Adaptive Networks

The Governance for Sustainable Development

The earth lasts forever.
What is the secret of its sustainability?
Is it because it does not generate itself and has no self-interest?
Hence, the wise puts him self last and is first.
He is outside himself and therefore his self lasts.

Is it not in this way
That he is able to perfect himself?

Lao Tse, around 600 BC

Adaptive Networks
The Governance for Sustainable Development

Adaptieve netwerken
De besturing van duurzame ontwikkeling

Proefschrift

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Preface

Why this book?

This book is the result of nearly three decades of wondering why it is so difficult to take action where things are clearly going wrong. My father taught me to love the wilderness; the Dutch peat lakes, where one can quietly wander in Dutch flat-bottomed boats, and the tropical rainforest, where man still may discover many places and species. Both were disappearing then, and this process has only intensified since. Later, I came to understand that many people have similar feelings about nature and other adversely affected qualities of life. People complain about the course of societal development and the role of governments. They ask for innovations, high quality development and better governance, sometimes referring to 'governance for sustainable development'. In my professional life I have seen many claiming that they have solutions. But in their heart they know it is not that simple. After having been environmental and management consultant for 15 years I decided to write this book.

How this book was written

I wanted to write this book in the first place for people who simply were wondering how we could be so collectively stupid, like my father. Secondly, I wanted to address policy makers and citizens, pointing at their options to contribute to common goals, and developing a language for them to express these options to each other. I have become used to apply the term sustainable development, as the Brundlandt Commission did in 1987. So, this book addresses all who want to contribute to governance for sustainable development.

When I started off, I asked Geert Teisman to coach me. I admired him for his ability to put everything in a context, including contexts. We developed a way of analyzing the limitations of the Dutch efforts for sustainable development, and constructive efforts to deal with these limitations. These efforts included using influence at the right time in the right direction, sometimes in highly politicized contexts. It included developing trust that the opponent would not misuse the opportunity pointing at negative short-term side effects. It was not easy to have access to the deeper thoughts and, sometimes, emotions of the acting policy makers. Yet, it was important to follow these people in detail. Otherwise the nuances of this process might have been lost, the small differences in initial

conditions that create important changes in outcome, might have been over-looked.

For my empirical research I was able to make use of my professional contacts in the mobility, energy and environmental policy sectors. Job van den Berg, one of my colleague consultants, had access to the heart of influential networks. Through him I had first-hand access to informal networks which developed trust, and whose members were able to express their thoughts and emotions enough to allow me to understand the subtleties of their action, and to explain the development of policies in The Netherlands, and to some extent in Europe. I was trusted not to publish prematurely, and I think my observations and reflections made the group as a whole more aware of their own role and potential. This lasted five years, allowing me to trace back the link between small and large-scale changes in policies.

In the book I also describe how the group evaluated their own action, and I assess the theoretic possibilities for such a group to *know* if certain courses of action have a high quality from a larger-scale point of view. This has led to recommendations for those who are willing to try to follow this path, albeit in different contexts, and become a sustainable change manager. In hindsight, the lessons they had to tell are extremely interesting, and in my view such groups may be the only effective way to make use of the opportunities we have to create a better development.

The nature of proactive change

To these ends, I felt I needed to go back to our basic knowledge about causality and change, using insights from political sciences, economical theories, theories on trust and cybernetics. Public and private officials ground their policy behavior on what they think is real and right. Not the facts but the images of reality seem to generate social change, so I had to understand how such ideas develop. I identified five themes of social change that have to be considered in conjunction: the content of our ideas, the structure of our social system, the process that results from social interactions, the individual conduct that leads to interactions, and our perceptions of reward and causality, that lead our conduct. My first assertion is that larger scale changes only occur if the five variable change simultaneously and in reinforcing interaction. My second assertion is that such change has to be established at three interrelated levels: power interactions, social learning interactions, and personal behavior.

Simultaneous causally interrelated change of different items may be called *co-evolution*. It can be imagined how the cheetah may have co-evolved with the antelope, the chicken with the egg, the city with farming systems, views in politics with views in society. Where two items are mutually dependent, I assume that the alternative for co-evolution is catastrophic inertia. In social systems co-evolution is required between governments, between the public world and the private world, between contrasting pressure groups, higher management and lower management, and also different regions or countries. Co-evolution is a governance capacity. Each one of these entities needs to be open to change, and

needs to be able to transform its existing preferences into combinable ones, matching the short-term and the long-term. Letting go the traditional stand-alone way of working is, as Machiavelli already observed in the 15th century, the most difficult strategic option. Many have put their stakes on what is. This book however shows possibilities of change. It shows that if a sufficient number of people, across parts of social systems, become aware of interdependency and the mechanism of co-evolution, they can develop internal trust and generate changes in policy agendas. I have termed such groups *adaptive networks*. This book is about adaptive networks in action. I describe them as living organisms, with their own metabolism. An appetizer: they feed on social connections.

Structure of the book

In this book I develop a framework for understanding adaptive networks. Chapter 1 describes dilemmas of governance for sustainable development. Chapter 2 explains these dilemmas through an analysis of theories of change, from which I deduct observable characteristics in chapter 3. This leads to a description of change at three interrelated levels: power networks (chapter 4), adaptive networks (chapter 5) and change managers (chapter 6). Chapter 7 contains conclusions and implications for sustainable change management. I hope this book can help you explain to yourself and others how your actions can be in the interest of larger groups and future generations.

Acknowledgements

This book is based, among others, on dozens of interviews with policy makers who have been closely involved in the transition discourse throughout 2001 - 2005. This included monthly interviews with several members of the Innovation Board Sustainable Mobility. I would like to say thanks to all these people. Names of people and companies have been replaced by made-up names throughout this book, except Cabinet members and members of formal committees. The policy makers whose actions are analyzed are not the only policy makers who significantly influenced the transition processes.

Next to my father, Job van den Berg and Geert Teisman whom I already have mentioned above, I am also grateful to DHV Management Consultants for its financial and professional support. But foremost, I thank my wife Nelleke and sons Peter and Loek, who have understood how important this was for me.

1 Governance for sustainable development

Sustainability (...) is a development which fulfills the present needs without risking that future generations cannot fulfill their own needs. (Brundlandt-Report, UN 1986)

'Perception is reality'. By looking for a joint perception, you change reality (Paraphrase of Barry Nalebuff)

1.1 A breakthrough in thinking about sustainable mobility

2005: optimism about sustainable mobility

In early 2005 several Dutch ministries developed a joint program to stimulate a transition to a sustainable energy system. In its context, there were talks with several oil industries and automobile industries about joint action concerning 'automotives' – possibilities for future sustainable car fuel and propulsion systems. CEOs were involved, and insiders believed that this significantly improved chances of breakthroughs. These insiders were representatives from the mobility system, the energy system, as well as academics and influential people from different kinds of NGOs, including the mobilists union and the environmental movement. Optimism was based on the shared idea that there were possibilities for sustainable breakthroughs or at least for interventions that may reduce the present lock-in of the automotives system. Insiders saw The Netherlands as neutral ground because it doesn't have a car industry, and apparently it had a government that was prepared to act. The process they had followed to get this far was termed 'transition management'.

2000: pessimism about sustainable mobility

Five years earlier, in 2000, such relative optimism was largely absent. The oil industries and automobile industries did not talk about desirable scenarios or joint action, and the government did not encourage such cooperation in any credible way. There was cooperation between ministries in research programs, involving the private sector and NGOs, but these programs had always stranded. Their main characteristic was that they aimed at creating joint scenario thinking and subsequent action: backward-looking from an imaginable desirable future to present-day joint action. This was termed backcasting. However, that action had

never led to market breakthroughs, due to a weak connection with decision-makers who could take real action. There had also been talks between largely the same organizations concerning the future of the Dutch mobility system, for example in negotiations about the future of Rotterdam port under the so-called greenpolder model. This was a way of doing business between parties that are all important for political support. The government had asked these parties their advice to enable a decision about extension of the port area. Here, decision-makers had been closely involved, but in the framework of a spatial decision by the government there had been no opportunity to discuss different scenarios or interventions for sustainable energy and mobility. There was a gap between backcasting processes and processes that were driven by looming short-term action by one powerful agent, the government.

1.2 The theoretical research object: sustainable change management

A socio-cognitive approach to change

As the breakthrough in thinking about sustainable mobility shows, many believe that certain new automotives may contribute to sustainable development. Sustainable development is also my concern, and the key question of this book is therefore: *How can new ideas about sustainable development, like certain automotives, be widely adopted?* This question has two parts: First, how can ideas in general spread in society and become a motivation for action? And second, how can we know which ideas are sustainable? If we assume that it is possible to answer these questions, the process of consciously generating and spreading sustainable ideas may be termed sustainable governance. The process that leads to sustainable governance is management of sustainable change. I am in particular interested in sustainable change management. In this section I set out how I define 'change' and 'change management'. This is based on the more in-depth theoretical overview in chapter 2. For the moment I limit to write that the idea of sustainable change management implies a socio-cognitive view about proactive change: 'management' implies an intentional, conscious social effort, i.e. an effort based on understanding (and therefore cognitive). 'Sustainable' implies proactive, aimed at preventing problems before they occur, or before it is widely accepted that they are problems in the first place.

The themes of change

To give terms like sustainable change management meaning, it is necessary to be keen on definitions. The question about sustainable development and sustainable governance is primarily a substantive question: a question of ideas, of *content*, like the idea 'new automotives are likely to be introducible and to significantly reduce environmental problems'. However, it is not only content. The spreading of ideas until CEOs negotiate about implementation of new automotives depends on the communications between people, and these take place in a social *structure*. The social structure is the whole of interaction patterns between people: their generalized relationships, for example in a hierarchical organiza-

tion like an automobile industry. Every interaction by definition conveys information, and therefore the receiver may interpret it as a communication, in which case it might contribute to sustainable development. The structure is the place where interactions occur, and the whole of the interactions is the *process* in which ideas may, or may not, spread. These may be ideas about structure, for example about an independent organization to control the quality of new fuels. Whether ideas are born and what happens to them depends on the *conduct* of individuals. Are they going to interact and propose an idea that they believe to be sustainable? Are they looking for sustainable ideas in the first place? If so, what do they consider to be sustainable? And, finally, are they *rewarded* for acting in the common interest? (Which takes us back to content: the common interest, defined as sustainable development).

Content, structure, process, conduct and reward are thus all closely related and key to sustainable development. My hypothesis is that structures exist that are specialized in sustainable development, in the sense that they try to make

> "structures exist that are specialized in sustainable development"

society more robust against the impact of changing conditions, like the depletion of resources. I term these structures *adaptive networks*: groups of people who interact, coming from different parts of society, and who develop ideas that *influence* those parts in the benefit of the whole (as they see it). In that way thinking and acting in society becomes more aligned, less contradictory, creating fewer dilemmas, and society as a whole becomes more capable of adapting to changing circumstances. This process of alignment is termed *co-evolution*: the ideas in different parts of society may evolve separately, but if there are connections they may also influence one another. Adaptive networks consciously try to align the parts.

Content: sustainable development

In this book I want to explore how thinking about sustainable development may evolve under the influence of adaptive networks. Many people are concerned with sustainable development. People ask questions like: how can we stop the cutting of tropical forests? How can we improve the quality of our development in the sense that it may last a long time? How can society improve its consciousness about the quality of our development and about options or needs to – collectively- choose a better development? It is about fair distribution of resources between generations and between social groups. Fair distribution is not automatically generated. A well-known example is the tragedy of the commons, which causes dwellers to cut forests, in the long term against their own interest. On the short term, they have no other option because they don't know how to

> "discourses may be only 'complexity speak'"

organize a different development. Yet, they know that this can't go on forever. Such dilemmas may be termed social dilemmas because they face a society, not just one person. Social dilemmas make people act toward their personal, short-term interest, whereas they may have preferred

to act in the collective long-term interest if they knew how. Somehow, the agents don't know how to bridge the dilemma.

Still, there have been studies showing that a sustainable development is technically possible and only requires collective willpower to shift to another development (e.g., several publications of the World Business Council on Sustainable Development (www.wbcsd.ch); Standing Senate Committee on Energy, the Environment and Natural Resources of Canada, 2005). There are barriers in the process of governing our own development – we are collectively myopic. We are concerned about sustainable development, yes, but we seem unable to develop politically acceptable measures that will change our development in a proactive way, before it is too late. We even can identify the cause: there is a tragedy of commons (e.g., Scharpf 1997), but we may not trust that the government would be able to enforce a collective change of behavior. We develop *policy discourses* (sets of shared ideas) about innovative processes of policy making, but we don't 'walk the talk'. As there are at present discourses that take complexity theories as point of departure, these discourses might in reality be nothing more than 'complexity speak' (Van Twist (1994): 'linguistic innovation'; Standing Senate Committee on Energy, the Environment and Natural Resources of Canada, 2005). The structure of our society, which includes government, seems unfit to address sustainability.

Structure: our division of tasks

In this book I want to explore how structures, in particular adaptive networks, influence our development. Our development is still far from sustainable. In theory there may be sustainable alternatives, but they seem unattainable. It is often said that we favor the profit of our corporations, thereby neglecting the quality of our life ('people') and the functioning of our ecosystem ('planet'), which carries nature in general, including us. Neglecting people can lead to an unfair distribution, which again may lead to social instability. This may be unsustainable. Neglecting the planet may lead to depletion of critical resources for which we can find no alternative, or to a reduction of the quality of life.

The government is insufficiently able to correct that neglect. It is not that we are not aware of the social dilemmas. Governments and corporations have departments responsible for the protection of qualities of our development, such as environment, health, water, conditions for labor. Such departments try to develop policies and instruments to intervene into market processes and social processes. How can we know if such policies really improve the quality of our development? It is commonly believed that the instruments produced by government departments dedicated to the solving of the problems caused by social dilemmas are insufficient. An international example is the Rio convention on Sustainable Development (UN 1992). A national example is the Dutch 4th National Environmental Policy (Ministry of Housing, Spatial Planning and the Environment 2001).

> "any leader claiming to have a simple solution for a complex problem is a populist"

The point is that the problems that face us are complex. Every proposed solution is likely to meet resistance from people and organizations who see their situation deteriorated in the short term with certainty, whilst they are not convinced that the solution actually will help solve any problem, not even in the long term. And if they do believe that it might help, they might still believe that the cost of the solution is unfairly distributed. For example, environmental groups may call for drastic action, but often there is doubt as to whether the cure would be worse than the disease. A ban on tropical wood in only one country may only somewhat slow down the logging. It would be uncertain whether other countries would follow. And this gives opposition in The Netherlands – there are enough opponents to revolutionary ideas that have obvious disadvantages in the short term and unclear benefits in the long term. This is why problems like sustainable development are sometimes called *wicked problems*.

Solutions for wicked problems are proposed by organizations that might have some power, just like they meet resistance from organizations with vested interests that also have power. For example, corporations have power to adjust their production processes, NGOs have power to influence the public opinion, and governments have power to forbid or stimulate certain behavior. All these organizations may be aware that they have a common problem, and they may search for common solutions. In any discussion between these organizations, it is unlikely that solutions for wicked problems can be found. Each organization has its own *objectives*, about which it frequently discusses internally, and on which the leaders base their positions.

These fixed positions make the interactions between organizations fruitless, despite the fact that sometimes leaders may speak out that they are in favor of sustainable development. The leaders cannot support any concrete solutions, because these are contrary to their other pre-existing objectives, which in the short term are more important, perhaps even for survival of the organization. They have made their commitments to shareholders, employees, voters and members. The organizations that interact in such a way, vainly trying to improve the quality of their common development, together form 'structures of structures'. Such structures may also be termed *power networks*. The term *network* underlines that no one organization or leader is in charge of what the whole network will do. The term *power* underlines that the interactions are based on the formal position of leaders who have power in their own organization, and that this power is based on formal objectives. Since the objectives are exclusively produced from within the organization, they are not aligned with the objectives of other organizations in the network, and the approach to common problems becomes fragmented. The cooperation in power networks, or the lack of it, is a process that is termed *governance*. In that process, new structures may emerge. If these aim at new cooperation, new connections, they are adaptive networks.

Process: the interactions that shape ideas

In this book I want to explore how processes shape ideas and structures that may lead to a different, more sustainable development. Governance leads to the whole of decisions we make to influence our development . The objectives of organizations are shaped by their internal interactions; many small decisions that create legitimacy for the leadership and its formal objectives. In corporations the decisions are primarily based on what people believe will create profit for the organization and for themselves. This depends on decisions made in the market, and ultimately by consumers. In such a way, the economy has its internal drive that, for example, also leads to globalization. When people see that the economy has adverse side effects that lead to unsustainable development, they may call for action, and new structures like ministries and NGOs may be erected to address these problems by correcting market processes. Such interventions are also the result of many small decisions. Our development is therefore shaped by the everyday decisions we make, which is a process that develops in the context of power networks (i.e. in force fields that I term adaptive tensions).

If we are to change our development we need to change the way we make decisions, so that power networks will align their objectives. Paradoxically, the process of decision-making takes place in the context of power networks and therefore doesn't automatically create alignment because of its natural fragmentation, as indicated above. Something else is needed to create the required co-evolution, so that society as a whole may become more adaptive. This would be a different kind of process where ideas in different organizations or different parts of society can co-evolve in spite of the fixation on short-term benefit in power networks. That may increase our collective capacity to solve the complex puzzles we face, in other words the quality of our decision-making. Quality defined and achieved from multiple points of view may create a more sustainable development, since it can help us prepare for changing conditions.

Influential people are aware of this need and have proposed learning processes to increase the quality of our decision-making. These learning processes should not just aim at education, but on the quality of our interactions. How we act is a result of how we think, and how we think depends on how others think and act and on what we experience. We therefore should learn through dialogue and experimentation. Several initiatives in this line have been taken, like the UN Rio Convention on sustainable development (UN 1992), UN Secretary General Kofi Anan's 'global compact' initiative (Ruggie 2002); the World Business Council on Sustainable Development, development aid focuses on piloting, etc. A similar discourse concerns 'innovation' – also here it is said that breakthrough innovations, being of benefit to the larger community, depend on learning. The same is also true for 'quality management', e.g. the idea of 'spatial quality' in The Netherlands. Finally, it is mentioned in the 4th National Environmental Policy (NMP4) of The Netherlands, where it is termed 'transition management'.

"the learning of societies is enigmatic"

It is difficult to evaluate the effects of such initiatives. The learning of societies is enigmatic – it is not only the result of

specific initiatives that are said to create an alternative process for power networks, but also the result of all interactions individuals and groups have, personal or via the market mechanism. Someone buying a tropical hardwood chair in The Netherlands may contribute to the destruction of rainforests without knowing it. If he knew it, he may still buy the chair because if he wouldn't someone else would. The issue of rainforests is discussed in several national and international policy processes. Individuals from The Netherlands may visit a tropical rainforest during their vacation, see the misery or corruption driven logging, understand the linkage, and still buy that tropical hardwood chair. At the same time such an individual might support the international processes that try to prevent continued logging. He might stop buying products from unsustainable forestry. Different furniture corporations may set up a system of certificates for wood produced in sustainably managed forests. All that may be seen as part of a learning process.

As a new crosscutting dialogue emerges it may be said that a new group of people has interactions to achieve a common benefit, which makes that group an adaptive network. Adaptive networks by definition are not guided by pre-existing accountable objectives, but in stead by unspecific objectives like quality or sustainable development, and the personal concerns of individuals who leave the fixed boundaries of official objectives, and in that way they try to enhance dialogue between parts of society, enabling a co-evolutionary learning process. They have the aim of improving development and therefore they must be influential, but they have no formal power sources, so they have to convince purely through dialogue.

Where people speak about learning or convincing, they often have in mind that learning should lead to *knowledge*, and that knowledge, the *ideas* someone has about the world, can be transferred from one person to the other. If one person tries to convince another of his ideas, he is making a *proposal* or proposition. However, this is not helpful if knowledge creation is difficult to separate from the creation of the perceptions that create our daily activities and decisions. Knowledge is produced, translated and applied in a fragmented way. Fragmentation of knowledge leads to a whole variety of behaviors, in which there is not much consistency in action. Contradicting actions performed by several agents lead to disappointing results. This is widely seen as an important problem of governance in complex power networks of societies at the beginning of the 21st century. It is increasingly recognized that the influence of government on our development is limited. There is a need for more *interconnectivity* in governance networks, enabling co-evolution, and thereby more common understanding of wicked problems and, based on that understanding, more joint action toward sustainable innovations. I see interconnectivity as a characteristic of social networks, expressing the degree in which the agents are willing to engage in dialogue and act on behalf of the whole, also expressing the degree of trust (assuming that without trust there would be no dialogue).

