non-linear; slow change is followed by rapid change when things reinforce each other, which again is followed by slow change in the stabilisation stage.

Although transitions are characterised by non-linear behaviour, the process itself is a gradual one, typically spanning one or two generations (25-50 years).[9] The nature and speed of change differ in each of the transition stages:

- In the *predevelopment* phase there is very little visible change on the societal level but there is a lot of experimentation
- In the *take-off* phase the process of change gets under way and the state of the system begins to shift.
- In the *breakthrough* phase structural changes take place in a visible way through an accumulation of socio-cultural, economic, ecological and institutional changes that react to each other; during this phase, there are collective learning processes, diffusion and embedding processes.[10]
- In the *stabilisation* phase the speed of societal change decreases and a new dynamic equilibrium is reached.
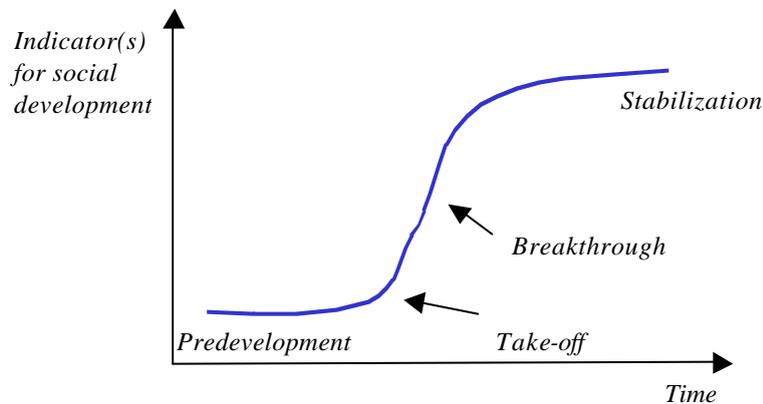

Figure 1: Four phases of transition (source: Rotmans, et al., 2000 and 2001**)**

A transition can be accelerated by one-time events, such as a war or large accident (e.g. Chernobyl) or a crisis (such as the oil crisis) but not be caused by such events. Transitions are the result of endogenous and exogenous developments: there are cross-over effects and autonomous developments. Technical change interacts with other changes, social change and cultural change, which means that one should look for process explanations (multiple causalities rather than individual causal patterns).
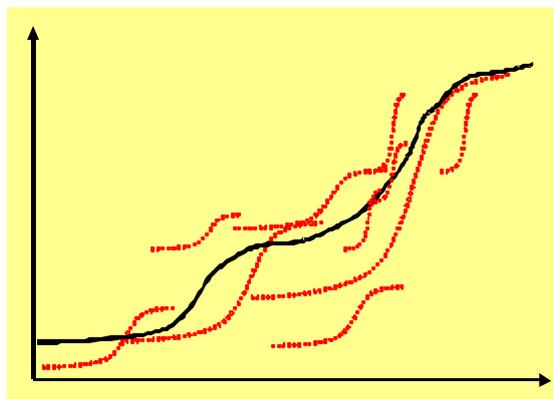

A transition

… is the shift from an initial dynamic equilibrium to a new dynamic equilibrium

… is characterised by fast and slow developments as a result of interacting processes of structural change

… involves innovation in an important part of a societal subsystem

Figure 2: A transition is the result of system innovations and other innovations and changes (source: Butter et al., 2002**)**

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[9] The time span is not a defining characteristic but a result.

[10] In Rotmans et al. (2000 and 2001) this phase is called the "acceleration phase".

Transitions are the result of system innovations and other changes. This is visualized in Figure 2.

Transitions are interesting from the viewpoint of sustainability because they offer the prospect of magnitude environmental benefits, alongside with wider social benefits through the development of systems that are *inherently* more environmentally benign. Examples of system innovation are: the hydrogen economy, industrial ecology and customised mobility.[11] So far the transition model is very abstract and ill-suited for policy or society. A refinement is needed for the purposes of policy. The refinement given was the multi-level perspective, coming from innovation studies (Rip and Kemp, 1998 and Geels, 2000 and 2002) and being used in the TIN project, describing the contextual history of technology in the Netherlands). The scheme distinguishes three levels: niches, regimes and the landscape that are influencing each other.

The first and arguably most important level is meso level of *regimes*. This refers to dominant practices, rules and technologies (and ensuing logic of appropriateness) that pertain in a domain, giving it stability and guiding decision making. We have technology regimes, production regimes, user regimes and policy regimes. The second level is that of *niches*, places in which new things are done and tested.[12] The niche may be a market niches or a niche created by a company (sponsoring a new technology) or government. The third level is the *landscape*, the overall setting in which processes of change occur. The landscape consists of the social values, policy beliefs, worldviews, political coalitions, built environment (factories, etc.), prices and costs, trade patterns and incomes. The term landscape refers to the sociotechnical lay of the land with its gradients, making certain advances easier to do.

Policy is thus situated in a context of sociotechnical systems offering functional services and disservices, housing interests and organisations with capabilities and mental models, who function in a world of beliefs, values, capital goods, prices, settlements, lifestyles and novelties.

Policy is thus not an external force. The crucial question for policy is of course whether it is possible to manage transitions. Can transitions be managed? From what we have said it may be clear that transitions cannot be managed in a controlling sense as transitions are the result of the interplay of many unlike processes, several of which are beyond the scope of control, such as cultural change that can be considered as a sort of autonomous process. What one *can* do, however, is influence the direction and speed of a transition and change the odds that a transition will occur. This can be done in many different ways, through various types of steering mechanisms.