Conduct: connecting the parts

In this book I want to explore what kind of conduct contributes to co–evolution. Studies show that learning can take place if people are willing to engage in dialogue: listen to each other, postponing their judgment, and really trying to understand the other. To some extent such interactions may occur at grassroots level, but how may such small interactions influence the *agenda* of power networks – the current set of objectives they advocate; the positions they take in public (i.e. *power position*)? What statements do leaders make in public? Do they take position against the other members of power networks, to re-establish their own leadership, or do they take position for the common interest? Do they promise reward for developing specific types of ideas or general types of ideas? The connecting agents should not only consider the adaptability of society as a whole (i.e. its capacity of proactive change to indications of looming changes in its environment), but also adapt to their own circumstances, which are defined by the context of changing power networks. They must have a skill of developing ideas that really are accepted on a wider scale.

From the top down, leaders like Kofi Anan have taken initiatives that should stimulate such dialogue. Another example is prime minister of The Netherlands Jan Peter Balkenende, who in 2002 personally started up a national dialogue about norms and values (Balkenende 2002). The question is whether such conduct actually trickles down so that many people develop the required skills, and change their ideas in interaction. Leaders like Anan and Balkenende often act despite an enormous mistrust that the initiatives they take lead to any common benefit. Just asking for dialogue is not appealing when people experience urgent problems.

> "simply asking for dialogue is not appealing"

More traditional leaders may empathically reword the emotions of their supporters or voters, and even focus the attention on forgotten problems, but they don't even try to supply their supporters with an understandable perspective for complex change. They rather insist that simple solutions can solve wicked problems, which is why they are popular. Many citizens, on the other hand, are aware that simple solutions don't exist, and turn away from politics. There is no language in which political leaders can express to their voters in an understandable way, how they subtly connect different organizations in governance networks to improve co-evolution of ideas and consistency of behavior. Traditional public leaders often have reached their position because they have made promises to their voters. They are rewarded for claiming that they have effective and simple solutions. They implement these solutions from the top down. Creating an understandable problem analysis and a solution that only needs to be implemented provides a comfortable feeling that things are under control, and that there is order. At the same time, such leaders often are aware that reality is not that simple, and that their solutions may easily fail. This is why traditional, more hierarchical public leadership feels rather uncomfortable with the increasing complexity.

Such leaders also tend to seek solutions by creating new order in the new organizations they set up to cope with complexity, by stating new objectives and by restructuring or re-organizing. New and clear responsibilities, on which public managers and their political leaders can be accounted, give an appearance of an effective approach. However, this in itself forms no guarantee for learning. It may only increase the number of organizations and leaders who try to interfere with societal development. This dividing way of order seeking often results into a higher degree of fragmentation.

> "traditional leaders often create fragmentation"

The alternative to creating new order that only adds to complexity is to personally act in a connecting way – not setting up structures that do it, but to actually do it, make the connections. Recently, several social scientists call for new cognitive approaches like scenario thinking and systems thinking (e.g., Senge 1990, Flood 1999). These theorists assume that such learning capacities will help a group to deal with an ongoing process of changing circumstances. The cognitive approach will provide a language that helps to communicate about ideas, which then may co-evolve and lead to pro-active innovations to adapt to new circumstances. Acting together becomes easier because trust develops more trust (Falcone & Castelfranchi 2001). Leaders who take connecting initiatives and create *enthusiasm* for adaptive networks in such a way are sometimes called change managers, transformative leaders, moderators or connectors. Senge (1990) speaks of personal mastership – focusing on what really is important to a person. However, this activity costs time, and is difficult to understand for the client, voter or member.

Reward: investing in recognition

In this book I want to explore how conduct that contributes to co-evolution can be rewarded. Adaptive networks and their interactions, seeking new goals, are obscure phenomena. By definition they connect hierarchical organizations and parts of society, without having their own visible agenda. Their members must go beyond activities that are officially recognized and therefore they are unlikely to be rewarded by the organizations that pay their salary. The effects of what they do have the form of more aligned ideas between parts of society – but since nobody is in control and few people are even aware of how ideas evolve, it is difficult to reward someone for such a result. Thus, the members of adaptive networks must be prepared to invest personally in the common interest of society, perhaps hoping that recognition comes later. This is not easy when they are under pressure to produce visible results. They should trust that their superiors will not punish them severely if they fail, but will rather reward them for good efforts. Trust is then similar to an expectation of reward.

> "how to reward connecting behavior?"

It is not evident that people make such an investment, or if they try, that they actually make a difference. There may be no trust that they actually do so. Responsibilities should be shared but under complex conditions fragments act on their own. Nobody is in control, and connections are

needed, but how to recognize and reward *connecting behavior*? Due to this negative general orientation on interconnectivity, the rewarding for connecting activity becomes intrinsically problematic. No new language may emerge that can be used to share thoughts about useful contributions, and enabling leaders to be rewarded for connecting behavior.

Connecting behavior is also called transformative leadership or change management; it is a matter of leadership because nobody is in charge and taking action toward change is therefore someone's personal initiative. It is transformative because the leadership is aimed at innovations that fit long-term ends and create new short-term ends. It is a paradox between two components of social processes; these are produced by two reward mechanisms, which are created by two counter-acting needs: the need to account for achieving orderly goals, and the need to create opportunity for seeking new goals in dialogue.

How can larger societies develop ways of encouraging people to display connecting behavior? What kind of language do we need to share our thoughts about the benefits of connecting behavior? How can such a language develop in the different subsystems that it benefits, in co-evolution?

1.3   The governance paradox of complex societies

Above I have identified the following themes for my book: content, structure, process, conduct and reward, which are all key to sustainable development. I also have indicated that these themes are closely related, which is why focus on any individual theme in isolation from the other themes is dissatisfactory. An adaptive network is a structure, but it is also the context and the result of a process, which is enabled by a type of conduct, which rewards different conduct in others, in particular conduct in the common interest, i.e. conduct that contributes to sustainable development.

> "Little affairs are so difficult to achieve as change and innovation, because many have put their stakes on what is"
> Niccolò Machiavelli, 1469 – 1527

I therefore structure my points according to a paradox that cuts across the whole set of themes: the paradox between accounting and goal-seeking interactions. The interaction types are similar to what Heclo terms powering and puzzling, in relation to policy learning and the view that policy actors are involved in the 'puzzling' or 'powering' whereby 'Much political interaction has constituted a process of social learning expressed through policy' (Heclo 1974: 305-06). My point, in line with Heclo's, is that the contrast between powering and puzzling, created by complexity forms a tension that can be used creatively. However, to overcome the inertia Machiavelli and others have observed, some level of empowerment is needed. It sheds light on the position of the object of this book, adaptive networks.

Governance of complex problems like sustainable development

In this book the complexity of modern societies is the point of departure. I assume that different governments are aiming at a whole variety of objectives at

the same time, and necessarily governance content is a mess. All power networks confronted with wicked problems have intrinsic difficulties to deal with long-term objectives. Dealing with such objectives requires different kinds of interactions than the more classic approach of objectives in which short-term solutions have to be reached, by fixing and thereby simplifying a problem. Complex societal systems are highly dynamic due to the enormous amount of interferences and interaction. This leads to the assumption that the only stable characteristic of complex modern societies is their chaotic state of being. Looming threats at the level of any of its parts cause ongoing tensions in the whole system, which lead to some level of chaos. Some agents purposefully exert pressure to create such tension, because they hope it leads to unexpected solutions.

In messy and complex governance networks interactions aimed at partial problem solving by seeking new goals will always occur alongside interactions to achieve fixed partial goals. Coincidental contradictions, interferences and intertwining between parallel interactions will always take place and will often to a large extent influence the outcomes. In order to deal with complexity, participants in governance networks will try to create linkages between coincidental parallel interactions, in order to generate a larger, common benefit. They are then acting part of a power network, but simultaneously and on their own initiative, almost illegally, they are also acting part of an emerging adaptive network. I assume that the messy and interfering interactions in networks can be classified in two types: the accounting type and the goal-seeking type. The accounting type is created by the idea that chaos can be controlled, at least in the sense that the agent expects reward for his contribution to an orderly goal. This goal is formed by the context of power networks in which the agent operates and that create expectations of reward. The goal-seeking type is the opposite: individuals try to develop new combined actions with people from different backgrounds, which may (or may not) yield accepted solutions in a wider context that they cannot control. They interact, and an adaptive network emerges. Both components, each representing a specific combination of content, structure, process, conduct and reward, occur alongside. Some people act primarily according to fixed objectives, others primarily seek new objectives. Before analyzing their relationship, I present stereotypic descriptions of both types of governance.

Accounting

The *accounting* style of interaction develops under the influence of fixed objectives that form the prime criteria for reward. Power networks provide such objectives. Power networks are structures that control resources like funding and regulations. The standing institutional framework, which by nature changes slowly, forms them. People in charge have achieved their position because they make promises in which their supporters believe. In that position they can control how their subordinates are rewarded in the implementation process, which leads to new laws, institutions and investments. They can allocate funds to people and activities they believe will produce the promised results. They can moti-

vate their people by means of the statements they make in public, and by rewarding behavior that fits the objectives.

"the market needs a stable playing field"

The power network forms therefore a context that attracts certain behavior according to prefixed expectations. This is beneficial because this fixation is helpful to give agents in the market certainty about the playing field in which they will act in the future, so they can invest without taking too much risk. The *playing field* is formed by the whole of government interventions like regulations, taxes and subsidies (the institutional regime). Even communicating about possible future changes can create a perceived investment risk and reduce the level of investment. This may reduce support for the power network among market agents who see their interests adversely affected. It is therefore important for society that expectations about the future playing field don't change without necessity.

As problems are complex, leaders may declare that they will work together with other leaders to develop solutions. However, to them it is vital that whatever solution emerges, this is not contrary to what their supporters define as primary, short-term objectives. Without their support, they would lose their position. Their agents, the people who carry out the actual work in the problem-solving process, are in the first place conditioned to watch out for these immediate interests. Otherwise, they are rewarded for cutting costs. It is then less attractive to contribute actively to a process of goal seeking. Because the goals haven't been found yet and these are therefore formulated in an unspecific way, and it is never certain whether superiors will really perceive a proposed solution as a success. The risk of meeting resistance from unexpected corners is considerable. And if there is success, many organizations have contributed to it, and one cannot be sure to get reward for one's own contribution. In other words, if responsibilities are shared, and the dominant interaction type is the accounting type, it is likely that nobody acts as a problem owner, making effort for the common benefit.

Simultaneously, re-organizations with the aim of increasing productivity take up most of the attention of managers. Such measures can easily be presented as effective solutions for wicked problems. Traditional leaders or managers, applying the accounting style, often resort to control because it provides the appearance of effectiveness. However, if problems are wicked this approach will not produce the promised outcome. Reorganizing organizations hoping they finally will fit in with the new changed environment

"re-organizing often does not help"

in many cases does not work. Quite often such organizations find themselves in an ongoing state of reorganization, without getting the sense of really controlling developments within and outside.

If the accounting style were the only style, there would only be reactive societal change. The societal system may produce, in its evolution, innovations in the market that become successful and start a chain reaction of changes that start in smaller niches, eventually tipping regimes (Rotmans et al, 2001). These inno-

vations might be triggered by incremental technological progress or by the exhaustion of resources that the systems needs. For example, if fossil fuel runs out, the transport system must shift to other energy sources, and when sufficient people believe that the energy price will rise they will start the required research. However, if the energy price rises significantly, there may not be enough time to develop other energy technology that meets the needs of society. The system could collapse or the new system could create less desirable side effects (like the impact associated with hydro-energy or atomic energy). For a more proactive attitude towards sustainable development, the goal-seeking style is also required.

Goal-seeking

Goal-seeking interactions are just as real as accounting interactions, because otherwise all change would have to be produced by political parties that formulate their programs, voters that reward the best program, and Cabinets that implement. Reality is probably that the solutions proposed and implemented are significantly influenced by many goal-seeking interactions. These interactions are not aimed at control but at development of some kind. It may be compared with parallel processing of information by computers – if all information has to pass through one microprocessor that controls everything, the process is slowed down and fewer problems can be solved. In the case of Cabinet there may be over a dozen of 'microprocessors', which is still by far insufficient in complex modern society. The alternative is that power networks put many microprocessors to work, let them freely associate with each other to combine their knowledge and search for new ideas, and the top level selects the results that have the best quality. If formal leaders are of the traditional type, they will have difficulty selecting solutions that do not meet their fixed objectives, which they already had formulated before in terms of simplistic solutions in their program. If the leaders apply the goal-seeking style, they formulate their objectives more in terms of problems, and work together with other leaders in the power network to create a joint perception of quality, and communicate about that, guiding the microprocessors that work in parallel, and selecting the best ideas that are delivered.

The goal-seeking component of governance is a process of building a case for change, in line with the idea of 'problem solving', introduced by Fritz Scharpf (1997), who describes the difficulty of wicked problem solving in the context of institutional hierarchy in game theoretic terms. A sufficient number of influential people must believe the case before it can be publicly proposed – otherwise, there is a high risk that a majority will reject the case for a long time. This proactive source of change could be early policy-making with the aim of preventing a system collapse or less desirable side effects. This policy process should then give impulses to the system with the aim of starting a sustainable chain reaction, preventing the system from locking into a less sustainable equilibrium. The goal-seeking component, in the eyes of Senge (1990), identifies such impulses or interventions.

However, there are several paradoxes related to pro-active policies. First, the process may be said to aim for sustainable development, but there is no widely accepted operational definition of that concept. So, a social process is needed to assess whether any action will effectively cater to a sustainable development and should be admitted. This social process, which takes up time and knowledge, is necessarily limited to a small group. However, who will believe a small group if they propose sustainable changes that go against the short term interests of many others who don't understand their case? Thus, pro-active policies have to start in small groups, which make proposals for interventions, but small groups have to seek support in much larger groups before they can be effective. This process of support gathering consists of *co-evolution* of the thinking in different parts of society, and the people who are actively involved in that process are connected in adaptive networks. I have chosen the word adaptive networks because they try to adapt to changing circumstances as early as possible, before a wide sense of urgency emerges through market processes (e.g. a quick price increase of oil). Mitleton-Kelly (2003) reserves the term adaptive systems for systems that react to a changing environment by adapting, and co-evolution where different interdependent systems co-evolve all along, adapting to each other. Her point is that the boundary between a specific system and its environment is difficult to define. I take as point of view that intentional co-evolution of ideas always reacts to previous ideas that interventions are required to prevent greater catastrophe or to create larger benefits. In that sense they are adaptive, also in Mitleton-Kelly's terms.

> "adaptive is both pro-active and reactive"

Proposals from adaptive networks are the result of a learning process that necessarily must precede the public agenda of the intervening organizations. The public agenda is formed within the structural context of society. Since institutions have a natural tendency for self-continuation, as described above, proposals for change will not easily emerge on the public agenda (unless formulated in unspecific terms, like most policies for sustainable development). Thus, the existing societal structure, which includes the structure of government, forms an inert 'force field' for the public agenda, within which adaptive networks may develop views about change, and try to influence the public agenda by long-term reasoning. Until their ideas have been adopted in the public agenda and the work programs of their organization, they have no other resources than knowledge and skills.

The tension between the accounting component and the goal-seeking component

If both fixed objectives that are controlled and new objectives that are developed could be totally re-conciliated, a high quality of development would emerge. However, this is not possible and therefore there is a *tension* between the two types of governance interactions: the results of goal seeking are difficult to see and people are pushed to produce visible outcome. Goal-seeking leads to a reasoning that may only produce visible results in the long-term, that may lead to reward only if others can be convinced. On the other hand, only striving for

fixed goals may be unsatisfactory for many, since it creates no solutions either; it may merely provide certainty for market agents. The tension between the two styles is often felt in rather implicit ways, like 'I hate bureaucracy but make the best of it'. The tension may be felt when people from different, competing organizations identify a common interest or a possibility for synergy that is difficult to realize because official objectives are aimed at outsmarting the other, and not at cooperation. This may be the case if interest groups or ministries don't agree about short-term government interventions, political parties compete for votes, or corporations in a production chain compete for customers.

The tension is indicated in Figure 1. The upper right formal, highly visible agenda setting process within the power context is too slow for alert responses to complex societal dynamics, since new insights have to be sufficiently shared in political circles before they emerge on the public agenda 'from the top'. Their four-yearly election programs often bind parties. Adaptive networks (lower left) can be more alert, but they have no formal powers and resources since only the public agenda can allocate resources. To have an impact, they must raise the interest of others who share their views, until sufficient momentum for action is gathered. The effectiveness of a learning network may thus be evaluated through its influence on the public agenda. The arrows in the diagram indicate power and influence as causal linkages between processes at three levels. This, then, has to be observable through a changed behavior of leaders, reflecting more than before the joint perspectives of the adaptive network, and if concrete action penetrates the public agenda, it may influence the law making and institution development process.

Figure 1. Influence through goal seeking and power through accounting
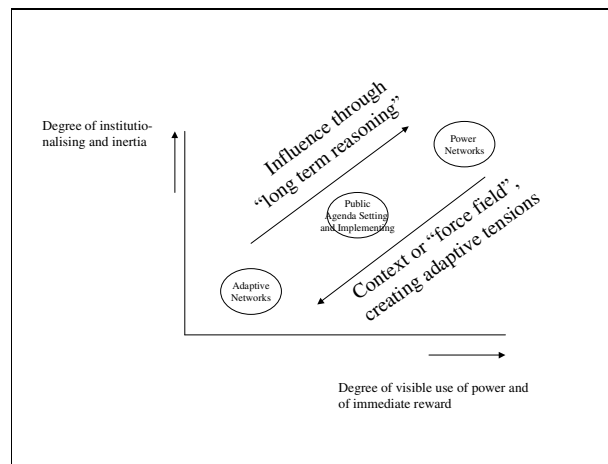
However, the members of an adaptive network are unlikely to clearly influence the public agenda for short-term interventions, unless they are capable of devel-

oping a convincing case for change. Thus, in the case of complex change, it may take up some time before an influence on the public agenda is observable. Before that moment, the participants of an adaptive network should evaluate their own chances of success.

This tension between interaction types may have a creative effect, because if adaptive networks see, and seize, opportunities, it may lead to a different public agenda that makes society as a whole more adaptive. It may provide the best of both worlds: ideas that have emerged in co-evolution and therefore are relatively robust and adaptive at the level of the whole, without creating more chaos than necessary. If that happens an adaptive network has influenced the way in which the power network exerts its power and creates expectations of reward. The point where both forces meet is intermediary in terms of dynamics and reward. The public agenda setting process is the process where formal leaders change their conduct in public, under the influence of both forces. They take a little risk; because their supporters, who legitimize their position, may not all understand. Reward is therefore uncertain for them too. They assess whether the time is ripe for such a shift.

Not only new communications by public leaders are an expression of a changing agenda. Also the choices made by agents responsible for implementation may have that effect. They must improvize in a real world, where things are not that simple. Agents may adjust their practices according to reality and in co-evolution with other parts of society affected by their practice (given complexity), often making irreversible decisions in the implementation of formal policies, and thereby influencing development in a way comparable with jurisprudence. If the agents act according to the rules, they are safe but may be personally unsatisfied with results. They may want to find balance so that they can believe in what they do, and they may develop that balance in dialogue with representatives of the other affected parts of society. Where the two forces meet in the center of Figure 1, also here there is a learning process in the sense that objectives and therefore conduct in the power network are adjusted according to ideas that have co-evolved via an adaptive network.

Both components are needed to create a sustainable development, and both need to be sensitive to the other in order for anything to change. Power networks, having a *power position*, should appreciate the necessity of co-evolution and adaptive networks, and adaptive networks, having an *influence position*, should appreciate the susceptibility of power networks for certain proposals. A power network forms adaptive tensions, *context* in which adaptive networks operate.

Change management as management of tensions

Thus, there is tension between the agendas proposed by order seeking organizations and the ideas developed in adaptive networks. What happens in such a situation, depends to some extent on the 'human factor' – that of conduct. Individuals may have some degree of liberty in their conduct, and may choose actions that relieve the tension they feel. They may choose to either stay on the

safe side, making sure they will be rewarded for their actions by staying close to fixed but less creative objectives, or they may take initiatives by connecting with others to develop new combinations and ideas. When they make the first choice a tension is never created, and if they make the second choice they try to 'make ends meet' which would release the potential energy in the tension. This is a risk: if they fail the investment is lost, only if they succeed there is payoff. They can do this by developing influential ideas that are new but still affect the public agenda, since then they are effective and likely to be rewarded (either in terms of career or in terms of personal objectives). The issue is that individuals first must see the opportunities before they participate in networks to create innovative proposals. If it seems like an impossible task, they will probably not begin the search process in the first place, and choose certainty.

Managers may be aware of the potential benefit of tensions. By means of their communications they can adjust adaptive tensions to challenge teams of people to engage in goal searching by indicating the types of

"instruments for sustainable governance easily lead to bureaucracy"

ideas that they will reward. To that end they should be prepared to defend that before their own supporters. Managers may also describe opportunities in existing contexts, making others enthusiastic to join in an adaptive network.