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[11] Other examples of system innovation are: biomass-based chemistry, multiple sustainable land-use (the integration of the agricultural function with other functions in rural areas) and flexible, modular manufactured construction (Ashford et al., 2001).

[12] The place can be a geographic place or refer to a special kind of product or technology used by specialized users.

Transitions thus defy control but can be influenced.[13] They cannot be created *at will* by people or by central government, any less than large technical systems can be created by system builders. Assessing the evidence on this issue Joerges (1988, p. 26) finds that:

> Retrospective studies of LTS [Large Technical Systems] show that they never develop according to the designs and projections of dominant actors: LTS *evolve behind the backs of the system builders*, as it were. It has been shown, too … that typically none of the agencies contained in LTS manage to form a somewhat complete picture of their workings. LTS seem to surpass the capacity for reflexive action of actors responsible for operating, regulating, managing and redesigning them in ways, which, as social scientists, we understand poorly.

Transitions are best viewed as macro-outcomes of micro-decisions (cf. Schelling,) in a changing landscape that cannot be reduced to specific events and decisions. They result from the interplay of individual and collective decisions under collective structures (rule systems) in a heterogeneous sociotechnical landscape. There is thus a large amount of non-controllability of transitions. Still it may be useful to engage in transition management.

In doing transition management several things require special attention:
- One should be careful not to get locked into suboptimal solutions. This call for the use of markets for coordination and context control instead of planning. A second way of circumventing lock-in is by exploring different configurations through portfolio-management—a common strategy in finance to hedge risks. One should not bet on one horse but explore a wide variety of options both incremental and radical ones.
- One should embed transition policy into existing decision-making frameworks and legitimise transition management. Transition management should be politically accepted and a joint concern for different policy makers and society at large. Long-term goals chosen by society should guide policy besides short-term concerns.
- One should ascertain a dynamic mechanism of change, making sure that the process does not come to a halt because when positive results do not immediately materialize due to setbacks.
- One should engage in multi-level *coordination*: coordinate top-down policies with bottom-up initiatives (engage in vertical coordination besides horizontal coordination). Local experiments should inform national policies and there should be strategic experimentation for system innovation, two things that did not happen in the past. There should be more and better coordination between top-level policies and local policies and also between various horizontal policies. National policies should be coordinated with international policies because go-it-alone policies can be harmful unless there are clear first-mover advantages.

Transition management works with dynamics not against them. The basic steering philosophy is that of *goal-oriented modulation,* not dictatorship or planning-and-

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[13] Management is thus used in the sense of shaping, not in the sense of control (Palmer and Dunford, 2002).

control. Transition management, in the way described below, joins in with ongoing dynamics and facilitates and builds on bottom-up initiatives. Ongoing developments are exploited strategically. Transition management for sustainability tries to orient dynamics to sustainability goals. The goals are (often implicitly) chosen by society, not the functional systems: the systems to satisfy these goals are worked towards in an adaptive, forward-looking manner. The goals and policies to further the goals are constantly assessed and periodically adjusted in development rounds.[14] Policies will differ across the different transition phases. In early phases policy should concern itself is with the formulation of transition goals and engage in the formulation of sustainability visions (quality images), which are re-assessed during later phases. The attention to innovation will be a continued feature of all phases; it is not just something for the early phases.

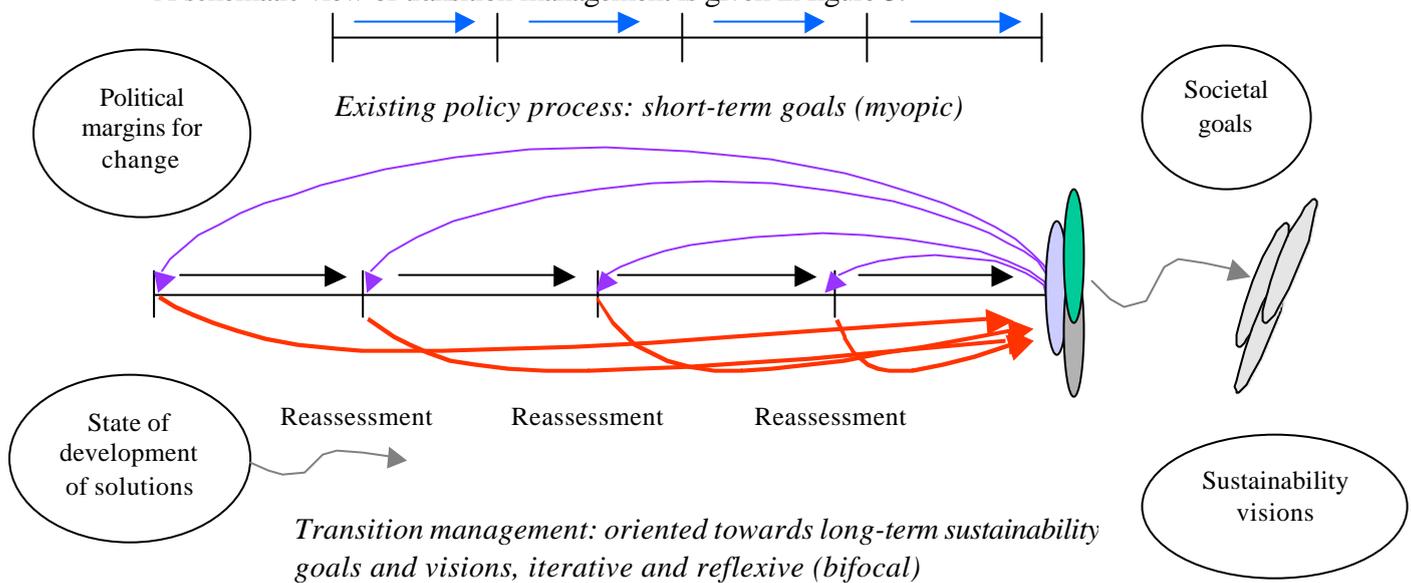A schematic view of transition management is given in figure 3.