But what about very complex problems like sustainable development? To some extent, traditional governance is aware of that role and the potential benefits of exerting pressures and tensions. Policy discourses like impact assessment, participatory planning and transition management have been used more or less explicitly to tell about the need for and the potential creative effects of these tensions (despite the fact that their formal rationale usually is more simplistic). However, often a normative approach toward learning removes its flexibility and creativeness, and the procedure becomes bureaucratic (Nooteboom & Teisman 2003). There is a need for more personal initiative for connecting behavior in real life situations, and not a need for new procedures that only add to the complexity of real life situations. The pressure caused by such instruments should therefore be cautiously dosed and customized at a level where it really evokes connecting behavior by providing opportunities for reward. This is illustrated in Figure 2. In power networks actors can purposefully adjust their agenda to create a visible tension in the power network, which forms an opportunity for adaptive networks to develop innovative proposals (a third way). The tension between the power network and the adaptive network is then a creative tension. The process of change may start at both sides.

Learning networks' can be power networks in disguise

I write consistently about adaptive networks when I refer to networks of people who try to connect thinking and acting in different parts of society. I have indicated that a characteristic of such networks is that the co-evolution of ideas leads to a changed behavior of power networks, setting a different agenda. They have to be driven by the potential energy of tensions. Enthusiasm is based on the

ability to see opportunities. The ultimate success is that wicked problems are solved in the eyes of large groups in different parts of society. I have chosen the word 'adaptive' because such networks need to adjust to circumstances if they are to find solutions to wicked problems. They have to monitor contextual conditions and create new linkages, with leaders in different parts of power networks, to see their potential. They have to assess their own credibility.

Figure 2. The tension in a power network creates an adaptive tension between it and possible adaptive networks
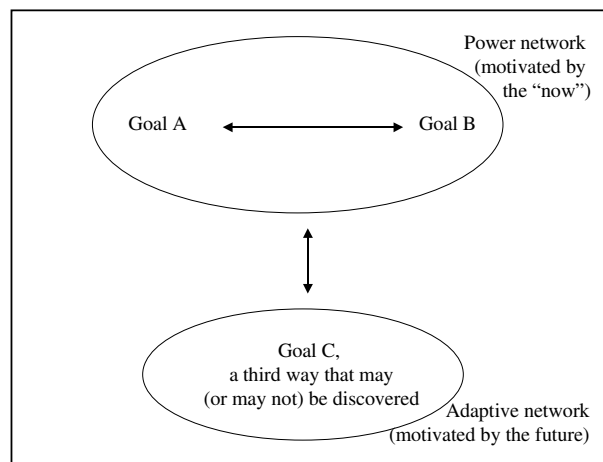
There is literature about forms of social learning, e.g. in communities of practice or learning networks (see chapter 2). A group of people may proclaim to be a learning network, but such networks may be power networks in disguise, in the sense that they are dominantly driven by existing objectives, rather than by a creative tension to produce new goals in the common benefit. A number of the participants may not recognize themselves in the common objectives, or may not believe in them. Then, the actual adaptive network may consist only of some of the group's members. Participants either may stay on the safe side or engage in a search outside their assignment. They may either not be driven by the desire to create innovative proposals, or they may not see, or be able to assess, opportunities, in an equal amount as other participants. A self-proclaimed learning network that is dominated by people who act for their own short-term interest and see the common interest as a side benefit, is not likely to be successful from the point of view of the whole group and probably should not be characterized as an adaptive network.

Theoretical questions: focus on goal-seeking in a context of order-seeking

In this book I focus on the innovation-oriented goal-seeking component, which is carried by adaptive networks. I observe how it can emerge in a context of

order seeking, bridging the tension generated by what seems a governance para-dox. The tension has many appearances, like order – change, power – creativity, short-term – long-term, stabilizing the status quo – innovation of societal sys-tems. I look at all themes: content, structure, process, conduct and reward, and I study public managers, change managers, who display connecting behavior, looking for new goals and making others enthusiastic to follow in that quest by linking knowledge about social context and technological options. Due to the fact that these interconnecting leaders often are not in the limelight of our me-dia-oriented democracy, there is not much known about what they do and how effective they are.

I consider the question how the two parallel worlds co-evolve. Where can tensions be pointed out that lead to new solutions, and where are the tensions unproductive? Is there a power context that invites co-evolutionary initiatives? Do adaptive networks know what to do to appeal to power? It is my assumption that a productive co-evolution of innovative and intertwining ways of manage-ment and control-oriented approach has to be based upon three conditions. First the adaptive network that evolves has to create *internal trust* (i.e. trust between members of an adaptive network) and *external trust* (trust between adaptive networks and power networks), because these attempts have an organizational border-crossing character by definition, and so take place in a context of con-trasting objectives and competition for support. In this book I present theories on trust and develop from these theories a theoretical model to analyze the process of trust building (or loss of trust). Third, I assume that in order to develop initia-tives that change the present system an adaptive network needs capacities of *foresight*. This foresight, in order to assess the potential effectiveness of coop-eration and create a belief, may concern the future of all themes (content, struc-ture, process, conduct, reward).

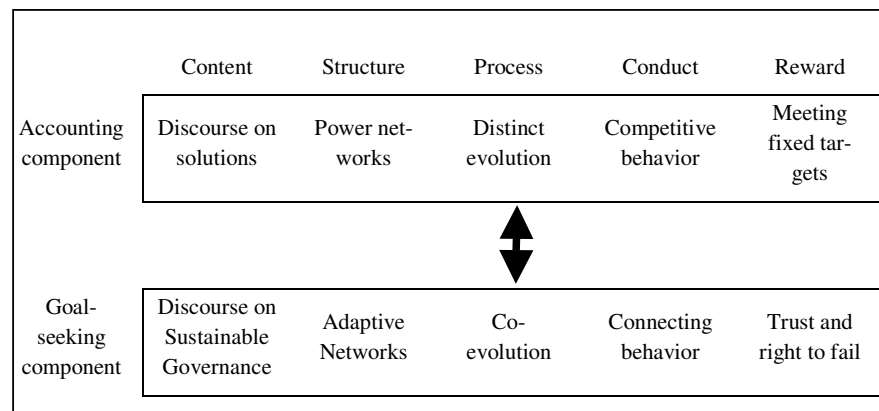**Figure 3. Overview of key words in section 1.2**
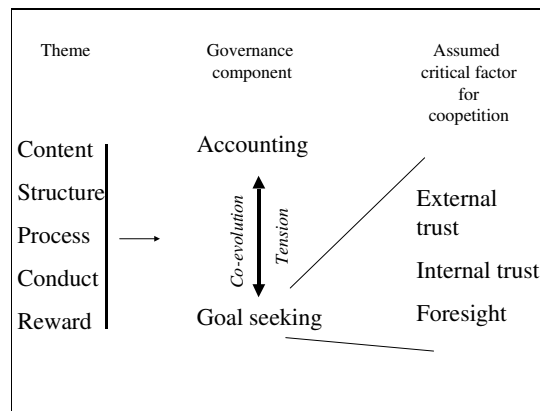
If all three assumptions are accurate for a given adaptive network, I assume it has the ability to cooperate in a context of competition and contrasting interests. This crucial competence of connecting leaders, for which they have to make others enthusiastic too, is termed *coopetition* (Brandenburger & Nalebuff 1996). If this ability is present, people can see that the cooperation may have benefits and may reward them. They can consciously ensure that trust is continuously generated in the process. They hope that by linking the knowledge they have, they can develop proposals that are acceptable, being in the interest of the power network. I elaborate the aspects of this cooperation in competition competence and develop a model.

An overview of key words in this section is presented in Figure 3 and in Figure 4. In order to underpin and test my theoretical thoughts I do case study analyses in Dutch attempts to create sustainable development, under the transition discourse. My theoretical questions are:

- How can the idea of adaptive networks, including ideas about trust and coopetition, be related to existing theories of complexity and change? This question is answered in chapter 2, which includes the philosophical question related to the evaluation of the sustainability of ideas;
- How can these theories be operationalized to observe adaptive networks, their interaction with power networks, and the spreading of sustainable ideas in the real world? Do the theoretical ideas help to explain the content, structure, process, conduct and reward in the case of a specific adaptive network? Which questions should I answer to give more clarity? This is considered in chapter 3;
- Which lessons for sustainable change management, contributing to sustainable governance, can be drawn? This is answered in chapter 7, which deals with issues like coopetition, which, as conduct in adaptive networks, may contribute to a more adaptable society.

Figure 4. Change management as connecting behavior

	Content	Structure	Process	Conduct	Reward
Accounting component	Discourse on solutions	Power networks	Distinct evolution	Competitive behavior	Meeting fixed targets
Goal-seeking component	Discourse on Sustainable Governance	Adaptive Networks	Co-evolution	Connecting behavior	Trust and right to fail

The empirical research object, transition management, and the empirical questions, are introduced in 1.4 – 1.6.

1.4   The empirical research object: transition management

The transition discourse

The theoretical research object, as introduced above, is the goal-seeking component of governance. This is behavior that takes place in structures termed adaptive networks, and it leads to a process that generates new content.

The empirical research object is the *transition discourse*, which is characterized as follows:

- *Content*: the transition discourse in the Netherlands (2000 – 2005);
- *Structure*: the structures that emerged and that produced the transition discourse, that is the team that prepared the 4th National Environmental Policy (NMP4) (VROM 2001), and three follow-up processes of NMP4 (the Innovation Board Sustainable Mobility, the Energy Transition Process and Inter-ministerial Cooperation);
- *Process*: the goal-seeking interactions that took place in these structures, and between these structures and the outside world, and which explain the emerging and evolution of structures;
- *Conduct*: the goal-seeking behavior of influential participants which explains the process;
- *Reward*: how these individuals expect to be rewarded for their behavior.

The NMP4, published in 2001, is widely seen as a landmark in the process of the transition discourse, and gives it its name (see 1.5 on Page 28). However, earlier forms of this discourse already emerged in the 1990s, and after 2001 its evolution has continued. In 2006 it is still alive; it has evolved into an inter-ministerial program.

As indicated above under Change management as management of tensions (Page 20), the transition discourse is interesting because it is a discourse about the goal-seeking component. It creates some legitimacy for goal-seeking behavior. An interesting question is; does that help? Before describing in detail what happened in chapters 4 - 6, I give a general introduction to the rise and consolidation of the transition discourse. For further illustration I include parts of the NMP4 text and summaries of influential precursor studies and processes.

The transition discourse around 2001

The recognition of sustainable development as wicked problem and the need for goal seeking has emerged in Dutch and international policy networks that aim at sustainable development (in particular environmentally sustainable development) in the late 1990s, after circles involved with environmental policies had been disappointed with the effects of their earlier efforts. Similar noises were

heard in the USA (National Research Council 1999) and in the EU (Open Method of Coordination).

The problem analysis can be read from the NMP4 and several precursor studies and magazine articles. Influential people saw as main barrier to sustainable development that two types of processes were never connected. One type were the processes aiming at sustainable development, with primarily a long-term market focus. The other types were the processes aiming at economic development, with primarily a short-term market focus. The short-term goal of the sustainability projects was to illustrate the feasibility of sustainable development, and to convince decision-makers to take the appropriate measures. Only the first goal was achieved. In my words, both process types contained mainly interactions of the accounting type, which made them incompatible. Given complexity of sustainable development there was no sufficiently large-scale co-evolution of ideas; a case of fragmented power networks where every process was dominated by someone's short-term motives and therefore not credible to the other side. The first type of processes never became concrete; the second type never was accepted.

The solution was sought in learning processes between the domains that share an interest in the future of societal systems like mobility, energy, agriculture and international trade. The domains were identified as businesses, governments, NGOs and academics. According to NMP4, forerunners from different domains should come together and focus on the removal of the more specific barriers to sustainable development, like unfit regulations or a wrong playing field for the market. These 'arenas' should apply heuristics like learning by doing, backcasting, and keeping options open. The competence of system's thinking was seen as critical. And finally, the NMP4 indicated that the government should encourage such processes. In my interpretation, this was a call for adaptive networks, but without making a complete analysis of success conditions. The difference between power networks and adaptive networks was conceptualized by applying the concept of 'forerunners', which suggest these groups are, or should be, prepared to take some risk and spend some time. The assignment of these groups was on purpose formulated wide and on a 30-year horizon, leaving considerable room for goal seeking. The flipside was, of course, that this assignment was not accountable. This idea became embedded in government policies in NMP4 in 2001, which called this type of process transition management, and indicated that the government should stimulate it.

The linkage of the transition discourse with the innovation discourse

In The Netherlands after 2001, several Dutch (non-environmental) ministries initiated groups (so-called transition arenas), which had the aim of sustainable development in specific sectors like energy, mobility, agriculture and international trade. The environment ministry VROM, having the task of coordinating and reporting to Parliament about transition management, organized a group to catch the generic lessons learned in the separate transition groups. In the sessions of these groups, people from practice and academics were invited to share

views. These sessions were in the first years organized by VROM, and around 2004 this was taken over by networks of research and knowledge organizations, financed by several ministries. The ministry responsible for energy (EZ) set up a 'competence center transition management'.

A strong conceptual linkage had developed between the idea of transition management and the idea of innovation management. Whereas 'system innovations' had been almost synonymous with 'transitions' all along, people became increasingly aware that sustainable development by itself is less likely to gather enough momentum. It had to be made more tangible by linking it to other urgencies like energy security and competitive power of the Dutch economy – it was said that the Dutch should become forerunners with sustainable services and techniques. The linkage between the discourses about transitions and about innovations, carried by different power networks, was thought to help, since they both encouraged goal-seeking activities.

Table 1. Principles of transition management according to several authors in the magazine ArenA (several issues 2004)

Emphasize in your communications the urgency of the problem (whatever its solution), in order to claim more resources for goal seeking. Feed the dialogues that form the core of the goal seeking with transdisciplinary research – organize variation but also select once in a while.
Let management take part in goal seeking, to get their commitment and to select; enabling political discussion to concentrate on main lines and conditions for goal seeking
Have the courage to get rid of old regulations if these block transitions
Accept that bureaucracy always has difficulty to change and enable internal competition by making room for innovations at the highest management level
Different ministries should be more self-conscious and jointly make agreements about problems and solutions with economical sectors
Explain to the impatient environmental movement why it all takes so long: ideas that are proposed at political level are vulnerable; you first need to organize support about main lines

Throughout 2001 – 2005, there were regular publications about transition management in the journal ArenA of the Netherlands Association of Environmental Professionals. Several academics published about it, as well as an organization NIDO (National Initiative Sustainable Development). In 2004, I published an overview paper of several previous publications by influential thinkers about sustainable development, all in ArenA. These thinkers were Peter Aubert, Jaap Jelle Feenstra, Leo Jansen, Derk Loorbach, Jan Rotmans and Roel In 't Veld. They were civil servants, university professors, one former Parliamentarian and one former Cabinet member. All gave their view about the improvement of transition management, which I summarized in Table 1. These views demonstrate

that the environmental sector tried to become more skilled in goal seeking, and was asking questions about the nature and quality of behavior in adaptive networks.

1.5   Relevant content of Dutch environmental policies

To illustrate the transition discourse I have translated some passages of the 4th National Environmental Policy (NMP4):

> '… we need to make choice now that may have benefits only after 30 years. This results in a different kind of NMP; its horizon is 30 years and encompasses the worldwide implications of our actions. We have been successful in the past and also these ambitions can be achieved with a well-organized approach.'

> '… past successes have been significant but limited to policies that do not need to change the economic or societal system. However, we have run into difficult problems, which need worldwide system innovations or transitions. Several past efforts to address these problems have been evaluated. The Paper on environment and economy (1997) already indicated that private actors (the market) shared responsibility with governments to achieve 'delinkage' of economic growth and environmental pressures. The evaluation reveals limited success: joint action had been taken, but not leading to enough delinkage. Stronger interventions are needed to ensure adverse effects are incorporated in prices. This is technically and politically difficult. 'Cabinet believes that its policies should be directed towards internalization of external costs in prices.' In another evaluation, the conclusion was drawn that politics is unwilling to develop interventions that would have disastrous economic effects for specific sectors, despite leading to overall more welfare (with the example of intensive farming). A more important fail-factor, however, was the Dutch habit to formulate 'accountable' environmental targets without knowing whether these are feasible or what their implications are. Instruments don't work because they are not based on a sound analysis of costs and benefits. Once there is enough agreement, market-based instruments are most effective. Policies like the Kyoto protocol are extremely uncertain, and The Netherlands would do well to seek international allies to implement measures without that context.'

> '…. the following difficult worldwide problems need our attention: loss of biodiversity, climate change, overexploitation of natural resources (wood, fish, clean water, clean air, fertile soil, energy), health threats (of partly unknown substances and food), risk of large scale accidents, deterioration of the living environment, possibly uncontrollable risks because of unforeseen conflicts between the natural system and the human system. To address the problems there is a need for 'global governance', to make use of the opportunities of globalization. It is not difficult to sketch an ideal world in terms of desirable life conditions, but there are barriers. These are unequal distribution, short term thinking, fragmentation and a lack of effective institutions, limited instruments, problems cannot be solved by those who experience them, extreme uncertainties around solutions, a lack of proactive attitude.'

'Therefore a new kind of policy is needed: systems innovation based on key principles like sustainable development. We need more integrated policies, and rich countries need to take primary responsibility. Objectives should be clear for the long term but also flexible. This is a shared responsibility and the role of the government is to have the overview and to link parties to share their knowledge. (These parties aimed at were forerunners from corporations, NGOs, governments and academics.) It should stimulate research and action, and create the right conditions for all parties to take their responsibilities. Where necessary, the government intervenes with more traditional instruments, in particular market-based instruments and voluntary agreements. This is the government's contribution to transition management, which is the process that is needed to create sustainable system innovations. Transition management has the following features:

- learning to handle uncertainties, among other things by working with scenarios;

- keep options open and reduce fragmentation of policies: stimulate knowledge and technological development, create innovations and improvement, think in terms of multiple domains and agents;

- long term thinking as framework for short term policies;

- attention for the international dimension of change processes and searching for solutions at the right scale.'

According to NMP4, this approach should be applied on a system-by-system basis, with priority for the agricultural system, the system that creates pressure on international biodiversity and use of natural resources, and the energy system (also addressing mobility). For each system the environmental and other urgencies are indicated, and possible scenarios are sketched.

1.6   Other publications in the transition discourse

The text of NMP4 has resulted from the way it had been prepared: in dialogue with stakeholders and academics. People from all relevant domains (NGOs, corporations, academics, governments) had participated and supported the discourse. Their opinions had been formed in perhaps a decade of failing sustainability policies, and these experiences had been reported in earlier publications, which also made recommendations. In Table 2 I summarize precursor studies done by VROM, in addition to those already quoted in NMP4 itself (see under 1.5).

Table 2. NMP4 precursor **studies by or on behalf of VROM**

Bekkers, Heijne, Frissen, Ester 1996. Governance conceptions and instruments in environmental policies. In search for forms of co-production. The authors indicate that an open policy style is more effective. Objectives should be results rather than starting points. Moderators may assist in developing realistic perceptions between parties and developing joint action based on multiple goals. Incremental decision-making, through linking the process with cru-

cial decision-makers, increases support. This 'co-production' demands high strategic and tactic competencies of the participants. VROM should become moderator, architect of decision-making arrangements, referee, allocator of resources, and connector of scales.

VROM Council 1998. Advice on the 3rd National Environmental Policy (NMP3). This advice council referred to a 'greenpolder model' where societal partners (all relevant domains) negotiate about spatial government decisions, and indicated that an NMP4 was necessary to embed such main lines.

Cabinet 1999. Inception note for a paper on spatial planning. It indicated that a new governance approach was under development, which appeased environmental and other desires. It had the features that include an open policy process, subsidiarity and use of the 'greenpolder model'.

ORIGIN/Institute for Societal Innovation 1999. Learning and Innovation. Lessons from the private sector, opportunities for VROM. The authors reviewed theories about the learning organization and 'the learning society'. Their conclusion was that VROM needed to apply such ideas more strongly, including improving related competencies of their employees, and providing a context for innovation processes outside and inside VROM *(Ctd next page)*

to compete for government support and resources. In these processes VROM could be connector as well as implementer of actions.

Article by Leo Jansen in ArenA, May 1999. Leo Janssen had been program manager of the inter-ministerial program Sustainable Technological Development (DTO). Here sustainable scenarios had been created together with the agents who could implement these scenarios. In this article he indicated that for sustainable development we need a coordinated change of culture, structure and technology and leadership.