Existing policy process: short-term goals (myopic)

Transition management: oriented towards long-term sustainability goals and visions, iterative and reflexive (bifocal)

Figure 3: Current policy versus transition management

Policy actions are evaluated against two types of criteria: 1) the immediate contribution to policy goals (for example in terms of kilotons of CO_2 reduction and reduced vulnerability through climate change adaptation measures), and 2) the contribution of the policies to the overall transition process. This means that under transition management policies have a *content goal* and a *process goal*. Learning, maintaining variety and institutional change are important policy aims and policy goals are used as means for change. The evaluation and adaptation of policies (strategies, involved actors, progress etc.) in development rounds brings flexibility to the process, without losing a long-term focus.

Transition management is thus *bifocal* and based on a *two-pronged* strategy. It is oriented towards both system improvement (improvement of an existing trajectory) and system innovation (representing a new trajectory of development or transformation). It breaks with the old planning-and-implementation model aimed at achieving particular outcomes and is based on a different, more process-oriented philosophy. This helps to deal with complexity and uncertainty in a constructive way.

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[14] The idea of development rounds comes from Teisman (2000).

Transition management is a form of process management against a set of goals chosen by society. Societies' problem-solving capabilities are mobilised and translated into a transition programme, which is legitimised through the political process.

The role of government differs per transition phase. For example, in the predevelopment stages there is a special need for social experimentation and creating support for a transition programme, the details of which should evolve with experience. In the acceleration phase there is a special need for controlling the side effects of large-scale application of new technologies. Throughout the entire transition the external costs of technologies (old and new ones) should be reflected in prices. This won't be easy: taxes are disliked by anyone who has to pay them. Perhaps it helps if they are introduced as part of a politically accepted transition endeavour, and when the revenues are used for funding the development of alternatives. Over all, transition management requires new roles and new modes of operation, especially for governments, that deal with the specific characteristics of transition processes. This means that a policy-transition towards a more flexible, participative and facilitating government is necessary.

Transition management should not be seen as constituting a radical break with past policy. In a sense, it builds on a tradition in the Netherlands of involving stakeholders and using deliberation and debate as means to develop policies. In transition management, there remains a need for specialised (what critics call fragmented) policies as well as for more innovative and recently developed policy instruments. It puts these policies in a different, longer-term perspective and tries to better align specific policies. Mathematically one could say that *transition management = current policies + long-term vision + vertical and horizontal coordination of policies + portfolio-management + process management*.

To be clear, transition management does not aim to realise a pre-selected path or even achieve system innovation. It may be enough to improve existing systems; it may also be that the problems turn out to be less severe than at first thought. In other words, transition management does not consist of a strategy of forced development but uses bottom-up initiatives and business ideas of alternative systems offering sustainability benefits besides user benefits. It can thus be seen as a necessary change in how we as a society deal with complex processes of societal development.

4. Transition management: why and how?

Transition management is not an instrumental activity. The actual policies are the outcome of political negotiations and processes of co-evolution, which inform further steps. Foremost reasons for engaging in transition management are:

1. Because of the barriers to system innovation—which have to do with uncertainty, the need for change at various levels and vested interests; as a result of this we are locked into trajectories driven by short-term benefits instead of longer-term optimality (Kemp and Soete, 1992).
2. Because public policy is highly fragmented and oriented towards short term goals—transitions require the coordination of various policy fields: S&T policy, economic policy, innovation policy, environmental policy, transport policy and agriculture policy.

There is a cyclical element in transition management which is depicted in the below figure. The process of transition management consists of a number of activities, which can only be defined in general terms, because they are largely dependent on the nature of the transition problem at hand and, because of the interactive nature of transition management, on the actors involved.
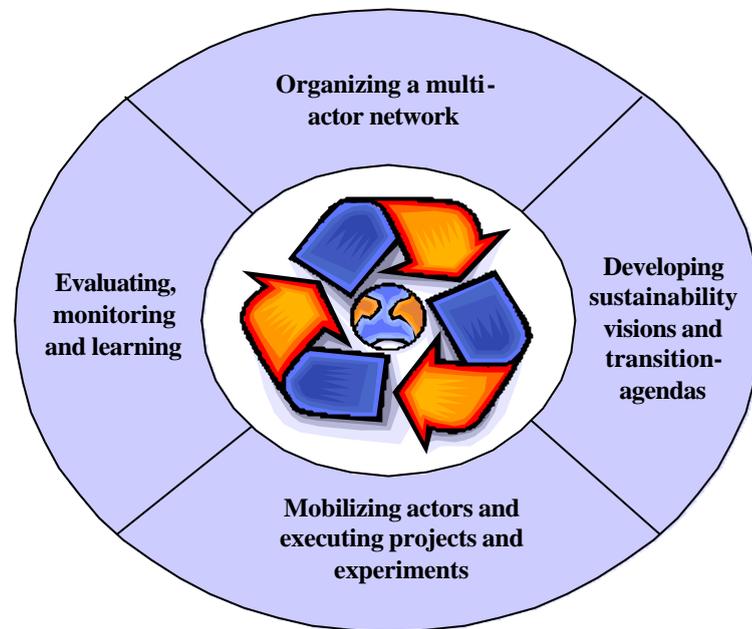