Above the clover flower the daisies; societal network for innovations directed toward sustainability; Henk Diepenmaat & Harry Te Riele, 2001. This was a report written by two consultants with a background in process management and innovation. VROM had asked them to develop a perspective for a process of system innovation. They had developed the idea of innovation teams and strategic teams, both composed of individuals with influence and knowledge from all domains: businesses, governments, civil society, academics, intermediary organizations and citizens. The operational teams would have to develop concrete innovations under the guidance of the strategic teams, which would have to ensure political support. The report was prepared when the ideas about transition management were still formed, and was of influence to the NMP4.

Transition management, the case of a sustainable energy system (Rotmans e.a. 2001). A particular influential study in 2001, which was prepared by Rotmans e.a., introduced the word 'transition management', which became building block for the NMP4. The study was an exercise of the type of analysis that could be made by an imaginary learning group striving for a transition to a sustainable energy system. In particular a diagram showing an S-curve with the phases of a large-scale transition became widely quoted in the discussions during and after preparations of NMP4. The S-curve showed that societal change processes are not linear but large systems can quickly (i.e. within a generation) move to a different equilibrium. They can also be inert if actions to distort the equilibrium are absorbed by short-term interests (lock-in).

The challenge of transition management was defined as forming a joint vision about desirable outcomes of transitions ('a basket of objectives') and letting this be leading for actions to develop dynamic views ('learning by doing') of how short term interventions can lead to paths of development that fit the vision (transition paths). The key was to think backwards in time, ensuring that short-term actions fit the vision, and if that is not possible keeping all options open and take joint action to reduce uncertainties. Actions aim at developing new economic niches with an eye on breakthroughs at regime level and ultimately at landscape level of socio-economic systems.

An example of a research program for sustainable development

One of the experiences that opened many people's eyes for the need for transition management was the DTO program (DTO is a Dutch acronym for Sustainable Technological Development) (Aarts 1997). The objective of the program, which was a cooperation of four ministries, was to illustrate how cooperation around sustainable technology can make our development more sustainable. In the period 1994 – 1999, seven illustration projects were implemented in unsustainable activities like building, feeding, residing, water, washing, chemicals and transporting. The projects were co-productions of the program bureau with industries and other societal groups. Dozens, if not hundreds of individuals had been involved.

In each process the same joint steps were made: a strategic problem exploration, a sketch of a sustainable future, backcasting to action now, definition, elaboration and implementation. In 1997 the program was evaluated (Aarts 1997). The conclusion was that despite the fact than many people believed certain sustainable scenarios, a breakthrough was not in sight. Either the projects had become devaluated to become incremental, or they were not feasible or politically acceptable in the short term.

Vergragt & Jansen (2001), who had been closely involved in DTO, concluded that non-technological barriers culture and structure were at least as important, and that the processes drifted off into a direction that would be interesting for the short term of involved stakeholders, without staying in tune with the long term. They drew some lessons as explicit recommendations for those who would be implementing the ideas of NMP4 about transition management. One was that stakeholder involvement is key – in order to understand on what basis they would cooperate. The role of the government would be to formulate challenges for the long term, but otherwise it should be limited. It should remove barriers in legislation, but its fragmentation reduces possibilities for other roles. At present it only looks four years ahead. They identified fragmentation and short sightedness of government and politicians as key bottlenecks, and that it was time for a 3rd generation of environmental policies: to remove structural barriers without falling back to blueprint planning. The government should help creating niches where innovative companies can experiment. This first phase is unattractive for companies, due to uncertain payback and ownership of the created knowledge.

In 2001, another article also looked back on DTO (Van Kasteren 2001). It came to similar conclusions. Despite the fact that many projects had been followed up by further research or pilot projects, no breakthroughs could be reported. The initiators were uncertain about the market demand for their ideas. One program coordinator compared the program with building a cathedral: the return on investment is too small. Industries cannot take the initiative. Further more, a breakthrough depends on a change of culture and societal structures. There simply is no sustainable technology available that the market can absorb.

The greenpolder model

The greenpolder model was a discourse and a procedure in the late 1990s and early 2000s, about the way interactions should take place with respect to large spatial investments. It has been the platform for several discussions about sustainable development where the environment movement met economic forces under the context of a government decision. This section is strongly based on Teisman & Nooteboom (in prep). Other international publications about the Greenpolder Model are Glasbergen (2002) and Deelstra *et al* (2003). In depth cases studies in Dutch are presented in Weggeman (2003).

The Greenpolder is an evolved form of the better-known Dutch polder model. The polder model is a specific pattern of interactions that emerged in the Dutch polder culture in the 1980s. It was a context for cooperation between employer's and workers unions to keep wage negotiations and other social policy negotiations from getting out of hand. The Dutch polder model has some international appeal, despite the fact that it is criticized for decades. President Clinton commended it, when he and Prime Minister Kok of the Netherlands met at the end of the last century. Three characteristics are indicated as essentials of the Dutch polder model (Pleij 2005): (1) Joint decision-making is based on exchange of arguments. Arguments will work when they are able to convince the other and if they clarify point of disagreement; (2) Respect for dissent and giving dissenters the opportunity to express themselves; there is an open orientation towards inclusion, not exclusion; (3) Participants are guided by the pragmatism of daily life and looking for efficient and manageable socially broad basis. In the early 2000s the Dutch economy was less successful and the polder model was accused of delaying decisions, short-term thinking and incapability of making decisions altogether. Pleij (2005) however argues that the Dutch polder model must not be abandoned because it is 'a beautiful and socially well-trained decision-making technique that already exists in the Netherlands for ages'. In his eyes it is a nice self-willed combination of conflict and consensus.

However, the polder model was exclusively aimed at socio-economic policies. During the 1990s the controversy about major investments in national physical infrastructure strengthened. The opposition against these investments was growing as were the environmental demands posed to these investments. In order to deal with the growing resistance more open and interactive approaches were applied (for empirical evidence in the Netherlands: Edelenbos 2000, Hendriks & Tops 2001). The most serious problems arose in the two interna-

tional so-called mainports of the Netherlands: the Rotterdam Harbour and Schiphol Airport in Amsterdam. Important investments were needed in order to preserve their high positions in the international rankings of mainports. On the other hand the policy towards sustainable development – adopted by national, regional and local governments determined limits to growth. The two mainport-developments were considered to be bifurcations and test cases that require strategic decisions about the future of The Netherlands as a whole.

It seemed to be impossible to find solutions for mainport development that could fit at the same time the economic demands and the ecological ambitions. In order to find solutions that could fit both demands and could lead to a more solid societal support of economic and environmental lobby groups a specific interactive approach was started. This approach was called the Greenpolder Model. The idea came from participants in the Socio-Economic Council (SER). They translated their traditional polder deliberation approach oriented towards the cleavage between economy and social welfare to the new upcoming cleavage between economy and sustainability. The advisory council of the Ministry of the Environment suggested using this idea in the physical planning domain. The concept was adopted by national government and used for 'mainport' decision-making. The quick adoption probably has much to do with the relative success of the Dutch economy during the 1990s.

The then existing interactive approaches in Amsterdam and Rotterdam were transformed into the Temporary Platform for Deliberation about Schiphol (TOPS) and the Project Mainport Rotterdam (PMR). Environmental groups and representatives of private companies active in the mainports were invited to look for joint results. TOPS was successful in terms of joint fact finding (Deelstra *et al* 2003, Weggeman 2003). In a short period an enormous amount of facts and figures were produced and several participants got the impression that a kind of joint understanding was growing. It however failed to come to joint conclusion. The main reason for that was that the aviation industry did not want to come to such a conclusion in deliberation with the environmental groups without having some kind of consent with national government. National government however was not willing to due so. This noncommittal approach is in clear contrast with what often happened in the classic polder model. So, national government did not seem to be ready for a new polder approach if that should lead to changes in their own policy making process.

The PMR process was more successful. The environmental groups and the Port Authority as representative of the private sector did succeed to reach a joint conclusion: a new polder for harbour activities reclaimed from the sea and new natural areas to compensate the land reclamation. Once this alliance was concluded it became almost impossible for national government to neglect the outcome of PMR. The minister was not very pleased with it. She got the impression that non-governmental alliances ruled the sector. So, even though the outcome is seen as an important success, also this case indicates that government was not really ready for a new polder approach. It was for these reasons that the greenpolder concept became less popular at the end of the 20th century.

The polder model and the greenpolder model are mainly based upon three characteristics. First of all it is based on tripartite talks. Government, private companies and civil society are involved in joint decision-making. Secondly, the negotiations take place between people with a substantial rank and file in governmental organizations, private companies or non-profit. Thirdly, they are looking for and gaining a balance over and over again between partially overlapping and partially conflicting interests (negotiations in long rows of games). In the case of the greenpolder model, in contrast with the traditional polder model, the private and societal participants were not in a position to negotiate as they had been in the traditional polder model. A lot of the gains of the game could not be translated in direct financial terms and government claimed a much more prominent role. For the non-governmental participants, it was a closed shop. There are clear signs that government did not take the results as serious as it did in the traditional polder model (Teisman & Nooteboom in prep). The Greenpolder Model approach worked in certain respects well in a few concrete cases (the development of a new port area in the Rotterdam). Overall however the Greenpolder Model was not seen as a highly successful arrangement. The main reason was that the environmental groups and the lobby groups of the business community were not able to make deals with each other, like they were used to do in the traditional polder model. Government was too heavily involved in the environmental issue and was not willing to share responsibility with the two other participants in the Greenpolder Model. Often governmental officials used the divergence of opinions between the two lobby groups as a permit to go on with their own policy proposals and approaches. And if the two groups really achieved a joint result of negotiation, as in the Rotterdam Port case, the minister was not satisfied because she got the idea of not being in charge. In particular the Rotterdam case has been a learning process for involved parties. Societal partners made a deal about a large extension of Rotterdam Port based on a joint vision about the development of the transport sector in general. On the one hand it was satisfactory that such a process was possible between the environmental movement and the economic sectors, on the other hand it was also clear that the outcome was still in many ways a compromise.

Empirical questions

In this book I address the following questions about the transition management discourse: How did power networks evolve, and where can adaptive networks be hypothesized as an explanation of that evolution? (answered in chapter 4). How did adaptive networks evolve, and where can change managers be hypothesized as an explanation for that evolution? (answered in chapter 5). How did change managers influence development? (answered in chapter 6). These questions are further explained in section 3.7.

2   Theoretical notions of complexity

If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow (Rachel Carsons)

On page 23 I have described possible dilemmas that the governance paradox may produce, like the tension between conduct aimed at short-term benefits and long-term benefits. These dilemmas are not new to the social sciences. What can we learn from existing scientific literature about the existence of co-evolution between accounting behavior in power networks and goal seeking behavior in adaptive networks?

In this chapter I present an overview of existing theories, and I take it as it is offered to me: discipline-by-discipline. I start my search in the political (and public administration) sciences, from where I explore private and public management theories, which I build up from economic theories to knowledge management and innovation management. From there I focus on complexity theories that have recently developed in these and other sciences. Finally I will highlight some insights from theories on trust. This overview serves as a background base for developing an operational framework for empirical analysis, which is developed in chapter 3.

2.1   *Political sciences*

Machiavelli

It seems sensible to start this theoretical exploration in the political sciences. After all, Machiavelli said already in 1515: 'There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.' and, even more cynical, 'Men are always wicked at bottom unless they are made good by some compulsion.' (from *The Prince*). A deep paradox can be felt in his work, between the need to be wicked in order to achieve power, and the need to be good for the general benefit. 'For injuries ought to be done all at one time, so that, being tasted less, they offend less; benefits ought to be given little by little, so that the flavor of them may last longer.' Even if 'to do good by some compulsion' is their primary goal, leaders first have to achieve and maintain power. Obviously, in Machiavelli's eyes, knowledge about the impacts of actions is

only relevant to rulers if it helps them to achieve and maintain power, and then perhaps, 'to do good by some compulsion'.

Modern classics

Classic modern theorists (Simon 1957, March & Olson 1976, March 1994) still believe decision-making is only partly based on collective rationality. Of course, democracy, new technologies and globalization have had some impact after 1515. In the stable Western world of the 2000s, 'wicked' more has a meaning of playing games, which can be as dirty as the prevailing political culture allows. Rulers now have to share political power and cannot use repression. Perhaps leaders now can make use of research and ITC to develop better ideas of what the people would view as benefits, making it easier to 'do good'. The margins for politicians have also become narrower since their power basis depends on their inflexible political program. The voter may be better educated, enabling him to choose the best program or person. On the other hand, the societal system is more complex and more difficult to influence with political power – it has its own, fast dynamics. It is increasingly 'governanced' in networks, coalitions of agents who have related interests in the system (Castells 1996). Perhaps ITC makes governance in networks, where rulers share power in a complex society, more effective, since it is easier to make and adjust agreements for joint action. However, complexity makes it more difficult to maintain a power basis, since action is difficult to explain to voters.

There is no 'knowable' rational complex decision

The competent decision-maker, once being in power, may be supposed to act in the interest of society. However, even then, political sciences know no way of evaluating that he does. The first, rather philosophical, question that therefore must be asked is: 'Is there in theory a criterion available to determine whether a decision is rational from the point of view of society as a whole'? Whereas traditional welfare theory usually gives a negative answer to this question (e.g. De Bruin *et al.* 1998), several social scientists try to deal with this question within a constructivist paradigm (see also Page 23 and Jasanoff & Wynne 1998). Under that paradigm, a belief in the rationality of certain decisions is constructed through social interaction processes. Different social groups have different rationalities. The question whether there is some yet unknown joint rationality of which social groups are unaware, and of which they might become aware through a social learning process, is theoretically unanswerable. If it is assumed that such rationality exists, it only can be constructed by way of that interaction process –a 'social learning process'.

Tracing back a policy process, decisions must therefore be seen as clews of actions by many interdependent agents. Every once in a while an idea breaks through, which is remembered by many. These events and the periods between two breakthroughs may be called development rounds (Teisman 1992). As I explain hereafter under complexity theory, development rounds (or breakthroughs in thinking which are in hindsight linked to specific formal decisions)

are the result of non-linear developments or transitions in a relatively small social subsystem.

Process and rationality in governance networks

Since 1990 a dramatic increase has occurred in publications about the idea of policy networks and governance in networks of private and public agents (e.g. Powell (1990), contrasting networks with markets and hierarchies; Castells (1996), proclaiming a network society). Globalization has increased the relative significance of networks of interdependent agents, who might or might not cooperate. Decision-making processes become clews of rows of decisions in which the interaction is crucial for the outcomes (Teisman 1992, 1995, 1998). There is no single decision-maker who can take a 'rational decision'. Rather, the 'decision' is a sequence of interactions between policy makers who represent stakeholders like businesses and governments. Each unilateral 'action' and 're-action' represents a small decision. These small decisions add up to joint views or decisions by larger, co-operating groups. A number of competing or cooperating arenas try to influence decisions by a competent authority.

If power is distributed in networks, accounting a single actor for the outcomes does not cater to better decisions. No single actor has the interactions fully under control. The implication is that the content of complex public decisions can only be evaluated from a mono-rational point of view, which obviously is insufficient. However, there might be more agreement about the most desirable process of decision-making rather than its result. For example, a decision that was prepared according to democratic rules might be acceptable to most groups in a certain society. This decision represents process rationality. We enter a paradox: the most influential 'small decisions' are not so much taken in the procedural steps, but rather in informal interactions that cannot be regulated. Therefore, the content of the resulting formal decision will mainly be rational from the viewpoint of those being able to make the most influential small decisions (e.g. In 't Veld 2000).

In reality, in line with Machiavelli, the social context of the personal networks of a policy maker is more important than any 'rational' information that is offered to him by others (March 1998). Participants in the policy process will use information about impact of current or potential action only if it helps them to explain to their own rank and file why they should support the outcomes. If such policy maker has learned something through his interactions in the arena that has changed his rationality, he must be able to share this lesson with his own organization or supporter group, or a mismatch with his short-term interests will result and he will not be able to maintain position. The cognitive learning abilities of people are limited, leading to a *bounded rationality* (Simon 1957). Alternative actions that might be sustainable cannot be understood. Policymakers have no choice but opting for the short-term interests created by collective bounded rationality. This explains inertia in the face of overwhelming evidence that things go wrong.

Common rationalities

Where bounded rationality hampers governance from a collective rationality, collective rationalities do exist to some extent. The process that leads to them is often called social learning (in the management sciences it is also called knowledge management, see page 43). One of the first authors to deal with his was Lindblom (1965) who described 'partisan mutual adjustment' as behavior that leads to some level of coordination among different actors in a network, which increased 'the intelligence of democracy'. Heclo (1974) referred to puzzling and powering in networks, where 'much political interaction constitutes a process of social learning expressed through policy'. Authors like Scharpf (1997) studied the conditions under which actors in a network are rewarded for conduct in game-theoretic terms; i.e. by some clear and predefined payoff for themselves. He infers that complex problem solving is unlikely because it depends on rare capabilities.

Nonetheless common rationalities do exist. Peter Hall (1993) described changes of dominant rationalities, which he called paradigm shifts. The emergence of rationalities in networks is also described in *Discourse Theory*. Hajer (2003) defines discourse as an ensemble of ideas, concepts, and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices. He claims:

> 'It should be possible not only to identify discourses but to assess their influence as well. Two terms facilitate this: discourse structuring occurs when a discourse starts to dominate the way a given social unit (a policy domain, a firm, a society – all depending on the research question) conceptualizes the world. If a discourse solidifies in particular institutional arrangements, say a measuring system for air pollution, then we speak of discourse institutionalization. We thus have a simple two-step procedure for measuring the influence of a discourse: if many people use it to conceptualize the world (discourse structuring) and if it solidifies into institutions and organizational practices (discourse institutionalization).'

Governments have tried to stimulate social learning by organizing a transparent and participative process. As 'game leader', the government might try to create new interdependencies between actor groups, so that they can negotiate about policies at early stages and possibly adjust their agendas. Ideally, a collective rationality would emerge. Policy arenas often request the government to undertake such action, which is then often termed 'interactive policy-making' (Edelenbos 2000, Healey 1997, Innes and Booher 1999). It is also said that the government may moderate learning networks, like Kofi Anan's Global Compact (Ruggie, 2002), and the transition management discourse in The Netherlands.

Unfortunately, governments have not been very successful in stimulating social learning that leads to a 'merging', or at least attuning, of discourses. The interdependencies are pervasive and asymmetric (one group is more dependent on the other than vice versa). The more interests are linked in a negotiation package, the more difficult it becomes to develop joint action that satisfies all parties, whilst any single party can block a general agreement (Edelenbos 2000).

There is frequently no single negotiation process, but a number of parallel and competing arenas trying to influence government decision-making. This process is not controlled or moderated by anybody. These arenas do not represent all influential perceptions. The processes in and between such partial arenas have, for example, been described as policy advocacy coalitions (Sabatier 1991).

As different networks have competing or conflicting ideas, pushing and giving an overload of information will provoke more countervailing power by those who defend their immediate interests (Galbraith 1952). In a democracy, countervailing powers can have significant influence and create balance as well as inertia, depending on whether there is cooperation between the powers. Opponents may believe that there could be potential benefits of cooperation, but the costs in terms of the time required to get to joint action are too high (Kickert 1997). In many cases, the actors do not agree on what the problem actually is, or on the type of knowledge that is useful to solve the problem (ill-structured or 'wicked' problems). Under such conditions, negotiating actors may fear that they will get no support for any progress made; i.e., the political cost of shifting positions will be too high, which brings us back to Machiavelli. On the other hand, cooperation may work and solutions for the common benefit can be found. This may be heavily influenced by cultural traits. The Dutch polder model, for example, is about deals between employer's organizations and labor union about socio-economic policies. Bill Clinton and Tony Blair have commended it, but in the early 2000s it became less functional. Anton Hemerijck, a political scientist and expert in the polder model, said at the time 'Sooner or later the Dutch will return to negotiating with each other again, after all, that's what they do best.' (The Economist, 2004). The green polder model, which has already been summarized on Page 32, is a similar approach, applied to large spatial decisions.

In the 1990s and 2000s in The Netherlands, a number of discourses about governance have emerged quite strongly, and penetrated into parliamentary discussions and official policy papers. Examples are not only 'interactive policy making' and 'greenpolder model', but recently also 'different government' (headed by a dedicated minister), 'transition management', and 'development planning' (in spatial policies). Such discourses are, in political networks, generalized under the title 'innovation of governance'. The general idea among Dutch public management theorists is that such 'linguistic innovations' (Van Twist 1994) are necessary to achieve a more common rationality also at the level of policies, but also that the success probably is limited.

Formalizing complex decision-making processes

Discourses about governance can institutionalize just as well as other policy discourses. In that way, efforts have been made to get the dilemmas created by bounded rationality under control by means of formalized decision-making processes. The institutionalization of the polder model, and to a lesser extent the green polder model, can also be seen as such efforts. An early and successful effort was the division of the executive, legislative and judiciary powers proposed by Montesquieu in the 18th Century as the *Trias Politica*. Later, more

detailed rules developed with the aim of discouraging policy making against certain interests, rules about transparency of public information or provision of information before decisions are made. Such developments are often driven by international treaties, like the Rio Declaration on Environment and Development (UN 1992), which has strongly encouraged formalization of Environmental Impact Assessment and Strategic Environmental Assessment. The general view about effectiveness of such instruments is that whereas they may protect against obvious mistakes, in complex situations they do not really help to develop new common rationalities (Nooteboom & Teisman 2003). Our point in 2003 was that a more relevant question is whether the different actors, despite differences, are willing to cooperate. Procedures form no guarantee that they will do that. The government can try to moderate cooperation, but this is difficult to formalize in procedures, and it probably does not depend on the existence of formal procedures, as long as the government remains authority for crucial development decisions. The government could initiate a process of changing the interaction patterns. The 'rules of the game' determine whether actors accept knowledge offered by others if it doesn't support their position. If they do, such knowledge may be termed a 'serviceable truth' or 'negotiated knowledge' (e.g. Jasanoff 1990, In 't Veld 2000). Such common rationalities can be developed without detailed procedures, as long as the political force field creates interdependencies between actors, so that there is an incentive to cooperate.

Coopetition

The processes where moderators succeed in helping opponents to cooperate are difficult to formalize. Under the 'threat' of government action or under the pressure of countervailing powers, these processes can emerge if actors are prepared to cooperate to some extent. As the puzzle becomes more complex, the outcomes are more often a compromise than they are the best possible outcome. Good solutions without adverse side effects are usually not found under these conditions. Scharpf (1997) explains that complex problems require a process he terms 'problem solving', which needs a common agreement regarding the overarching policy goals. Such agreement in his view difficult to combine with the negotiation process that also is needed under complex conditions, to enable government decisions. Combining the two modes of interaction requires exceptional skills of simultaneously negotiating and cooperating (Scharpf 1997). On the other hand, cooperation between opponents may also emerge without the pressure of programmed governmental action. Policy entrepreneurs may take the initiative for such cooperation, being keen on opportunities to link discourses (Kingdon 1995). 'Co-opetitive' relationships, where those who compete for customers, members or voters jointly structure the context of their competition, may increase the acceptance of knowledge as useful for decision-making (Brandenburger & Nalebuff 1996).

Lessons from political science

Machiavelli's thinking still stands. Political leaders must be in a comfortable position before they can manage change. Under complex conditions there is a paradox, since many leaders must work together, whilst they are also competitors for power. A comfortable position suggests inertia rather than change. In democracies interdependence is created in networks, which forms an incentive to search for common rationalities. This leads to behavior of puzzling and powering, where to some extent solutions can be found, but under complex conditions common rationalities are mainly based on compromises. Being aware of this problem, widely shared discourses about governance emerge. However, there is uncertainty as regards the effects of such common but rather abstract rationalities on real life development. The process of working together may, or may not be improved. If interdependencies are manifest at the political level, formal procedures like impact assessment probably do not help a lot in increasing the skills of cooperation.

2.2   Economics and management

Adam Smith

The object of this research is social learning to enable sustainable transitions, also termed system innovations. The latter term is from the innovation sciences, which build on (evolutionary) economical sciences. Like in political sciences also here the linkage between human decisions and human knowledge has always been at the core of the debate. Adam Smith, in his *The theory of moral sentiments* (1759):

> 'Thus self-preservation, and the propagation of the species, are the great ends which Nature seems to have proposed in the formation of all animals. Mankind are endowed with a desire of those ends, and an aversion to the contrary; with a love of life, and a dread of dissolution; with a desire of the continuance and perpetuity of the species, and with an aversion to the thoughts of its entire extinction. But though we are in this manner endowed with a very strong desire of those ends, it has not been entrusted to the slow and uncertain determinations of our reason, to find out the proper means of bringing them about. Nature has directed us to the greater part of these by original and immediate instincts. Hunger, thirst, the passion which unites the two sexes, the love of pleasure, and the dread of pain, prompt us to apply those means for their own sakes, and without any consideration of their tendency to those beneficent ends which the great Director of nature intended to produce by them.'

In other words, people can be concerned about the future of mankind, and at the same time act in a selfish way with short-term motives. In the *An Inquiry into the Nature and Causes of the Wealth of Nation* of 1776 Smith indicated that the invisible hand of the market uses selfish behavior to create a common benefit via scarcity of goods that are in demand and supply.

Evolutionary economics and innovation governance

The nature of change processes in a society where the market is a major driver of change has been studied in economics. The general assumption is that actors in the market maximize their individual welfare, and invest if that is likely to happen within an acceptable horizon. From prehistoric times our society has developed in several waves. People tried to invent new items to be sold on the market, which led to technological innovations. Schumpeter introduced the term creative destruction in *Capitalism, Socialism and Democracy* (1942), showing how innovations may lead to the destruction of old economic activities. This was an inspiration for evolutionary economics, next to thoughts from evolutionary biology. The idea was that economic activities develop much like biological species, with niches as the direct context that determines the life conditions for an 'economic species', regimes that form a wider context comparable with habitats, and landscapes forming an even wider context comparable with larger ecosystems (Rotmans *et al 2001)*. New combinations (*neue kombinationen*) of resources and ideas drive the development.

Scholars of evolutionary economics mainly try to analyze the evolution of economic systems by explaining the interaction between the three levels. Change has to occur at different levels, which is compared with biological co-evolution. Several directions of change can compete, and when one wins, the technological paradigm changes (Dosi 1988). If an innovation enters an empty niche a bandwagon effect can occur, but if the innovation is considered desirable for long-term reasons its niche may have to be artificially protected until a breakthrough occurs (Hoogma *et al* 2002). To that end, a dominant direction has to develop among all groups that can influence the niche. There is a risk of lock-in: the system may enter a local equilibrium, which it cannot leave even if it is known that there are better development options. The system develops it own dynamics and all actors dependent on it must follow.

In 1995 a scientific group supporting the OECD wrote (OECD 1995):

'Thus innovation policy has only recently emerged as an amalgam of science and technology policy and industrial policy. Its appearance signals a growing recognition that knowledge in all its forms plays a crucial role in economic progress, that innovation is at the heart of this 'knowledge-based economy', and also that innovation is a more complex and systemic phenomenon than was previously thought. Systems approaches to innovation shift the focus of policy towards an emphasis on the interplays between institutions, looking at interactive processes both in the creation of knowledge and in its diffusion and application. The term 'National Innovation System' has been coined for this set of institutions and flows of knowledge.'

This was recognition that innovation policies were not a responsibility of only corporations or only the government, but of the two together. In 2005, OECD continues (OECD 2005):

'Innovation policy in the OECD countries has mostly been seen as an extension of R&D policy. As such it has been linked to research and technological development. This remains the case, even though the systemic approach developed under the label 'national

innovation systems' during the 1990s expanded this perspective to include interactive linkages in the innovation system.' (…) 'The governance of innovation is knowledge-intensive. Achieving a coherent cross-sectoral innovation policy will require organizing the production and use of policy-relevant knowledge and integrating it in decision-making processes. Hence, policy learning is a key element of innovation governance. (….) The learning-oriented governance system should rely more on flexible, decentralized management practices, open learning, and flexibility.'

Systemic instruments

To follow-up on the observed need for innovation governance, Smits & Kuhlmann (2004) propose that a new type of policy instruments, the systemic instruments, should be furthered. These systemic instruments focus more on the connectivity between the organizations that need to contribute to innovations and the need of social learning. They use terms like connectivity and co-evolution, which I will elaborate further in 2.3. Smits & Kuhlmann (2002) claimed a co-evolution, a mutual influence, between innovation practice, interventions and theory ('Triple PIT Helix'), which can be sped-up by means of instruments that intervene at the level of the whole helix (system level). Such instruments should e.g. manage interfaces between (social) systems, facilitate construction of new subsystems, identify prime movers, provide a platform for learning and an infrastructure for strategic intelligence, and finally stimulate demand articulation, strategy and vision development. They observe that these five types of intervention are emerging in Dutch innovation policies, in addition to 'traditional' R&D policies. They review four Dutch systemic instruments (including DTO which I analyzed in 1.6). Smith and Kuhlmann (2004) claim that public policies may help to increase the use of systemic instruments, by providing strategic intelligence and spaces for learning (Lester & Piore (2005) use the term 'public space' for a similar approach).

Volberda & Van den Bosch (2004) claim that there is a need for managerial and organizational enablers of innovation. In their view these should provide innovations that trigger a sequence of events that eventually lead to desirable reform; comparable to the levers for change suggested by Senge (1990). Such levers should create selection environments (internal to business) and strategic regulations (external to business – i.e. government). They refer amongst other things to regulations that create high environmental ambitions and form an incentive for innovation. Loet Leydesdorf (2005) makes a similar assertion from sociological point of view:

> 'The evolutionary perspective in economics can be complemented with a turn towards re-flexivity in sociology in order to obtain a richer understanding of how the overlay of communications in university-industry-government relations reshapes the systems of innovations that are currently subjects of debate, policy-making, and scientific study. (….) The social construction by agency can then be considered as the subdynamics of producing variation, whereas selection is structured at other levels. (..) The model of evolutionary theorizing in economics, for example, can be recognized as providing a meta-biological perspective in which selection environments are often considered as 'given' for

a firm. (…) From a sociological perspective, however, neither selection environments nor technological options are biologically given.'

Change and knowledge management and organizational learning

With change and knowledge management I refer to the thinking about how firms and people can survive and develop in a dynamic, global and knowledge-intensive economy. Several theories have emerged about the improvement of capabilities of organizational learning. Already in the late 1960s, Peter Drucker introduced the term 'knowledge workers', and claimed that their effectiveness should increase, and is the best measure of capital or welfare. In the 1990s, a wealth of studies and management guides has emerged.

Several authors (e.g. Argyris 1985, Senge 1990), have focused on the cognition of a management team as unit of change (Virkunen & Kuutti 2000). Senge (1990), for example, indicates that managers may join their knowledge to form a perception of the system they try to manage, looking for interventions (levers) that change the processes in the system. Other authors have focused on the idea of learning by doing. For example Levitt and March (1988) argue that conduct is usually derived from logic of appropriateness rather than logic of consequence. In other words, historically formed routines only change incrementally. If the life system of an organization changes too fast, it cannot adapt. Others (e.g. Schön 1973; Hall 1993) have indicated that under changing conditions some adaptation is possible through double loop learning or higher-order learning. Under the pressure of changing conditions, managers of several parts discuss change for the common benefit. At another level, authors focus on the type of interactions needed to become good at that, for example Brown & Duguid (1991) on Communities of Practice and Nonaka & Takeuchi (1995) on creative dialogue between abstract and concrete thinking. Nonaka & Takeuchi see organizational learning as a system of knowledge production, where tacit knowledge in different individuals can be merged to create systemic knowledge, which is then internalized and converted to operational knowledge.

Learning groups can develop a joint 'what-if?' strategy, orienting themselves toward anticipated context changes, e.g. by interacting with large groups through market research, trend watching and by interacting with smaller groups through joint evaluation or joint fact finding. Descriptions of possible futures are central to motivating joint action, and should consist of easily understood narratives (e.g. Schwarz 1991, Rotmans *et al.* 2001).

Coopetition

Like in political theories, in management theories the idea of cooperation between competitors has also emerged. Nalebuff & Brandenburger (1996) refer to coopetition between corporations that have complementary products and services. It is in their common interest to offer their products together, which gives a synergy. However, they could also try to each deliver all products as pure competitors. Coagulating into one large corporation creates slow adaptability. To achieve a common benefit activities should be attuned and, to prevent free

rider behavior, the relationship should be governanced. Trust is important to work across organizational boundaries in Communities of Practice or otherwise. The focus on possibilities for coopetition in networks of organizations is a state of mind, and managers have three options: linking the perceptions of the different organizations, selectively activating or de-activating organizations in a network, or creating arrangements where the network can regularly meet (Teisman 2005).

The lessons from economics and management theories

Economic and management theories reach the same conclusions, as does political science: network governance is needed, and this is a matter of cooperation between many different organizations that also must compete. Building a large hierarchy does not help to deal with societal complexity and dynamics. The solution is in a selection mechanism that favors the development of practices and ideas in smaller organizations for their common benefit. Where for a single firm such selection environment is given, it is not impossible that coopetition develops in the interaction between firms. The relationships in such a network should somehow be governanced to prevent free rider behavior. The question is how such governance can emerge. Some say that the government should create instruments that 'help the network help itself', like environmental regulations. In terms of complexity theory: by creating tensions that bring the system at the edge of chaos, where it has an incentive to search for new solutions. Under that incentive, people with a different, more connecting, 'state of mind' can become successful.

2.3 *Complexity theory*

The theories about politics, economy and management reach a similar conclusion: under complex and dynamic conditions the conduct of interdependent individuals and organizations determines the degree in which they can adapt to changing circumstances. That conduct determines the capability of complex problem solving, puzzling, coopetition or complex innovation. It has components of trust, merging perceptions through interaction and systems thinking, and these may lead to interventions in societal systems. In the 1990s such thinking merged with thinking from other corners like biology, where theories about chaos and complexity had emerged. These theories help us understand how different types of conduct may emerge under certain conditions, or evolve over time in complex social subsystems. That very understanding may theoretically lead us to different, more adaptive, behavior. Eve Mitleton-Kelly (2003):

> 'If organizations are seen as complex evolving systems, co-evolving within a social 'eco-system', then our thinking about strategy and management changes. With the changed perspective comes a different way of acting and relating which could lead to a different way of working. In turn, the new types of relationship and approaches to work could well provide the conditions for the emergence of new organizational forms.'

In complexity theory social subsystems are defined as groups of individual agents (people, organizations) that have relationships and show some level of organization or order (also called the 'pattern that connects'). A specific type of social subsystem is the policy network, where interdependent actors interact for common policies. The difference between social subsystems and other systems like physical or biological systems is supposed to be caused by free will: humans may not only be a play-ball of their environment, reacting in predictable ways. They could also take development in their own hands and simply 'decide' to become more adaptive. Eve Mitleton-Kelly is not alone in her suggestion that understanding complexity could help us manage ourselves and lead to new organizational forms. For example, C. Joslyn, F. Heylighen & V. Turchin make a similar suggestion with the idea of metasystem transition theory (Joslyn, Heylighen & Turchin 1997). Jenner (2000) writes about group consciousness and culture as an adaptive system (borrowing ideas from Carl Jung). In communications theory similar expectations exist; Loet Leydesdorff (in prep.):

> 'A globalized system can be considered as a strongly anticipatory system which constructs its own future states. A strongly anticipatory system is no longer necessarily based on historical manifestations, but its operation can increasingly be knowledge-based.'

How can these expectations be understood?

Complex systems

A system consists of units that interact, like atoms in a molecule or ants in a colony. The interaction pattern is a form of order. There are higher-order and lower order systems. Several subsystems may interact like if they were agents, and their evolution becomes linked. Then they form a higher-order system with the lower-order subsystems as agents, several layers can emerge by combining subsystems to next levels or systems disintegrating into parts whilst retaining their higher-level structure to some extent. A nested subsystem emerges. As economic systems have a nested structure with niches, regimes and landscapes, so do the social systems. A family is a relatively more embedded (nested) subsystem; a nation state is less embedded. The whole of human population is a social system, and since all humans have relationships either directly or indirectly, all smaller groups that may be distinguished as having more internal interaction than external interaction, are technically subsystems. A special kind of nested system is the heterarchy (e.g. Mitleton-Kelly & Ianacci, 2005). A heterarchy is a group of loosely connected hierarchical organizations, also called network organization (see also March and Simon 1958, Thompson 1967). A structural cooperation between firms, governments and NGOs, as intended in the transition discourse, may therefore be classified as heterarchy.

Composed socio-economic (innovation) systems

Social systems often depend on market systems. For example, the transport industry, the services industry (commuters), part of the government, part of the academic world as well as environmental groups are all social systems that may have an interest in development and change of the same mobility system. To-

gether, these subsystems compose the (social) mobility system. Some components depend on the continuous growth of the mobility system and are strongly interwoven with it; other components are negatively affected and try to control it. If different social systems are strongly related to a single economic system, the term 'composed system' may be applied. In recent innovation theories, the term 'innovation system' is proposed (Smits & Kulhman 2002), but still poorly understood (Leyesdorff 2005a).

The (social) mobility system is an example of a composed system. Its components are subsystems that emerge on the same roots (the same citizens / consumers), but may develop ideas and discourses that are in conflict with one another. A person could drive a car and also be member of an environmental NGO that discourages car use. He knows that self-sacrifice (using environmentally friendly transport) will only help if enough people make that choice, which he doesn't know how to achieve (the so-called prisoner's dilemma). So, he becomes member of an environmental NGO that may press the mobility sector to search for solutions that overcome the prisoner's dilemma. In the transition management discourse, it is said that transitions need the cooperation between forerunners from all domains of a system. In the case of the mobility system this may include the mobilists, the logistical sector, public transport, environmentalists, academics with knowledge about possible development and impacts of mobility, governments responsible for infrastructure development mobility management, and other governments like finance and environmental protection.

Dissipative structures, entropy and human motivation

Many complex social systems are in a state of constant flux. They are then a special case of complex systems that are called dissipative structures (Prigogine & Stengers 1985). These are structures that develop (i.e. non-equilibrium) in open interaction with their environment. Their development is not an extrapolation of their history: it is non-linear and often with quick changes. Dissipative structures maintain their order - their stable structure - in the face of a constant flux of matter and energy passing through them by dissipating entropy to their environment – i.e. by constantly creating new order and disorder from energy-matter that previously did not belong to the system. As the amount of order grows, the structure becomes more complex and chaos is reduced. Examples of dissipative structures are biological cells, organisms, ecosystems, economic systems and social systems. Throughout history, systems on earth have become increasingly complex. The input of solar energy increases the entropy (disorder) on earth, like water molecules move more chaotically when warm, but 'under certain conditions, entropy itself becomes the progenitor of order' (Prigogine & Stengers 1985). For example, entropy can be transferred as sunlight taken up by chlorophyll, which forms the basis of a complex, orderly ecosystem.

Despite the attractive simplicity of the 2nd law of thermodynamics, entropy is not a currency that can be easily recognized as such and traced as it is passed on between subsystems. The energetics of genetic blueprints, markets, hierarchical organizations and network organizations need other explanations. In such dissi-

pative systems, it has the form of information that helps the system to find energy-matter in the future (e.g. Hierarchical Information Theory and Shannon entropy, based on the information content or complexity of a system). In the market mechanism entropy may be represented by the purchasing power of money (money is not only energy-matter but also a form of information based on trust); in organizations it may be the expectation of reward and punishment. However, it is in social systems often unclear how information motivates people, and to which extent it is the promise of material reward. A lot has been written about human motivation (e.g. McLelland 1987; Beck & Cowan 1996). People who have a motivation to learn may choose to participate in network organizations, next to earning positions in the market and in hierarchical organizations. They may be encouraged by creative tension (Fritz 1989) – an awareness of the option to move from the current state to a desired state.

Self-organization

The process of spontaneous formation of interaction patterns ('emergent properties') in systems is termed self-organization. Mitleton-Kelly (2003):

> 'In an organizational context, self-organization may be described as the spontaneous coming together of a group to perform a task (or for some other purpose); the group decides what to do, how and when to do it; and no one outside the group directs those activities. An example is what happened in an Integrated Project Team (IPT) in the Aerospace industry. The team was brought together to create a new project. The members of the team represented firms, which outside the IPT were competitors, but within the team had to cooperate and to create an environment of trust to ensure that sensitive information, necessary for the creation of the new product, could be freely exchanged. The team had to prepare a six-monthly report for its various stakeholders. This report was on hard copy and was usually several inches thick. Some members within the team decided that they would try an alternative presentation. They found that they had the requisite skills among them and they put in extra time to produce the next report on a CD. The coming together of the sub-team to create the new format for the report illustrates the principle of self-organization. No one told them to do it or even suggested it. They decided what to do, how and when to do it.'

In this example, the right persons were together at the right time and they responded to the assignment that had been given to them. Apparently that is what they were programmed to do, or at least capable of doing for whatever motive. They created their own order. If stakeholders take the assignment away, the team may dissolve, and its ideas and patterns may be lost. This form of self-organization is then reversible (*conservative* in words of Mainzer 1996, quoted in Mitleton Kelly 2003). On the other hand it may also be consolidated elsewhere or on another basis, for example if the team has learned lessons it thinks are also valid in other contexts. If self-organization is irreversible the route back to the old situation is cut off; the subsystem may still fall back to lower complexity, but not like it was before. In social systems self-organization (ideas and networks that carry them) may either evaporate or consolidate (Teisman 2005). If some people deal constructively with tensions in a social system they may

seek change that relieves the tension, which may lead to temporary reversible hiccups of change that are premature but do lead to new ideas that may resurge irreversibly; for example when the pressure is higher and felt by more persons who are willing to participate in the change. The ability of creating lasting ideas and networks (according to ideas about the learning organization) itself is an emergent property (Mitleton Kelly 2003).