Figure 4. Activity clusters in transition management

Problem definition and Transition goals

The starting point for transition management for sustainability is that problems related to sustainability are unstructured and often ill defined. Because such problems do not have a single 'owner' and thus require collective action, a common definition of the problem at hand is necessary which enables developing shared goals. Transition management is therefore targeted at widely acknowledged problems requiring a response for which no ready-made solution is (or will be) available. Often these are not single problems but a range of problems. For energy for example, the problems are dependence on scarce (non-renewable), resources (oil, natural gas), emissions of greenhouse gasses stemming from the combustion of fossil fuels causing climatic change, price volatility from shortfalls in supply often as a result of wars, and the military conflict over oil resources and oil power. A problem of course is that each solution to these problems has its own disadvantages. In the short-term there are all kind of tradeoffs. The aim of transition management is resolve the tradeoffs. This will be a collective task for which one needs transition goals that reflect societal aspirations. In the case of energy the goals could be: cheap, safe, secure and environmentally benign energy.

Transition visions

The transition goals should be translated into transition visions: system images with a technological and behavioural component that are appealing and imaginative. There may be different visions. In the case of energy we have at least three visions: the hydrogen economy, the all electric society, and decentralized energy systems based

on micro cogeneration power plants and renewables. Each of the visions should be explored.
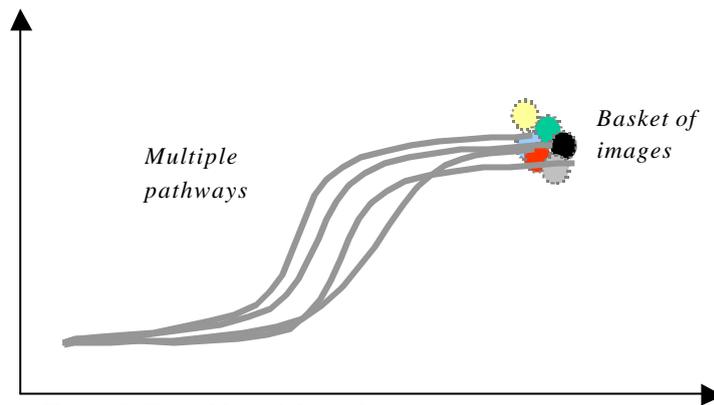

Figure 5. Transition visions: images and pathways

Inspiring visions are useful for mobilising social actors, although they should also be realistic about innovation levels within the functional subsystem in question. These visions could be thematic or sectoral, but have to present inspiring images of the future state of that specific sector or theme. This means that the starting points of the vision are translated into the institutional, economic, ecologic and socio-cultural aspects associated with that specific final-image.

The visions should be adjusted as a result of what has been learned by the players in the various transition experiments. The participatory transition process is thus a goal-seeking process, where the transition visions change over time (the transition goals are likely to remain the same). This differs from so-called 'blueprint' thinking, which operates from a fixed notion of final goals and corresponding visions.

Transition paths and interim objectives
Transition paths are possible routes towards the final images. The images do not necessarily have to be consistent (only with the vision) and multiple paths can be developed for one image (see Figure 3). It is important to incorporate interim goals and objectives in the transition paths that become more concrete the closer they are to the present. The transition paths however also have to reflect the necessary trend breaks and behavioural and institutional changes, the uncertainties associated with the pathway and the barriers and chances for implementation. Finally, practical experiments (programmes) that are targeted at exploring the transition paths are derived from the analysis and developed strategy and executed. The vision, in combination with the images, the transition paths and the experiments forms the joint transition-agenda

Programmes for system innovation
Another important element of transition management are programmes for system innovation to explore visions of sustainability. An example is a programme for integrated mobility, identified by Kemp and Rotmans (2002) as suitable by combining user benefits with sustainability benefits. An integral part of such programmes is the real use of new technologies in society—to learn from practice and facilitate processes of mutual adaptation and institution building. Experiments with new solutions and instruments are an important element of transition management. The experiments should be based on visions and inform these. For instance one could

think of a series of consecutive experiments with electric mobility or integrated mobility. They should be undertaken as part of programmes for system innovation. They should be designed for specific learning purposes and not be undertaken in the ad hoc manner of today's experiments with sustainable technologies.

Such support programmes should be time-limited and flexible to prevent the creation of "white elephants". System innovation in the sociotechnical realm involves changes in sociotechnical systems beyond a change in (technical) components. It is associated with new linkages, new knowledge, different rules and roles, a new 'logic of appropriateness', and sometimes new organisations. The choice of the programmes should be based on assessments of sustainability benefits and user benefits.

Evaluating and learning

Transition management involves monitoring and evaluation as a regular activity and the use of so-called 'development rounds', where what has been achieved in terms of content, process dynamics and knowledge is evaluated.

The first aspect of evaluation are the interim objectives: have they been achieved and why not so? Have there been any unexpected social developments or external factors that were not taken into account? Have the actors involved not complied with the agreements that were made?

The second aspect of the evaluation concerns the transition management process itself. The set-up and implementation of the transition process is put under the microscope. How do the actors concerned experience the participation process? Is it dominated by certain parties (vested interests)? Is it too consensual (too cosy), or is there too little commitment? Are there other actors who should be involved in the transition process? Are there other forms of participation that must be tried out?

The final issue for evaluation is the amount of learning or 'enrichment' that has taken place in the previous period. A special point of attention is what has been learned from the experiments carried out to stimulate the transition. What have been the most important learning moments and experiences? Have these led to new knowledge and new circumstances? And what does this means for future policies?