Living systems (autopoiesis)

One step further to complexity is the idea of autopoiesis, first proposed by the Chilean biologist Humberto Maturana. The key idea relevant in this book is that capabilities of spontaneous self-organization may evolve under influence of natural selection. Maturana saw life as an emergent property of autopoietic systems, a type of dissipative systems. Maturana & Varela (1992) define autopoiesis as a circular network of production processes in which the function of each node in the network is to participate in the production or transformation of other nodes. The entire network continually (re-)makes itself as nodes are replaced. It is a closed network of production processes in which the output of one process ultimately feeds back into itself. The system may gradually change by means of natural selection of the characteristic of its nodes.

Social network theory sees behavior in networks as a continuously reproduced set of ideas and rules, carried as a local culture between the members of the network. Therefore, in that sense social systems are alive. When a social system is confronted with new circumstances, self-organization may occur without any process of natural selection, making use of the already present characteristics of the network. This is not autopoiesis and requires no natural selection (Kauffman 1993). If, however, the nodes with capabilities to self-organize are relatively successful, endurance of this behavior or these competences may be favored (e.g. Leydesdorff 1997). Therefore, adaptive capabilities may improve by autopoiesis. Improving adaptability of a social system may for example occur under the pressure of other social systems, which compete for the same limited resources, like subsidies. On the other hand, the whole group may profit from the capabilities of a few. In that case, free riders are equally rewarded and there may be no relative advantage in the selection process. As natural selection of nodes (in social systems: lower order systems or at the lowest level, persons) determines the properties of the network, and the properties of the network determine how ideas develop in the network, the question becomes how can characteristics evolve that further ideas for the common good.

Emerging order

If social systems are life forms, that doesn't mean there is always order. Dissipative structures maintain their structure by creating new order from the energy they receive from their environment. They can do that by creating more order or more disorder. If they create more order, this can be in the form of an emerging new subsystem, but this could be temporary and fall back to disorder. In evolutionary economics the idea of creative destruction of economic systems

(Schumpeter 1934, 1980), and the social systems dependent on them, represents the combination and even causal linkage of order and disorder.

Figure 5. A fractal
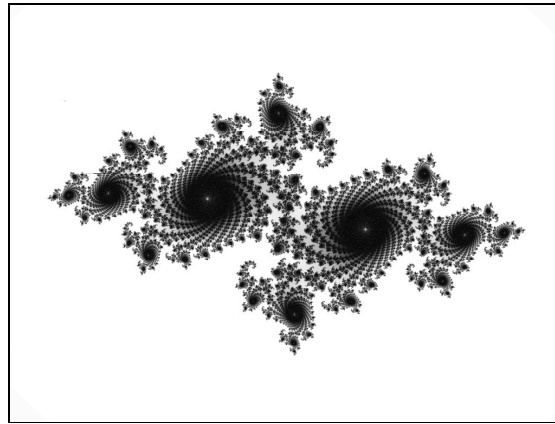
Emerging order may be compared with graphics called fractals, which may be produced by recursively applying algorithms in computers. The repetition resembles autopoietic growth. As algorithms operate, the fractals develop and order may emerge (Figure 5). Comparing human history with a fractal, all living individuals are somewhere at its developing edge. The inside of the fractal is history, which currently still can be read from the genetic, geographic, economic and cultural situation as well as from the direction of development. Nevertheless, in real life different social subsystems compete for the same limited resources, which causes chaos – these systems do not experience a predictable environment or future for themselves. Their autopoietic dynamics are disturbed, and this may happen unexpected and there may be no solution at hand that leaves both competing subsystems intact. To prevent a catastrophe, both systems need to adapt in non-obvious ways. However, notwithstanding the power of historical legacy, in theory humans can make the choice to change the mammoth tanker's course. The question is whether they can achieve the necessary degree of social alignment. Each social subsystem has its own autopoietic dynamics and people in these systems are not easily rewarded to go against that because it makes the future more uncertain.

Coping with inherent uncertainty

People experience chaos or disorder as unpredictability of their future in relation to the future of their social and physical environment. The future is not an extrapolation of the past, but it is inherently uncertain. Still, in that context people and organizations have to make decisions about their own conduct. Teisman (2005) distinguishes two ways of dealing with that. The first view he terms the 'order-seeking', 'rational-mechanic', 'organization and decision-oriented' or

'complexity-reducing' view, which some theorists apply to find general patterns in what at first seems to be disorder. This behavior leads to what I have in chapter 1 coined the accounting component of governance. Order-seeking managers try to broaden the span of control of people and organizations by treating a complex system like it were a complicated kind of simple system. The second view according to Teisman (2005) is the 'disorder-acknowledging' view, in which people and organizations accept that their span of control is limited. Teisman:

> 'The composite nature of social systems, and for a part coincidental and temporary interactions between subsystems, drive development.'

Such interactions are, in many ways, equal to the goal-seeking governance component as I have defined it in chapter 1. Such a worldview doesn't have to lead to fatalism; people and organizations still can make educated guesses about what to do. They can be driven by the desire to develop anything for which they are immediately rewarded; they can also be driven by the desire to take the future of the larger social system into account.

Proactiveness (adaptive systems)

Adaptive systems can adjust to changing circumstances. These circumstances consist of their environment, the real life world where the social systems feed from, and of the other social systems that feed on the same world, and may compete for resources and may provide complementary services. An adaptive social system, like an organization, may either react to an observed change of conditions and adjust its operations accordingly (reactive response), or it may assess its possible future environment, observing resources stocks, trends and behavior of competitors, and prepare itself for possible change (proactive response). In the first mode it co-evolves via the market mechanism, in the second mode it co-evolves via the world of ideas.

Under complex conditions there is a huge bonus on being the first to adapt, but if whole societies depend on coordinated behavior to cope with a changing environment, wide scale co-evolution of ideas is required. Taking an extreme example, climate change is a problem of the whole of humanity. To be prepared for all that might happen to us as the climate changes and to prevent the worst, co-evolution of ideas at world scale is needed. As that happens the complexity of ideas carried by humanity may perhaps match the complexity of its environment, which is required for adaptive systems according to the Law of Requisite Variety. If the range of possible courses of action to respond to development is too narrow, there must be many developments to which the system cannot adapt. To be able to flexibly implement solutions as fit, co-evolution is required. Humanity should think and act together to some extent. Several authors indicate that we could learn to do that. Mitleton-Kelly (2003) writes, for example:

> 'The notion of co-evolution is thus one of empowerment, as it suggests that all actions and decisions affect the social ecosystem. No individual or organization is powerless—as each entity's actions reverberate through the intricate web of inter-relationships and affects the social ecosystem. But co-evolution also invites notions of responsibility, as once the ecosystem is influenced and affected it will in turn affect the entities (individuals, organiza-

tions, and institutions) within it. This notion is not the same as proactive or re-active response. It is a subtler 'sensitivity' and awareness of both changes in the environment and the possible consequences of actions. It argues for a deeper understanding of reciprocal change and the way it affects the totality.'

Another such author is Rotmans (2005), who terms this activity transition management:

'Transition management is aimed at stimulating societal innovations towards sustainable development. This being aware that this is not possible by enforcement or top-down, but subtle and co-evolutionary, by means of a visionary process of agenda-setting, learning, designing and experimenting.'

The idea behind such reasoning is that human social systems are different than other complex systems: humans have the capacity to think ahead and act ahead and to develop cooperation where required. Whether we do that is our choice. Individuals cannot do that on their own – the awareness of the need has to emerge at different places, so that new systems can emerge by means of a new system of rewarding people in social networks. However, there may be no need to see human social systems as principally different than other complex adaptive systems. Humans may be more adaptive than other systems, because they are capable of representing some of the system's complexity in their brain, therefore anticipating more. Stewart (2000) argues that evolution is directional, toward greater collective intelligence.

The future is still unknown, however. These individual and collective mental representations are still based on past events and exemplars, which people extrapolate into the future, being aware of the dynamics of complex systems as they had seen in the past. It is uncertain to which extent the masses, who have to accept interventions for the common good, share in the co-evolution of ideas about such interventions.

Co-evolution, interconnectivity and connective behavior

If co-evolution of ideas is to occur, people and subsystems need to be not only connected through the market mechanism, but also through exchange of ideas. As such they are member of a complex nested, composed system. Proactive adaptive behavior (i.e. before the non-linear change of indicators from the market) has to facilitate co-evolution of ideas and depends on the extent to which interactions occur between people and subsystems of different levels. This has two elements: the number of connections people have and the quality of these connections (are they only aimed at market transactions or are they also aimed at the evolution of the systems they share, i.e. their future). If there are interactions that create ideas at the level of the whole composed subsystem, and that are also meaningful for lower-order subsystems, the connections are good and it is more likely that the system can adapt to changing circumstances when there are warning signals that change is looming. Since circumstances are created by yet other social systems, also there is an opportunity for next order co-evolution.

However, complexity limits connectivity, through bounded rationality and a dominant reflex of order seeking behavior, as an extrapolation of successful

behavior under less complex conditions. Energy is wasted on building political pressure and counter-pressure, where subsystems collide in the political arena without constructing an alternative. If most people have an order-seeking attitude (Teisman 2005), they only add to complexity without developing ideas for an alternative development. In other words, with a domination of order-seeking behavior the higher-order systems have too many conflicting selection criteria for ideas about development, and many good new ideas never emerge or never reach the surface. Inertia is the result. Communications appear more chaotic since more people seek power from more points of view, and eventually lose position as they inevitably fail. The actual development is not influenced until the exterior world selects (for example through a rise of energy prices).

If a significant part of the population displays disorder-acknowledging behavior, more alternatives may be generated and implemented. By taking ideas about complexity as starting point, they can enhance chances of success. They can, for example, look for the 'adjacent possible' (Mitleton-Kelly 2003) – an option of conduct that forms new combinations between existing systems by looking around in the neighborhood for lucky combinations. An example is the Senseo – a combined product of two corporations - electrical device engineering and coffee dispensing. At the edge of chaos, autopoietic development moves toward satisfaction of the needs the system has defined for itself, but not all needs are vital – a temporary setback doesn't have to affect its vital life support systems but could limit to aspects of the quality of life. This gives it time to look for another development.

Much of the literature about learning organizations or management in complexity is in line with this thought. I focus on Etzioni (1986), Senge (1990) and Kingdon (1995). In general, according to these authors, such managers should fix their personal objectives pragmatically and flexibly, staying in tune with the chaotic behavior of the larger system as possible, developing a network to some extent at random, scanning for opportunities and taking them, forming new combinations. One of the first ideas that fit into this thinking is mixed scanning proposed by Amitai Etzioni in the 1960s (Etzioni 1986), indicating that people and organizations should develop and constantly update a wide view for orientation, whilst focusing on concrete actions that fit that view. Peter Senge (1990) indicates 'the whole' is 'unfigureoutable' but still an open eye to the whole can give rather intuitive insights. It becomes rational behavior to spend time scanning the whole by means of more or less random networking and development of specific innovative initiatives in combinations of knowledge and influence from new sets of parts– more so than defending the direct interest of subsystems in political games. If people and groups of people are capable of doing this they still will be of little influence unless they make politically acceptable proposals. So, they should seek opportunities that may bring the system out of balance, and bring it to another equilibrium. If collective development is at a crossroads (a bifurcation), a small intervention (a lever according to Senge) can make a big difference. To create such interventions it may be helpful to seek political opportunities to find support. Political systems are unpredictable, and an alignment

of actions depends to some extent on chance: the opportunity for a match should be there, and someone may be capable of seeing it and using it. Such a *policy entrepreneur* (Kingdon 1995) enhances connectivity. He may not only react to observed opportunities, but also create perceptions, with others who have complementary knowledge, from opportunities that may emerge.

On the other hand people and organizations that seek order do not easily reward this disorder-acknowledging behavior. From an order-seeking rationality the benefits of disorder-acknowledging behavior are invisible – they don't fit the partial goals that have been agreed. Managers earn their position in an order-seeking context. To prevent inertia they must acknowledge disorder and act to it. What is needed to make people and systems bridge this tension? Teisman (2005) points to the skill of 'double thinking'. In his view it is inevitable that in the public rhetoric the order-seeking view dominates. Leaders who propose simple solutions are popular. At the same time these leaders should be aware that their solutions lead to a fragmented approach, which needs to be supplemented by an approach that connects with the whole, and which is difficult to communicate widely.

Co-evolution of connecting behavior

As connecting behavior, next to order-seeking behavior, helps to make larger composed subsystems co-evolve, several authors have asked how connecting behavior itself may evolve. Such behavior seems self-sacrifice of the individual, because there is no reward in terms of reaching the objectives set in order-seeking behavior. As connecting behavior precedes more systematic cooperation, Axelrod (1984), for example, has asked the question how cooperation can evolve, in terms of game theory. Heylighen (1992), for example, argues that through the evolution of language, ideas can be widely shared and cultures can emerge where language itself becomes a system that rewards behavior. The ideas (or memes) that can be expressed in that language (like altruistic norms, e.g. the ten commandments) can evolve by natural selection, without having to be altruistic themselves in the sense that they favor the survival of competing ideas. Humans or human systems on the other hand are submitted to their own culture, which entails altruism at their level.

The question, of course, becomes how do memes evolve; what is their selection mechanism. The answer might be that the agents that produce the language, humans, believe that it is in their benefit to apply that language and to reward themselves and other for responding to its norms. As primary needs are fulfilled, the agent will have spare energy to give attention to future survival, which depends much more on the future of the group as a whole. They can make that assessment due to abilities of foresight that have evolved for direct survival, and which are perfected in the evolution as different groups compete on competencies of long-term survival and population growth. Only with a focus on the long term, learning-by-doing is more difficult because there is delay between conduct and effect. In a social system, belief therefore becomes a self-reinforcing idea. To which extent beliefs are selected that actually help long-term survival may

depend on the ability of individuals to make that assessment adequately, and follow their own ideas rather than ill-founded beliefs of others. Whether there is any direction in the evolution of *that* capacity is unclear. Chance may be a factor, similar to the observation of Prigogine & Stengers that:

> '… under non-equilibrium conditions, at least, entropy may produce, rather than degrade, order (and) organization (….) if this is so, then, entropy, too, loses its either/or character. While certain systems run down, other systems evolve and grow more coherent' (Prigogine & Stengers 1985, quoted in Mitleton-Kelly 2003).

Such processes should be observable at the level of conduct of managers. As different competing corporations learn to cooperate as well, double think and connecting behavior can be observed to co-evolve. Gradually, the two firms learn to cooperate and see the benefits of that. What happens at the level of individuals? In each corporation, a manager may have to continuously earn his position. As he gets replaced his successor may behave differently, more connecting, due to his character or his training. This can be the result of a learning process at the level of runners-up who develop different competencies than the sitting management, in co-evolution with a learning process at higher management level that rewards the runner-up with the competencies they prefer. An enabler at high management level may protect this behavior, which is based on sound reasoning but doesn't fit the corporation's culture. The enabler might take this initiative because of his own analysis and his initiative to seek contact with an enabler in the competing firm. Together, they connect the corporations by allowing their ideas about cooperation to co-evolve. The question remains, under which conditions is such double thinking rewarded in the first place.

At higher system levels, co-evolution of ideas may occur between universities, industries and governments in a 'triple helix' (Leydesdorff 2005a). In this process, better interfaces between these domains develop, whereby the 'whole' functions better. Leydesdorff:

> 'The management of these interfaces is both an economic imperative and a political challenge, yet knowledge-intensive in the elaboration.'

The question is still, what do these interfaces look like if they are effective, can they, for example, be generically structured, and how is that behavior rewarded in a culture of order-seeking, accounting behavior. Interconnectivity itself should be rewarded.

Build-up of human and social capital under 'adaptive tension' – at the edge of chaos

Several authors have described how self-organization speeding-up co-evolution occurs and even can be managed in a hierarchy where one system controls the resources of other systems. They can take measures that improve qualities of distributed intelligence (McKelvey 2001), organizations as brains (Morgan 1997), or structuring chaos (Brown & Eisenhardt 1998).

The reasoning starts by assuming that a complex social system is under threat and needs to adapt to survive, and that this threat is observed by at least

some managers in this system. This complex social system could in theory be the whole of humanity, if it has a common 'enemy' like climate change or social instability after population growth, but several authors focus on firms that need to survive in a globalized and unpredictable market. McKelvey's point is that whereas pressures (energy-differentials) from the environment place a value on change for the firm as a whole, 'charismatic visionary CEOs more often than not create conditions likely to inhibit the development of distributed intelligence'. In his view leaders in complex situations should not develop charismatic visions but 'manage adaptive tensions'. Leaders can make the firm more aware of the threat and build up tensions inside the system where they have some control because they can 'attach a motivational valance'. They should create the right amount of tension ('at the edge of chaos' and 'far from equilibrium'), and the right kind of tension ('managing the attractors'), and they should manage the agency problem.

The system (hopefully) reacts by self-organizing collective intelligence as an emergent order. Managers don't impose solutions (visions), but define the problem, creating opportunities for reward. The firm self-organizes according to the available *human capital* (the competences of the individuals) and *social capital* (the way in which the individuals are 'wired'). Then, as intelligence operations are repeated at the edge of chaos, existing or new personnel fits better in the learning requirements, and the firm's adaptability to a changing environment, its human and social capital, improves.

Managing the amount of tension

McKelvey (2001), following Cramer (1993), identifies two critical pressure values for social systems, analogous to physical systems. Below the first critical value for the pressure, the system returns to its equilibrium state (also called point attractor). Above the second critical pressure value, the system becomes chaotic – it's behavior is almost completely unpredictable ('stochastic'), doesn't return to the previous equilibrium, and in stead goes astray to what is called a strange attractor. If one were to try to simulate this, small differences of initial conditions would have big effect on the outcome (the so-called butterfly effect), but the now chaotic system still remains within certain boundaries. An example is the weather, where storm depressions are difficult to forecast, but remain within a storm-prone part of the atmosphere. Some chaos within limits is needed to obtain room for innovations. Catastrophe theory predicts that as adaptive tensions build up without adaptation of the system, the butterfly effect may cause a landslide when the time is ripe. Tension builds up until the resistance is broken. Only if the system succeeds early in passing on the external tension to its individual agents, so that they too feel an adaptive tension between the two critical values, such landslides can be prevented. The system can distribute its intelligence and simultaneously link it in new combinations according to the dynamic pressures from outside. Then it may hold requisite variety, meeting the variety of perturbations from outside by the variety of knowledge combinations from inside.

Only between the two critical values, 'far from equilibrium' (Prigogine & Stengers 1984), there is an emergent order, 'at the edge of chaos' (Kaufmann 1993). Only in this situation, it may develop requisite variety and increase its negentropy (order, opposite of entropy) by creating new order as a dissipative structure. By doing that, it might out-compete existing structures in its environment, implying that these other systems are pushed over *their* second critical value. This is equivalent to creative destruction. On the other hand, in a highly competitive industry, competitors may co-evolve to become highly adaptable. McKelvey (2001):

> 'Employees in high-velocity firms in Silicon valley work routinely in an atmosphere of adaptive tension much higher than might ever appear in large dinosauric firms or government agencies'.

Managing the attractors

Attractors are the direction to development, for which the system is geared. Game theoretic processes lead co-evolution in this direction; the pressures on the system define the tradeoffs of the game, and thereby the attractor. If the pressures are low, it is a point attractor created by bureaucratic negative feedback. Strong visionary leaders function as such, and inhibit collective learning. As the pressure rises connective behavior may be rewarded as well, leading the system away from the point attractors to strange attractors, which may lead to a new equilibrium with new point attractors. In advance, the new equilibrium is not predictable, but it has certain knowable boundaries. These boundaries can be defined and constantly updated by a learning community, and communicated to the larger firm by strong leaders. McKelvey:

> 'The trick is the aim these strong leader types toward using point attractors that '*drive*' the system toward reducing the T_s (SN: external tensions), but do not '*define*' it in the command-and control ways that inhibit change.'

Such strong leaders may also be termed enablers, because they enable a learning process. They succeed in combining their legitimate position, based on their vision, with being connected to dissipative structures in their firm that constantly redefine vision and reward. As the time is ripe they adjust their point attractors. The time will be ripe quickly if the firm has more human and social capital. The enabler manages both at the same time, through point attractors (the legitimate position) and strange attractors (the aim of learning activities). This is similar to what Teisman (2005) terms double thinking. It also enables co-evolution of thinking in the firm with thinking in its environment. The firm has to react to what it sees happening in its environment, and for that it needs to be connected to its environment. If it is not, it will only be able to react to visible developments in the market, which might be too late. Such enablers can change the way ideas co-evolve; in other words, they change the selection mechanism for memes. If such enablers are successful, this behavior may be reinforced and managing change can become a successful meme. This may have happened in

Silicon Valley, and it depends on the benefits of fostering learning processes: how much human and social capital can develop?