Monitoring and evaluation (of experience but also goals and visions) are key elements of transition management. Learning is a policy goal in its own right.

Creating public support

A continuing concern is the creation and maintenance of public support. This is important for the process to keep going and preventing a backlash, which may occur when quick results do not materialise and setbacks are encountered. One route to follow is through participatory decision-making and the societal choice of goals. But societal support can also be created in a bottom-up manner, by engaging in experiences with technologies in areas in which there is local support for them. The experience may take away fears elsewhere and give proponents a weapon. With time solutions may be found for the problems that limit wider application. Education too can allay fears but real experience is probably a more effective strategy. Through the prudent use of new technologies in niches in which the technologies and new types of systems of control are attractive for use, societal opposition may be circumvented.

New types of interaction with societal actors
The interactions with actors will change. First and foremost the wider public is involved in policy making, through the choice of transition goals and discussions about the future, and there is a greater orientation to innovators who are encouraged to come up with imaginative solutions. The innovators may be incumbent companies or outsiders. The latter group is more likely to come up with radical solutions. Incumbents will less dominate the policy process, which means that there is a change in governance, i.e., the ways in which the plurality of interests is transformed into coordinated action, through deliberation, responsibilities and roles (Eising and Kohler-Koch, 1999, p. 5). There is still a great deal of deliberation as in the *polder-model* in the Netherlands and other models of interactive governance but transition management directs itself strongly to innovators and not the actors with large vested interests and is only consensual with regard to the long-term goals.

Transition-arenas
The transition-arena as a new institution can be considered a meta-instrument for transition management and enables the above-described interaction between the actors. The transition-arena is a virtual arena, an open and dynamic network in which different perspectives, different expectations and different agenda's are confronted, discussed and aligned where possible. In it's first phase, the transition-arena is a relatively small network of innovators and strategic thinkers from different backgrounds that discusses the transition-problem integrally and outlines the transition goals. In this phase, it is important to come up with creative, inspiring and integrating goals and ideas. Further on in the process, the network will expand to include less strategically oriented actors (such as local authorities and people with practical knowledge about processes of change) to develop transition paths and link these to existing (not only governmental) policies. Finally, short-term experiments and actions are derived from the goals and paths and more operationally oriented organisations and actors will be involved.

Instruments of transition policy
Transition management does not call for an upheaval in policy instruments but says that different policy fields should be better coordinated. Ways to do this are
- *in science policy*: sustainability assessments of system innovations, transition road mapping, studies of past and ongoing transitions, focusing on the role of policy and usefulness of various governance models;
- *in innovation policy*: the creation of innovation alliances, R&D programmes for sustainable technologies, the use of transition-experiments, and alignment of innovation policies to transition goals;
- *in sector policy*: niche policies (through procurement, regulations or the use of economic incentives), the removal of barriers to the development of system-innovations, and formulation of long-term goals and visions to give direction to research and innovation.
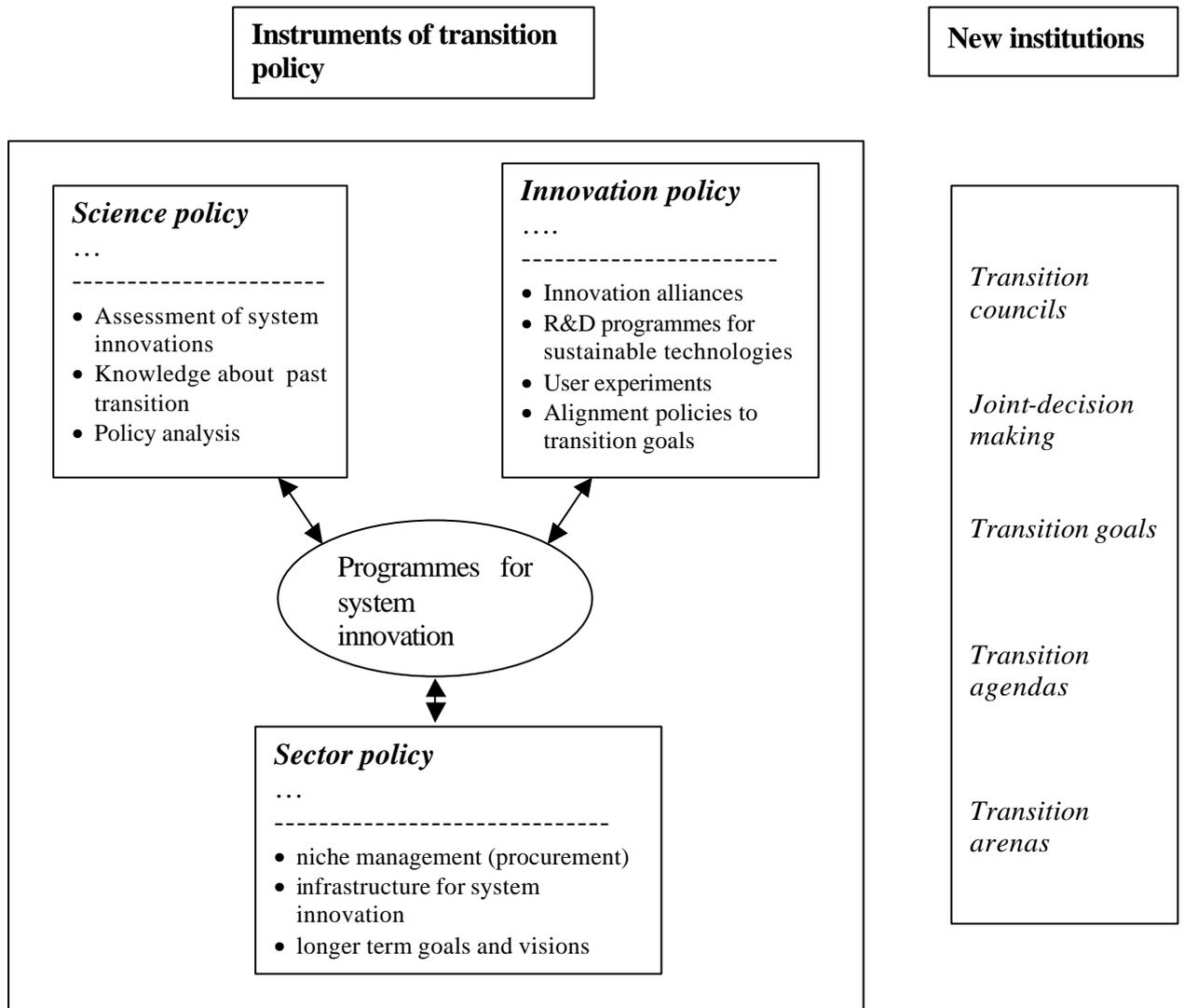
Instruments of transition policy		New institutions

Science policy
…

- Assessment of system innovations
- Knowledge about past transition
- Policy analysis

Innovation policy
….

- Innovation alliances
- R&D programmes for sustainable technologies
- User experiments
- Alignment policies to transition goals

Programmes for system innovation

Sector policy
…

- niche management (procurement)
- infrastructure for system innovation
- longer term goals and visions

Transition councils

Joint-decision making

Transition goals

Transition agendas

Transition arenas

Figure 6. Alignment of policies and instruments for transition

It may be worthwhile to state that the instruments are not so much specific to stages. There is a need to finance research and innovation in all stages, not just the first two stages (as noted in the Vromraad report "Decoupling of environment and economy through innovation" (2003) and RIVM and TNO-MEP). Policies that facilitate technology embedding are clearly something for later stages but the embedding of the transition endeavour and creation of public support for change is a continuing task throughout all stages. Control of new systems is something for later stages but such control may be altogether prevented through proactive policies based on the anticipation of negative side effects. Transition management goes beyond instrument choices, as shown by the right box describing the new institutions connected with transition management. The governance aspects are taken up further in the next section. Lest to say that instrument choices are based not just on their ability to achieve particular policy outcomes but also on their usefulness to foster transitions.

5. How does transition management sit with different governance approaches?

The afore-described notion of transition management was developed somewhat independent from the literature on governance. It was informed largely by insights from the innovation literature and evaluation studies of innovation policy and environmental policy instruments. This section will analyse how it compares with comprehensive planning, incremental politics, adaptive governance, interactive governance, and multi-level governance.

Transition management: soft planning instead of comprehensive planning

Transition management does not aim to control the future (to use Wildavsky's term) by engaging in comprehensive planning (based on blueprints). It relies heavily on market forces for the delivery of functional services for the obvious reason that no authority can plan for the efficient delivery of specialized services. Transition management does not blankly rely on market forces, but is concerned with the conditions under which market forces operate, by engaging in "context control" so as to orient market dynamics towards societal goals. The context control consists of regulations, the use of taxes, subsidies and emission trading (economic instruments) covenants, the use of policy goals and specific types of planning (such as land use planning). It consists of government acting to secure circumstances that will maximize the possibilities for progressive social movement by promoting innovation and mitigating negative effects (Meadowcroft, 1997, p. 27).[15] Private initiative is thus not curtailed but rather reoriented towards those activities that serve not only private goals but also serve social goals. Even Hayek, the foremost critic of macro-planning, saw a role for context control by government:

> "the holder of coercive power should confine himself in general to creating the conditions under which the knowledge and initiative of individuals is given the best scope so that *they* can plan most successfully" (Hayek, 1944: 26 quoted in Meadowcroft, 1997: 19)

Comprehensive planning is not a sensible strategy for changing functional systems because it is bound to be disruptive. It can be used for big technological works such as aerospace projects and coastal defensive where services do not have to be customized to individual needs. Transition management is best viewed as a form of soft planning or indicative planning. There is a role for specific planning policies for land-use and physical infrastructure. The need for these planning policies is unabated.

Transition management: an exercise in incrementalism

By opting for small steps transition management can be viewed an exercise in incrementalism. An incrementalist approach has three advantages: first, it is do-able because it is not disruptive from the viewpoint of special interests, second, the costs of a certain step being a mistake are kept low, third, it allows one to change course (one gets less locked into particular solutions)[16] and fourth, useful lessons may be learned

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[15] Context control may be viewed as a form of planning (see Meadowcroft, 1997, p.27).

[16] We take the view that path dependencies can not altogether be prevented, each act will influence future acts in ways that are not entirely clear. Incrementalism, portfolio-management and the stimulation by policy of robust solutions help to circumvent but not altogether prevent the problem of

informing further steps. Even though it is generally seen as slow it may bring change faster than more dirigistic approaches. Charles Lindblom powerfully states the case for incremental politics:

> "Abstractly considered, incremental politics looks very good. It is intelligently exploratory when linked with sequences of trial and error. It reduced the stakes in each political controversy, thus encouraging losers to bear their losses without disrupting the political system. It helps maintain the vague general consensus on basic values (because no specific policy issue ever centrally poses a challenge to them) that many people believe is necessary for widespread voluntary acceptance of democratic government. Moreover, incrementalism in politics is not in principle, slow moving. It is not necessarily, therefore, a tactic of conservatism. A fast-moving sequence of small changes can more speedily accomplish a drastic alteration of the status quo than can an only infrequent major policy change" (Lindblom 1979: 520).