Mitleton-Kelly (2003) writes:

> 'In a social context, it is the series of critical decisions each individual takes from several possible alternatives that may determine a particular life path for that individual. The alternatives available, however, are constrained by the person's current state and the state of the landscape the person occupies. Thus the emergent behavior of the person is not a matter of 'chance' but is the result of a person's selection among a finite set of perceived choices; as well as the past choices made (the history) that have shaped that person's life path. Once the decision is made, there is a historical dimension and subsequent evolution may depend on that critical choice; but before the decision is finalized, the alternatives are sources of innovation and diversification, since the opening up of possibilities endows the individual and the system with new solutions. When a social entity (individual, group, organization, industry, economy, country, etc) is faced with a constraint, it finds new ways of operating, because away-from-equilibrium (established norms) systems are forced to experiment and explore their space of possibilities, and this exploration helps them discover and create new patterns of relationships and different structures.'

Such a social entity can also be defined as an agent in a hierarchical organization, like a government agency. McKelvey (2001) indicates that human and social capital holders (the agents) could choose to put their own interests ahead of that of shareholders, creating what is termed 'slack'. He argues that managing the tensions and attractors right will help ensure that their selfish interests coincide with that of shareholders. Obviously the limits of effectiveness still lie in the attainable levels of human and social capital. This view reduces the rationality of focusing on efficiency, input versus achievement of fixed goals, if agents have to function in highly dynamic environments. The terms human and social capital can be seen as the capacity at all levels (including the human brain itself) of observing and passing on tensions, and allow ideas to emerge that might help relieve these tensions.

Connectivity in large social systems

Whereas McKelvey (2001) focuses on firms, this book is mainly aimed at much larger social units; composed subsystems. These have no hierarchy, other than a government that in theory has powers, but that can only act if there is a majority. However, the difference may not be that large. Like in firms, also in politics there are strong leaders, and they too can manage tensions. Only, the number of interdependent but perhaps weakly connected social groups involved is likely to be larger. Effective connecting behavior may then depend relatively more on mass communication than only on personal relationships. Tensions are less likely to be created through a hierarchical reward system, and more through pressures of a cultural and linguistic nature, that spread in discourses. That social process is also studied in communication sciences. Discourses in two related systems can become aligned in a process of co-evolution, by means of hyper-incursion, i.e. implicit self-reference at next-order level. Leydesdorff (2005b):

'The interaction between these two analytically different mechanisms of anticipation can be expected to organize stability in the historical manifestations of the strongly anticipatory system. The latter can be expected to develop in terms of fluxes. Stabilization can also be considered as a resonance among two selecting subdynamics.'

A large strong anticipatory social system is thus theoretically possible, because hyper-incursion is possible: self-reference enables not only persons and firms but also societies to become aware of itself and its own future, and its options, and thereby create its own future. However, the question remains what conduct is required for hyper-incursion, whilst letting it be solidly founded on various observations of the real life world.

Required competences

The insights from complexity theory seem to help our thinking about managing co-evolution through understanding connecting behavior. Several competencies fitting complexity have been mentioned earlier, like Teisman's (2005) idea of 'double thinking', Senge's (1990) ideas of (first order) 'systems thinking', Nalebuff & Brandenburger's (1996) idea of 'coopetition'. Lissack & Roos's (2000) idea of 'coherence' may be added, focusing on acting in a manner consistent with what a system 'is' in relation to the rest of the world ('coherence: an alignment of context, viewpoint, purpose and action that enables further purposive action'). Coherence perhaps comes one step closer to the idea of hyper-incursiveness (Leydesdorff 2005b): if more would act coherently, the world would probably be a stronger anticipatory system. Several authors (e.g. Kingdon 1995) emphasize the importance of moderators; under complex conditions the management of connections can be seen as a useful specialization. Moderators must apply double think, because they connect different subsystems whilst having a position of their own. A moderator must be able to imagine how their connecting behavior can lead to results, also for him. To that aim, he can apply the ideas of McKelvey (2001) about the management of tension. This is related to the idea of second order systems thinking introduced by Leydesdorff (1997).

Effective learning groups may assess whether a system is far from equilibrium and open for change. They can use mass events and publications for testing ideas, and see if these resonate. They should be aware of the cultural and game theoretic restrictions – for example, ideas should take the interests of many subsystems into consideration and define a perspective that can be accepted as in the common interest, creating a favorable context for breakthrough interventions. The knowledge represented in networks should not only include the market system, but also the political system.

Epistemological implications

Complexity theories have their implications for the nature of scientific knowledge itself, since they become part of the system. The triple helix model in innovation sciences illustrates this since science is one of the three strings of the helix. The science about scientific knowledge is called epistemology. Modern

epistemological views are excellently explained on the Principia Cybernetica Web (Heylighen 2003), of which I present the following excerpt:

'Epistemology is the branch of philosophy that studies knowledge. It attempts to answer the basic question: what distinguishes true (adequate) knowledge from false (inadequate) knowledge? Practically, this question translates into issues of scientific methodology: how can one develop theories or models that are better than competing theories?

The first theories of knowledge stressed its absolute, permanent character, whereas the later theories put the emphasis on its relativity or situation-dependence, its continuous development or evolution, and its active interference with the world and its subjects and objects. The whole trend moves from a static, passive view of knowledge towards a more and more adaptive and active one.

A recent view is that of constructivism. It assumes that the subject of knowledge builds up all knowledge from scratch. There are no 'givens', neither objective empirical data or facts, nor inborn categories or cognitive structures. The idea of a correspondence or reflection of external reality is rejected. Because of this lacking connection between models and the things they represent, the danger with constructivism is that it may lead to relativism, to the idea that any model constructed by a subject is as good as any other and that there is no way to distinguish adequate or 'true' knowledge from inadequate or 'false' knowledge. This 'absolute relativism' is avoided by social constructivism, which sees consensus between different subjects as the ultimate criterion to judge knowledge. 'Truth' or 'reality' will be accorded only to those constructions on which most people of a social group agree.

In these philosophies, knowledge is seen as largely independent of a hypothetical 'external reality' or environment. As the 'radical' constructivists Maturana and Varela argue, the nervous system of an organism cannot in any absolute way distinguish between a perception (caused by an external phenomenon) and a hallucination (a purely internal event). The only basic criterion is that different mental entities or processes within or between individuals should reach some kind of equilibrium.

Though these constructivistic approaches put much more emphasis on the changing and relative character of knowledge, they are still absolutist in the primacy they give to either social consensus or internal coherence, and their description of construction processes is quite vague and incomplete. Different forms or evolutionary epistemology offer a more broad or synthetic outlook. Here it is assumed that the subject or group of subjects constructs knowledge in order to adapt to their environment in the broad sense. That construction is an on-going process at different levels, biological as well as psychological or social. Construction happens through blind variation of existing pieces of knowledge, and the selective retention of those new combinations that somehow contribute most to the survival and reproduction of the subject(s) within their given environment. Hence we see that the 'external world' again enters the picture, although no objective reflection or correspondence is assumed, only equilibrium between the products of internal variation and different (internal or external) selection criteria. Any form of absolutism or permanence has disappeared in this approach, but knowledge is basically still a passive instrument developed by organisms in order to help them in their quest for survival.

A most recent, and perhaps most radical approach, extends this evolutionary view in order to make knowledge actively pursue goals of its own. This approach, which as yet has not had the time to develop a proper epistemology, may be called memetics. It notes that knowledge can be transmitted from one subject to another, and thereby loses its dependence on any single individual. A piece of knowledge that can be transmitted or replicated in such a way is called a 'meme'. The death of an individual carrying a certain meme now no longer implies the elimination of that piece of knowledge, as evolutionary epistemology would assume. As long as a meme spreads more quickly to new carriers, than that its carriers die, the meme will proliferate, even though the knowledge it induces in any individual carrier may be wholly inadequate and even dangerous to survival. In this view a piece of knowledge may be successful (in the sense that it is common or has many carriers) even though its predictions may be totally wrong, as long as it is sufficiently 'convincing' to new carriers. Here we see a picture where even the subject of knowledge has lost his primacy, and knowledge becomes a force of its own with proper goals and ways of developing itself. That this is realistic can be illustrated by the many superstitions, fads, and irrational beliefs that have spread over the globe, sometimes with a frightening speed.

Like social constructivism, memetics attracts the attention to communication and social processes in the development of knowledge, but instead of seeing knowledge as constructed by the social system, it rather sees social systems as constructed by knowledge processes. Indeed, a social group can be defined by the fact that all its members share the same meme. Even the concept of 'self', that which distinguishes a person as a individual, can be considered as a piece of knowledge, constructed through social processes, and hence a result of memetic evolution. From a constructivist approach, where knowledge is constructed by individuals or society, we have moved to a memetic approach, which sees society and even individuality as by-products constructed by an ongoing evolution of independent fragments of knowledge competing for domination.

At this stage, the temptation would be strong to lapse into a purely anarchistic or relativistic attitude, stating that 'anything goes', and that it would be impossible to formulate any reliable and general criteria to distinguish 'good' or adequate pieces of knowledge from bad or inadequate ones. Yet in most practical situations, our intuition does help us to distinguish perceptions from dreams or hallucinations, and unreliable predictions ('I am going to win the lottery') from reliable ones ('The sun will come up tomorrow morning'). And an evolutionary theory still assumes a natural selection that can be understood to a certain degree. Hence we may assume that it is possible to identify selection criteria, but one of the lessons of this historical overview will be that we should avoid to quickly formulate one absolute criterion. Neither correspondence, nor coherence or consensus, and not even survivability, are sufficient to ground a theory of knowledge. At this stage we can only hope to find multiple, independent, and sometimes contradictory criteria, whose judgment may quickly become obsolete. Yet if we were to succeed in formulating these criteria clearly, within a simple and general conceptual framework, we would have an epistemology that synthesizes and extends all of the other philosophies.'

Thus, according to the Principia Cybernetic Web, a full memetics epistemology has not yet developed. Such an epistemology would be almost inseparable from complexity theory itself, because memes and meta-memes, including scientific

ideas, are emergent properties. A researcher studying knowledge production creates meta-memes, adding an extra recursive level, which is very individual – it is only shared with others if readers actually understand the book as intended, drawing lessons they actually use. The choice for this epistemology makes the researcher part of the system; he cannot validate the analyses made by the study object. Comparative, statistical research is difficult. The plausibility of the reasoning has to be demonstrated by referring to complexity theory itself – self-reference. Yet, if his theories become accepted in the system, they may create a deeper understanding of the learning processes in the composed subsystem and improve effectiveness of learning. More complex memes can be formed reinforcing the effectiveness and the learning process. Co-evolution between the practice of learning networks and thinking about learning networks may then occur. This is also the idea of modern innovation sciences (e.g. Smits & Kuhlmann, 2004).

Memes develop at the edge of chaos in social systems far from equilibrium, where entropy may diminish and therefore complexity may grow under adaptive tension. Finding a measure for this adaptive tension and that entropy is the challenge, because that would create deep understanding. Leydesdorff (2005a):

> '(…) a new mode of knowledge production can increasingly be generated. The local resonances compete at a next-order systems level. In order to study this selection, however, this 'virtual' (next-order) system has first to be hypothesized and specified.' (…) 'Since the reflexive selection mechanisms of cultural evolution cannot be identified by unmediated observation, the neo-evolutionary analysis (SN: this is the name Leydesdorff gives to this kind of analysis) has to begin with the specification of a hypothesis. 'What' does one expect to be communicated and why? The study of how this communication is institutionally arranged (and therefore measurable, in principle) is then a question of empirical design.'

2.4   Theories about trust

Trust has been identified as important by several complexity authors (e.g. Brandenburger & Nalebuff 1996; Leydesdorff 2005b). It is therefore worthwhile to summarize theories on trust, which helps in developing operational research questions.

Trust as a characteristic of conduct in social systems

I build this section mainly on B. Nooteboom (2002) and Mosch & Verhoeven (2003) who present overviews of trust theories. Trust shows as a characteristic of conduct in the relationship between social subsystems, at the lowest level individual people. These may depend on each other to achieve mutual benefits. If someone acts for the joint benefit, he anticipates getting something in return from the other. Since he cannot control the other he takes the risk that the other defects (opportunistic behavior). One definition is therefore: 'trust is a bet about future contingent actions of others' (Sztompa 1999). The object of trust can be a person or any social group that is perceived as a unity in terms of conduct. One

may trust organizations or complete subsystems. For example, a consumer may have trust in the economic performance of a country. The object of trust could also be a physical system, e.g. trust in a stable climate.

Zucker (1986) has proposed three types of trust: process-based, institutions-based and characteristics-based trust. Process-based trust is created in the personal experiences between people. It has to be continuously re-earned in interaction. Laws and general practices will not change so easily and therefore create institutions-based trust. For example, trust that inflation will be kept under control. Characteristics-based (or values-based) trust is the more subconscious kind of trust. For example, trust that people are intrinsically trustworthy. There might be a hierarchy: process-based trust may only develop if a person gives the process a chance, which may depend on his pre-existing values-based and institutions-based trust.

Trust mechanisms

In order to understand and manage trust, we need an understanding of trust mechanisms. Trust mechanisms are defined as: 'frequently occurring causal patterns that offer a plausible explanation for emergence and continuation of trust in bilateral and collective inter-human relations' (Hemerijck 2002, quoted in Mosch & Verhoeven 2003).

In a situation of interdependency, interactions may emerge slowly and trust may gradually develop. When cooperation goes well trust may increase. Trust is therefore caused by as well as the cause of successful cooperation without opportunistic defection. The idea that trust develops through positive feedback loops and that it has several embedded levels, is generally supported. Perceived in that way, trust becomes a characteristic of social systems. Different levels of trust are patterns that emerge at different embedded system levels. Consciously managing trust is therefore an application of second order systems thinking, as proposed by Leydesdorff (1997).

Trust is based on continuous feedback because it builds on the capacity to abstain from defection for the common good on the longer term. If there is trust, a necessary resource (such as time before the next elections) may become depleted, and an incident may be enough to enter a steep negative spiral again. The so-called Dutch 'polder model' illustrates this point (see 1.6).

Trust in nested subsystems

At the system level such trust mechanisms create several 'layers', with a main distinction between trust localized in small groups of acquainted people, embedded in the general culture of trust in the larger system (e.g., Moody & White 2000). In small groups there are small-scale dynamics of trust development, and in bigger groups there can be large-scale changes (which may sometimes move very quickly as well). Layers of trust can be, for example (in order of embeddedness:) genetic development of the human race where people depended on each other in the struggle for life, deeper cultural characteristics (social capital), childhood development where children depend on their family for survival but

when less is at stake also learn from their siblings not to trust blindly, cooperation in a production process where added value is created in production and consumption chains, and finally cooperation in complex innovations.

What happens at the more embedded levels depends on the context formed by the less embedded levels. In the Dutch context, the polder model could emerge. Ultimately physical conditions may be of influence like joint battle against water (Dutch), little interdependency due to mountainous or desert conditions, need for joint planning due to long winter season, etc.

Table 3. Forms of trust (Nooteboom 2002)

Trust in an actor as such (behavioral trust)
Trust in means and inputs the actor whom you trust can dispose of (material trust)
Trust the competences of an actor (skill, languages, knowledge, ..) (competence trust)
Trust in the aims of an actor in several degrees (intentional trust)
Trust in outside enablers (conditional trust)
Trust in role models or methods that have been successful in the past (exemplar trust)
Trust in the information on which we base our trust (information trust)

In a system of positive feedback the question becomes which condition limits growth of trust (Senge 1990). A distinction must be made between the factors on which the agents base their decisions, which may be crude rules of thumb (trust heuristics), and actual trustworthiness in terms of living up to created expectations. B. Nooteboom (2002: 50) proposes several semi-conscious 'forms of trust' he has found in the trust literature, which are listed in Table 3. The interplay of these factors can be quite complex, especially because different actors may not apply the same trust heuristics and therefore misunderstandings may arise. Trust is based on *perception* of trustworthiness. In a healthy relationship where opportunities for opportunisms are frequent, the trustworthiness of the other may be constantly re-evaluated. Bounded rationality and intrinsic uncertainty reduce possibilities for risk calculation, and lead to development of rules of behavior (heuristics) for control of trustworthiness. Heuristics develop as rational behavior under conditions of bounded rationality, with deeper trust mechanisms levels as subconscious drivers or motives. Relational risk is 'governanced' by taking small joint steps toward more intensive cooperation. Each step is a 'satisficing round' where actors give just enough information to make a next step (cf. ex post satisficing, Teisman 1992).

External trust and internal trust

The website of the T3 group in Rome (T3 stands for trust, theory, technology) provides an interesting section on trust theories, which has a section that I believe is in particular relevant, about external trust and internal trust:

> 'In order to decide to rely on Y, the trusting agent X must trust the environment too, or in other words X needs to have positive expectations about the external conditions that

might influence Y's actions. In fact, the four basic beliefs of trust (competence, disposition, dependence, fulfillment) could be fulfilled but nonetheless trust may vanish because of hostile external conditions. On the contrary, these conditions might be so favorable that even if Y is able only to a limited extent, X could equally decide to trust him because the environment is extremely facilitating.' (From: http://www.istc.cnr.it/T3/trust/pages/internalexternal.html)

Whereas the four basic beliefs of trust as T3 defines it are in line with B. Nooteboom's overview, the idea of external trust seems especially relevant to adaptive networks; these have no power by definition and therefore depend on the force of arguments. They should trust that power networks are open to these arguments. If the power context is favorable, adaptive networks might depend less on internal trust to 'survive'.

Significance of trust for change management

B. Nooteboom (2002) has remarked that trust is especially important for groups aiming at radical innovations. Scharpf (1997) has described the capacity of complex problems solving as a competence, of which trust formation is an important element. Nonaka & Takeuchi (1995) have indicated the importance of trust in relation to organizational learning, and Lester and Piore (2005) in relation to management of innovations. Lester & Piore argue, for example, that emphasis on expanding the reach of market competition risks choking off the economy's vital 'public spaces', which are invaluable since here ideas from different subsystems can merge. Indirectly they indicate that due to a weak general understanding of the innovation process there is insufficient trust that such spaces are effective. These authors give little advice on achieving trust. The implication of their inferences is nonetheless that trust is an enabling factor for successful change management, and may to that end itself be 'managed'. According to systems thinking, the further development of trust may depend on a limiting condition, perhaps one of the factors in Table 3. A change manager may then try to create a positive spiral of trust by applying a lever; a relatively small intervention, but still creating a sequence of events (Senge 1990). Learning networks, aware that a lack of trust limits progress, can try to identify that limiting factor and to find such a lever.

3   A method of complexity research

Yet in most practical situations our intuition does help us to distinguish perceptions from
dreams and hallucinations (Francis Heylighen)

The overview of theories in chapter 2 provides various disciplinary ways of analyzing co-evolution and coopetition, where content, structure, process, conduct and reward gradually change, and a complex societal system may develop a degree of adaptability. In different disciplines, trust is believed to be an important variable that enables tensions to become creative, facilitating co-evolution and increasing adaptability. The reasoning is as follows: wicked problems ask for a complex approach; this complex approach may be observed in what I define as adaptive networks that facilitate complex ideas which can only emerge in co-evolution, but the implementation of these ideas in the real world depends on power networks. Whereas power networks depend on wide support for the individual (trust in traditional leadership), adaptive networks depend on the trust in their own common capacity to make their ideas spread over power networks (trust in connecting capacities). The understanding of this second kind of trust is key to managerial approaches to increase the success of adaptive networks. External trust, internal trust and foresight, three elements I wrote in the introduction, are considered relevant, but have not yet been conceptualized. The theory of coopetition (Brandenburger & Nalebuff 1996) focuses mainly on game theoretic analysis in inter-firm relations, rather than composed subsystems.

In the present chapter I make this theory operational for analyzing empirical cases through observable characteristics of the themes content, structure, process, conduct and reward. This forms the 'dictionary' of analysis (see also the glossary). Then, I re-order this into answerable research questions about co-evolution and coopetition. This forms the 'grammar' of analysis, because it provides structure in the writing. Together, they form the language, the theoretical content of this book.