Of course there is a danger of conservatism but forces of conservatism (in the form of special interests, veto powers, and timid thinking) always play out themselves, in any place and situation, as noted by Lindblom in a defense to his critics.

Transition management is not a strategy of incremental politics (although this is in most cases a good strategy) but an incrementalist strategy for changing functional systems. The reason for this is that with new technology systems, as with politics, you can't get it right the first time, there are too many variables; one has to opt for small steps in what is generally perceived "the right direction", trying different solutions. Like politics, technologies are not born perfect (Latour, Rosenberg) but require adaptation before they constitute a good solution. It is often insufficiently realized that the efficiency of markets rests on the weeding out of suboptimal designs of products and technologies through market competition (Nelson). Evolutionary change, founded on trial and error, while wasteful in the short term, is often the most intelligent approach in the long run. This view greatly influenced the vision of transition management.

Transition management is not arguing for blind incrementalism. Analysis has a role to play in the choice of incremental steps. Analysis has an important role to play in the determination of goals, the identification of visions of sustainability for meeting such goals, and the determination of steps (policy steps and technology steps) to learn about the visions and make a contribution to them. This is not so easy. According to Weiss and Woodhouse (1992; 260) incrementalism whilst intellectually appealing never was very helpful to practitioners, in failing to set forth a strategy for making fairer, more intelligent, or otherwise better social choices. Transition management does make a number of concrete proposals, one of which is to develop the long-term vision and intermediate goals to inform incremental action. Whether this leads to better decisions is still an open issue, but practice has already shown that at least novel and alternative steps are identified. Examples of policy changes are given in the last section.

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suboptimal solutions. Lindblom (1997) proposes to rely on the "intelligence of interaction" by relying on partisan mutual adjustment.

We should say that part of the appeal of transition management in the Dutch government was that it did not call for a complete upheaval of policy but for small steps, in the context of a process of long-term, structural change.

Transition management as adaptive governance

Adaptive governance is close to incrementalism. Ideally policy should adapt to changing circumstances and correct policy failures. The idea of adaptive management has a long history; it has been proposed by Lee (1993) as a way of dealing with uncertainty about economic use of eco-systems. In our view the best discussion of adaptive policy or governance is offered in the book *Democratic governance* by March and Olsen (1995).[17] They note that political institutions must cope with three problems of intelligent change: 1) ignorance: uncertainties about the future and the causal structure of experience, 2) conflict: inconsistencies in preferences and interests, 3) ambiguity: lack of clarity, instability and endogeneity in preferences and interests. Like Lindblom, March and Olsen are very negative about the use of expert intelligence, saying that "the history of efforts to act intelligently in democracies is a history of mistakes". They are especially critical about political change based on anticipatory rationality, based on backward reasoning from anticipated consequences[18]:

> "Too many atrocities of stupidity and immorality have been based on anticipatory rationality, and too many efforts to improve human action through importing technologies of decision engineering have been disappointing" (March and Olsen, 1995: 198-199)

In their view, the road to progress does not lie in long-term planning, using clear objectives, forward-looking estimations, information and calculation, and other elements of strategic planning but is to be found in contemplating the past, of adapting to changes, of developing capabilities to respond. This requires the creation of mechanisms capable of organizing experience in the service of improved learning (March and Olsen, 1995: 199).

March and Olsen offer a nice discussion of a strategy of experiential learning, discussing the various pitfalls. Learning is viewed as partial and imperfect, because of biased samples and because of limitations of learning capabilities. Suggestions are offered for how learning may be improved, through improved accounts (more and better measurement, analysis and interpretation of experiences), improved memory, and learning from others.

A real problem here is that you not only want to learn about a singular solution but about system innovation, and to facilitate processes of change. To learn about system innovation one should do strategic experiments as part of programmes for system innovation. Results from evaluation should feed into the projects and the overall programme, it should inform decisions at the operational and strategic level. Learning

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[17] A nice discussion of adaptive policy with operational elements is Walker et al. (2001)

[18] The criticism of anticipatory rationality should probably not be taken as criticism of anticipation or a call for short-sightedness but as a criticism of a particular method for dealing with the future: strategic planning. According to Club of Rome member Mesarovic (2001), sustainability requires anticipatory democracy.

goals should be determined prior to the experiments. It is especially important to learn about sustainability and conditions for widespread use. Promotion measures could be used as part of the experiment, to assess their efficacy.

These suggestions will help to learn more from experiments. Lessons learned depend on how experiments are designed and the types of experiments that are being undertaken. Having a good portfolio of experiments is important. Experiments help to learn about technology and instruments but also help actors to learn about goals. It is important to engage in higher-level learning: about goals and approaches.

Transition management and interactive governance
Interactive governance refers to joint decision-making. Ideally, policies are developed in interaction with stakeholder groups so that they are more effective and widely accepted when implemented. In actual practice, participation is mainly used to generate public support. This way policy-making is still viewed as the sole responsibility of the government, and participation becomes an excuse for either carrying out governmental policies or stalling the process because of the conflicts of interest. The infamous Dutch polder-model is a clear example of this over-involvement of stakeholders, defending vested interests.

The question thus is how to organize participation and interaction while maintaining effective governance. The solution offered by transition management is by placing the process in the centre and rely on mutual adaptation against a set of collectively chosen long-term goals.

When organised properly, transition management thus enables self-coordination and steering among actors without controlling the process in the classical top-down control mode. This mechanism has been described on a broader level by Lindblom (1965, 1997) as partisan mutual adjustment: in a generally understood environment of moral rules, norms, conventions, and mores, interdependent actors modify their own behaviour just enough to accommodate the differing purposes of others, but not so much that the mutual adjusters lose sight of collective goals.

For transition management, this implies organising and facilitation interaction, while not influencing the content of the process, since the outcomes are the result of the interaction itself and not of individual choices or demands. By co-developing visions and agenda's and collectively carrying out practical projects and experiments, the mutual adjustment of these perspectives and expectations takes shape.

Transition management and multi-level governance
Over the last decade, in Europe a system of multi-level governance took shape, more or less *de facto*. Authors such as Scharpf (1997) and Hooghe argued that the policy-making process is changing fundamentally as a result of the European integration. The chaotic and unguided process has led to a multi-level governance structure whereby at each level, different actors are involved in the decision-making process, resulting in "*a polity with multiple, interlocked arenas for political contest, of which the European level is one, where state executives, but also European institutions and a widening array of mobilised interests, contend.*" (Hooghe, L., 1996, p. 176).

Although this structure has emerged autonomously to a large extent, it has generated a lot of development and discussion in relation to the democratic effectiveness and legitimacy of the government. The ideal of multi-level is to better coordinate levels in a democratic way. For example, regional issues can be addressed directly art the European level and vice versa, enhancing the capacities and possibilities of smaller groups and regional actors. On the other hand however, policy-making has thus become less transparent; the division of power is no longer clear, as well as the accountability issue. So, although such a new, more diffuse and diverse structure could facilitate better policy-making for complex societal issues, it also raises some important concerns.

The same concerns have been raised with regard to transition management, which can be seen as a specific form of multi-level governance. Transition management implies policy-making on three levels: strategic, tactical and operational. Each level has its own implications with regard to the geographic scale, the actors involved and their tasks. By breaking down complex problems on the long term in partial problems that can be addressed on the mid-term and into practical problems that can be addressed short-term, one obtains an elaborate structure of interlinked arenas at different levels with different tasks and goals. The aspect of multi-level governance is least worked out in the model of transition management.

6. Conclusions

In this paper we delineated the concept of transition management that is currently used in the Netherlands for managing the transition to sustainable energy, sustainable mobility, sustainable agriculture, and the biodiversity and natural resource transition; and compared it with models of comprehensive planning, adaptive governance, interactive governance and multilevel governance. Transition management for sustainable development consists of deliberate attempts to work toward social, economic, and ecological objectives in a gradual, forward-looking manner in full recognition of system dynamics and windows of opportunity to effect change. Transition management is concerned with the normative orientation of socio-economic processes and seeks to overcome the conflict between long-term imperatives and short-term concerns. Because of its focus on the evolutionary dynamics of socio-technological innovation processes, transition management pays particular attention to learning, maintaining variety of options (through portfolio management) and institutional change—to avoid becoming locked into "evolutionary traps" (Malerba) and to escape existing ones.

Transition management employs an integrative and multi-scale framework for policy deliberation, choice of instruments, and actions by individuals, private and public organizations, and the society at large. It comprises elements of network management, process management, portfolio management, planning, and market coordination. Transition management is inclusive and calls for setting long-term and intermediate goals, alignment of policies short- and long-term policies, and strategic experimentation besides traditional policies. Because it aims for long-term change through small steps it is do-able in a society in which interests are well-organized, limiting the chance of getting lock-in to suboptimal solutions.

Transition management is perhaps best described as goal-oriented incrementalism[19], taking on board criticisms voiced against incrementalism of lack of orientation, conservatism, and negative stance against analysis noted in Weiss and Woodhouse (1992). The purpose of this paper was to delineate the concept of transition management and to compare it with governance models discussed in the policy literature, something that has not been done before.

We are aware that the paper suffers from a high degree of "advocacy". This is no accident. Both authors were involved in the development to the concept of transition management for the Dutch government. In this paper we were more interested in explaining the concept and putting forth the arguments in its favour than in tearing the concept apart. We are not saying it is a perfect model, but we think it at least has interesting and useful elements. We don't think a planning approach will work nor do we think that a pure incentive-based approach will bring system innovation about (it will merely mine low cost solutions). Transition management is no megalonist attempt to control the future but to orient dynamics to sustainability goals. Policy is concerned with the dynamics of variation and selection and not just with obtaining predefined policy outcomes. By opting for small steps transition management seems doable, and through it not only the knowledge problem but also the governability problem (Mayntz, 1994) can be addressed. Whilst the idea of managing varation-selection processes sounds very abstract, the model of transition management offers practical suggestions for how to do it, in terms of institutions and instruments. It is not an instrument as such, but a new perspective for decision making and governance.

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[19] In Kemp and Rotmans (2001, 2002) it is called "goal-oriented modulation". An alternative concept is that of "directed incrementalism" (Grunwald, 2000). Transition management could be labelled a "mixed scanning approach", a hierarchical mode of decision-making that combines higher-order, fundamental decision-making with lower-order incremental decisions that work out and/or prepare for the higher order ones (Etzioni, 1986). The fundamental choices are the long-term goals, the creation or abandoning of programmes for system innovation, reliance on certain ways of decision-making. The fact that we can use different labels for transition managements shows that it the ideas behind it are not new; what is new is the operationalisation of these ideas.

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