3.1   Content: ideas

The nature of content

Content is composed of units: the views, ideas, discourses or knowledge that emerges and is passed around in a social subsystem. I take position for the me-

metics view (see Page 59), in which a social subsystem constructs memes (views, ideas) about itself, its parts and the world. This world includes other subsystems it tries to influence. The link between worldview and conduct of a person or subsystem in interactions is defined as rationality. When asked, a subsystem is assumed to present its rationality. There can be a difference between the rationality as it sees it and the rationality as it tells it, since it may not be trustworthy. Rationalities should therefore be verified from different sources (triangulation). Hereafter, I normally use the term *idea* or *discourse* (as a shared set of ideas). A subsystem can pass ideas on to itself. It may also pass ideas on to the wider subsystem it connects, especially if communications are amplified in positive feedback processes (resonance). Different subsystems may produce different ideas, and these may compete for the attention of higher-order subsystems.
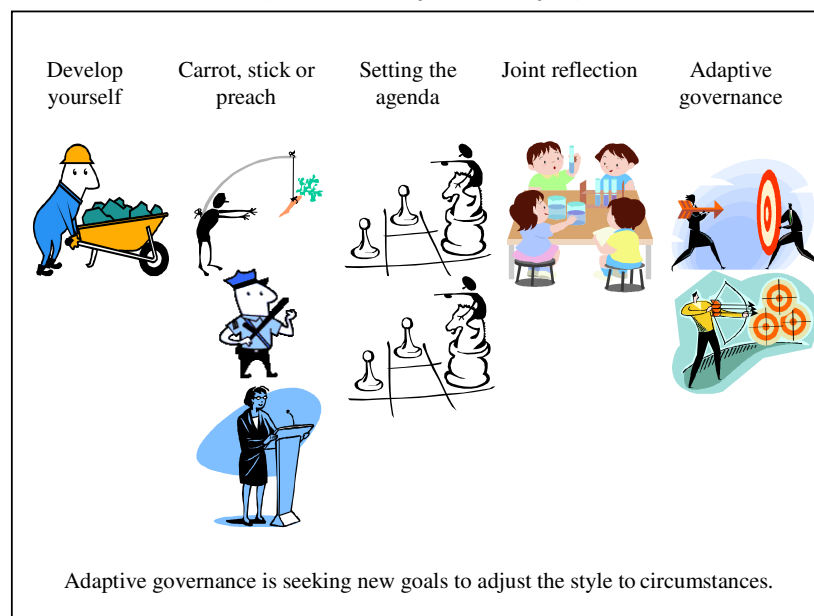
The study of how ideas develop and survive in the social jungle also creates ideas– ideas about ideas, or meta-ideas. This book studies how meta-ideas develop and is therefore itself a form of content at meta-meta-level. Hopefully the ideas in this book will fly about to influence many, intentionally creating a language to reward connecting behavior, and in that way contribute to sustainable development. Content may or may not lead to different structures, processes, conduct and reward. Because this book is complex, it seems unlikely that many whose business it is to shape the world, disposing of the resources to put levers in place, will share it – but if it does, a next order subsystem may be created.

Whilst applying a lever is defined as conduct (hereafter), the imagining of possible conduct is content. I distinguish two kinds of levers (see Figure 6). The first, and most obvious, kind of lever is to put in place market interventions that have a structuring effect on market processes, which affects the adaptive tensions in the societal system, which again causes new tensions and opportunities for goal-seeking behavior. Examples of interventions that in some degree had this rationale are Impact Assessment, pollution levies, and command-and–control systems that are not based on knowledge about the feasibility of allowable alternatives. Examples of the latter are the European Directives on air quality, water quality and protection of natural habitats. The idea was, more or less implicitly, that putting restrictions on our development will force developers to seek alternatives. The second kind of lever is strategic communication where a member of a power network communicates about his intentions. This may provoke reactions and strategic behavior of the rest of the power network, but more importantly through the media a big audience can be reached and the communication, if cleverly designed by an adaptive network, can have far reaching effects on behavior in the societal system.

Meta-ideas may exist only in the head of an observer, or may be shared with others in a *higher order (reflexive)* process. According to the Law of Requisite Variety, reflexivity is needed for adaptability, because a subsystem should match the complexity of its environment if it is adaptive. If a subsystem depends on many other subsystems, it needs to create complex ideas to be adaptable. However, all members need not cognitively share the full complexity of these

ideas – the connecting pattern may be there, like an emergent property of the whole subsystem, perhaps unwittingly formed through the individual behavior of its agents (like an ant colony can be more intelligent that its ants, or a brain is more intelligent than its neurons). The pattern *is* the complex, evolving idea. Such an idea then can be reconstructed by observing behavior of many nodes in the network, and their interactions. If the pattern is observed, a next order idea forms, and if it is shared it may enable to adjust the pattern to become one degree more adaptable.

Figure 6. Content: thinking about conduct in a part of the Dutch government (based on an unpublished report)

| Develop yourself | Carrot, stick or preach | Setting the agenda | Joint reflection | Adaptive governance |

Adaptive governance is seeking new goals to adjust the style to circumstances.

Market interventions (carrot, stick and preach) may be used as levers of the first type that intervene in market processes, whilst social interventions (setting the agenda, joint reflection and adaptive) may be used as levers of the second type that intervene in social processes to induce co-evolution.

If meta-ideas emerge, the involved agents are capable of influencing the development of lower-order ideas; i.e. the selection mechanism for ideas is adjusted. I like to use the word *natural selection*, comparing the selection of ideas (memes) in a social system with the selection of genes in an ecosystem. Which meta-ideas resonate in the higher-order system and become amplified, at the cost of other ideas, depends on a selection mechanism at the higher-order level, and this depends on the conduct of the agents. Successful ideas consolidate themselves, and

the subsystem that produces them. If subsystems are not successful, their ideas evaporate, and they dissolve.

Observing content

Ideas as such are not observable; an observer needs to interpret them from the words and actions of people who (as he might hypothesize) belong to a subsystem. If people speak the same language and say they have mutual understanding about the world, they are assumed to share ideas. (However, they may not base similar conduct on these ideas). Higher order ideas consist of ideas about lower order ideas that are produced by lower order subsystems. The ideas should be identifiable at each system level and be meaningful for the participants, even if not one of them sees the whole picture at lower level.
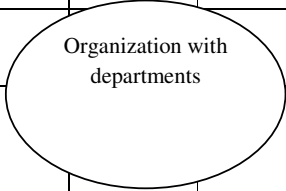
3.2   Structure: who does what

Structure as idée fixe (literally) or self-fulfilling prophecy

When people make choices, they take the perceptions they have of the structure of society – of who does what - into consideration. The assumption in complexity theory is that a valid generalization of who does what is possible, and it is defined as structure. Whereas structure may exist only as ideas in our mind, we assume that a real structure exists, simply because we all have the same structure in mind – and interact accordingly. It is important to see the structure as it really is produced by interactions, because it, and the conduct of its parts, determines how other ideas are passed on, and therefore how the structure itself will develop under the influence of these ideas.

The structure consists of social subsystems that consist of *agents* (or nodes) and a connecting pattern – a generalized set of interactions between the agents. An agent can be a subsystem that acts as a whole, or a person (in this text I often refer to persons where I also could have written the more general 'agents'). Any structure is itself a subsystem of something bigger. A hierarchical organization is full of power networks (*nested subsystems*). A social subsystem is also connected to the physical world, the ecosystem and the market system. Market systems and ecosystems also have a structure; it may, for example, be divided into interrelated systems of food production, mobility and housing. Each market system has a set of associated social subsystems – organizations, which may be divided into *domains*. A market system and associated social subsystems may be termed *composed subsystem*. A hierarchical organization may be part of one domain (like a university is a research institute), but may also incorporate different domains (like a ministry of transport may have an environmental department which is closely associated with an environmental ministry).

Table 4. Structure of a composed subsystem

Explication: A composed subsystem is a societal system, like in this case a mobility system in one metropolitan area. Such a mobility system itself is also a subsystem of still larger scale composed subsystems. The table includes hierarchical organizations. One hierarchical organization might include several domains and / or components. Each subsystem, including people, may show complex behavior by interrelating with other subsystems at different levels. People can be strongly embedded in departments where they are on the payroll, but they can also be less dependent consultants to the cooperation at higher subsystem levels. The latter is only possible if they are rewarded for that, i.e. the hierarchical organizations must be prepared to cooperate, which entails increasingly complex behavior.				
Components	**Domains**			
	(Inter)national Government	Metropolitan government	Research Institutes	Business	Civil society
Public transport providers					
Commuters					
Environmental policies			Organization with departments		
Freight trans-portation com-panies					
Manufacturing Industries					

A composed subsystem is governed by its structure, where different interests meet in a political arena. The different components are defined as the groups of subsystems in the composed subsystem that each represents a different interest. Table 4 gives an idea of the composition of a generalized metropolitan mobility system.

Structure as analysis tool for connecting behavior

If agents have the intention to develop new ideas about desirable futures of the composed subsystem, in order to making it more adaptable to changing circumstances, they have to allow for the interdependencies between its components. To intentionally develop ideas in co-evolution between different components, they need to develop an accurate image of its structure. They should not only focus on the structure of its interactions in the market, but also on its *power networks*, because the latter enable to reach a large audience with their ideas, and to get feedback and support from many (a requirement for market interventions). Power networks may be complex because many organizations are not

dedicated towards one composed subsystem only. Administrative boundaries cross the boundaries of market systems. Businesses operate in different markets. Political leaders and managers often have little responsibility for many systems, whilst nobody has final responsibility. Moreover, due to political developments the attitude of key players in power networks may quickly change.

Power networks and adaptive networks

Agents may simultaneously belong to several social subsystems. One such subsystem can be a power network, where behavior is aimed at (getting reward for) achieving public agendas and striving for promised goals. Interaction will be of the accounting type. However, this does not exclude that the same group can also deploy in goal-seeking interactions for the common benefit. This network then forms two seemingly incompatible structures. However, only the one with goal-seeking interactions, the adaptive network, is a higher order structure in the sense that it seeks meta-ideas with the aim of co-evolution.

A higher-order structure emerges if agents from different, but interdependent subsystems (i.e. belonging to one composed subsystem) form a new subsystem without compromising the original subsystems. If agents become dependent on the new subsystem, it is not a higher order system but it simply adds more complexity to the power network of the composed system. It becomes a competitor to the pre-existing power network, rather than connector. The agents therefore need to participate in two connecting interaction patterns: one at each level; one for ideas and one for meta-ideas. The ideas at the higher level influence the development of ideas at the lower level – a mechanism for natural selection of ideas, and the result is assumed to be more likely to be in the interest of the higher order subsystem, and therefore also in the (long term) interest of its parts. The structures that produce such meta-ideas are adaptive networks.

Observing structure

Structure can be observed through the ideas agents have about it. If many agents share ideas these are more likely to be accurate. Power networks, consisting of subsystems that can be identified and classified along the lines of Table 4, are relatively easy to observe, because their leaders, with their ideas, are widely recognized. Adaptive networks are obscure, since their interaction patterns are by definition only observable to the directly involved agents. (If others can see them as well, their ideas have already penetrated the agenda in a power network.)

An adaptive network includes members from power networks, who are willing to separate power interactions from learning interactions, and to use the tension between these two creatively. Learning interactions are reflexive, about the composed subsystem as a whole. However, the idea an adaptive network has about its own position in the structure is observable through interviews ('In which subsystems do you have influence and knowledge?' 'How are these subsystems interdependent?' 'Where are your blind spots?' – the latter may seem a

paradoxical question, but adaptive networks may have the feeling that there is some component or domain in their composed subsystem where they don't have enough knowledge or influence). An adaptive network should be able to identify itself (its composition), the tensions in power networks to which it is attracted, and how it separates the process of the usual power games from their learning interactions. Its existence is finally demonstrated through the innovative ideas it proposes to power networks. It they are successful, someone in the power network uses the proposition to intervene in the power arena, by making transparent statements about his own future conduct.

Figure 7. Observing adaptive networks
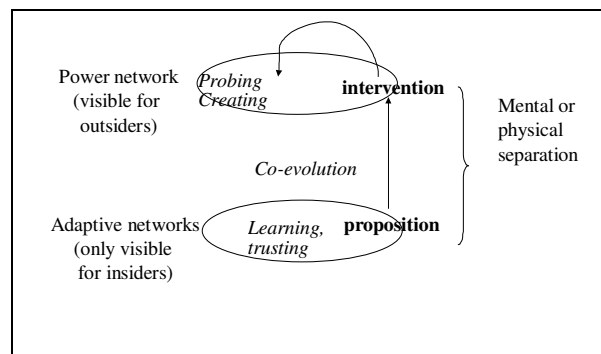
3.3   *Process: collective conduct in development rounds*

Defining development

Social subsystems are, I assume, living structures. In interaction with their social and physical environment, its agents continually interact, reproducing the subsystem. However, interactions are influenced by ideas, and as ideas may evolve, so may interaction patterns, and therefore the subsystems that carry them may evolve. This evolution process is termed *development*. The pace of development may be incremental (linear), or fast (non-linear). Involved agents may observe a fast change as a *development round*, and may be able to give a consistent account of the nature of the change. Development rounds can also be seen as changes of the public agenda at some level of composed subsystems. If one city politician decides to support investigating the feasibility of a metro system, this can locally be seen as a breakthrough. If the city council decides to build it, it is another breakthrough. If it is the first of its kind, other cities may copy the system and it may break through in a larger metropolitan area, where it may replace other public transport systems. It all may start as an idea of an architect who asks his superior resources to develop the idea; these are all breakthroughs at different scales.

I assume that the development of a subsystem depends on the external dynamics (the changing circumstances) as well as on its internal dynamics (resulting in its conduct as a whole). If external conditions change, the subsystem may adapt or not. If adaptability is high, the subsystem has high interconnectivity, i.e. many participate in adaptive networks, as at the edge of chaos new order is created (e.g. Mitleton-Kelly, 2003). In that case agents are prepared to suspend the short-term reward that they are used to receive for routine behavior, and develop shared perceptions of changes in behavior required to adapt. In that way, they try to *influence development*, steering it in a different direction by means of a *lever*, a small intervention that requires little power (from the side of the adaptive network) or political risk (from the side of the power network), but leading to co-evolution in power networks and ultimately in the composed system. If they don't succeed, a crisis may emerge (which is a different type of development round). I assume that development, in the market as well as in the world of ideas, shows spiral dynamics, depending on processes of negative or positive feedback, and a lever may reverse a process in a desired direction, like the proverbial butterfly in Rio may cause a storm in Texas.

Trust

Connecting behavior requires suspending routine reward and connecting with other agents, influencing the development of ideas. I assume this depends on trust that reward will come, which again depends on trust in persons or subsystems and their individual and common capabilities. I assume that trust elements are the indicators an agent uses to make a decision about behavior with uncertain effects. How an agent interprets an indicator depends on his personal conduct, but this also depends on the conduct of others. Each element, as it is interpreted, can contribute to either an upward or a downward spiral of trust in the subsystem, depending on whether there is enough of it. If one of these elements stops giving positive feedback (e.g. doubt about someone's intentions) it may meet a limiting condition and the relationship may not develop further or tumble into a downward spiral of trust.

I propose trust elements, which B. Nooteboom (2002: p 50) has found in the literature (see 2.4). My first distinction is between *internal trust* and *external trust*. Agents in adaptive networks should in the first place trust the other members of the network (internal trust). In the second place they should trust that they can get through to power networks to some extent (external trust). Internal trust, trust in the network's own abilities, is divided into two components. The first is *intentions*: Do all believe in the same objective at higher-order level? Do all want to contribute to it? Will no one betray the others by exposing common ideas prematurely so an effective counter-campaign can be set-up and the idea will remain unacceptable for a long time? The critical characteristic of intentional trust is that all in the group should trust all others, because one 'traitor' may ruin the process. The second component is *competences*: the group must believe that it has not only the will but also the capacity to achieve change at the higher-order level, given open minded power networks. The critical characteris-

tic here is that all should believe that enough competencies are present in the group, but not necessarily in each person.

External trust is defined as the belief that power networks have an open mind toward a certain kind of proposals for change, and want to support those, for example by changing their communications in public, enabling feedback and a wider learning process. Will political circumstances remain favorable? Will people with high positions be able to remain interested to link to the process and to enable it, or will they focus on other things, perhaps forced by the circumstances? Will actions be rewarded? The fundamental difference between internal trust and external trust is that the group can influence internal trust by means of its intentional interactions, whereas external trust depends on the larger political process, which by definition they cannot influence. They should simply trust that circumstances remain, or will be, favorable. This analytical difference seems important to explain the life story of adaptive networks – building the team whilst being blind to context changes is a risk, but the reverse doesn't create a team in the first place.

Foresight

I assume that a process may lead to more collective *foresight* (or rationality): the capacity to anticipate changes in the wider subsystem and possible effects of own actions. I assume that it helps if an adaptive network trusts that it has, or can develop, collective foresight. It is acting with some intention or aim, albeit unspecific and long-term. Foresight serves to somehow visualize how connecting behavior, given enough trust, may lead to that aim. Foresight is therefore a source of competence trust. Because it can develop in the process it enables, is also a product of competence trust. It is also a (complex, perhaps intuitive) meta-idea that gives direction to connecting behavior at the level of lower order ideas, thereby inducing a co-evolution.

Taking wicked problems and complexity theory as point of departure, the real potential effectiveness of an adaptive network depends on whether it takes into account the lessons of complexity theory. Therefore, under complex circumstances, the group needs to assess what conduct increases the chance of becoming a proverbial butterfly. Such butterflies are difficult to identify in hindsight, and therefore such behavior may be less likely to be rewarded afterwards. Nonetheless, assuming there is a mechanism for reward of thinking and acting along the lines of complexity theory in the common interest of a large group, the question becomes how an adaptive network can do that. How should they analyze their own conduct? Only by reflecting on how the group might create impact, making use of foresight, the group becomes a higher order subsystem.

The term 'sense of urgency' in this interpretation is part of foresight. If people tell each other that there is urgency, they refer to the impressions that have many people in relevant subsystems think and speak about certain wicked problems that need addressing. That perception may be part of their assessment that the time is ripe for change. In that sense, foresight is similar to trusting on your senses.

Observing process

I will study the empirical research object by describing its development by means of reconstruction of development rounds. These rounds emerge from the descriptions, in hindsight, of participants from the different involved subsystems. By first reconstructing the major development rounds, and then reconstructing the smaller development rounds that prepared for the larger ones, I can get closer to the proverbial butterfly – the one connecting action that resonated throughout the larger system and contributed to creating a series of ever-greater breakthroughs. A small breakthrough may form a different communication in a power network, about new action. That new action could be a lever for different interaction patterns and ultimately breakthroughs in the market.

Realistically, that butterfly or that lever may not be observable, but I will try to reconstruct how groups in influential processes displayed connecting behavior, imagining how they could become a butterfly. I will reconstruct their common objective, their trust and their foresight. I will try to reconstruct the process of positive and negative feedback that led to increased trust and foresight, and therefore to co-evolution, by asking the views of participants about enabling conditions. I will look especially for elements of trust and foresight that seem important from the angle of complexity theory, in order to see if respondents are aware of these elements, used and improved them. First I ask participants how they envisaged creating a joint impact. This would reveal that they have a joint language for *systems thinking*. They should be able to analyze their situation in terms of subsystems and power networks. From a higher-order perspective they should discuss possible action in lower-order subsystems, looking for levers to bring the social context into a new equilibrium, i.e. creating a spiral in a desired direction. They should put their trust in the same exemplars: stories about how other groups, people or interventions have created leverage in similar situations. One group member may also himself, through his conduct, be a role model to the rest of the group. Finally, as the weak point in previous sustainability projects has been the link to power networks, I will evaluate the way these groups thought about influencing power. Did they develop personal relations with power networks needed to achieve the next level breakthrough – possibly with the aim of achieving breakthroughs at yet higher management levels?

3.4   Conduct: individual behavior to build tension

Processes in subsystems are shaped by the conduct of their agents, which includes their reaction to signals from outside. Human agents have the option to give attention to higher-order adaptation (if they can see how to do that). The ability of seeing how, i.e. foresight, may develop in co-evolution. However, in a power context co-evolution only occurs if individuals take the initiative without guarantee of reward. Connecting behavior, transformative leadership, is required. One individual doesn't have enough knowledge or influence to create ideas that break through, and therefore he must make other people, with com-

plementary knowledge or influence, enthusiastic for a common cause, and start with creating trust and foresight.

If such a leader succeeds in drawing a perspective that other people believe, the process may gain momentum. That perspective is seen as an opportunity for developing proposals that will be accepted by power networks. In other words, such a leader should make the tension between the existing situation and opportunities visible to others, so that in a creative process through foresight they can combine their knowledge, and develop and test ideas. Opportunities should after a while be communicable to decision-makers who in small steps can change their communication, testing how the subsystem at large reacts.

Conduct is important, because tensions could also be interpreted as impossible to bridge, and trust may spiral downwards, which makes the tension even more destructive. Connecting behavior therefore is defined as taking the initiative of making tension between different subsystems visible to others, and leading the road to proposals that bridge the tension. First, few can see that road, later and if successful, many can see it and it may break through in physical reality. Agents may simultaneously belong to several social subsystems, which may compete for their attention.

Observing connecting conduct

Conduct can be observed by asking participants for which ideas they were enthusiastic, who else were enthusiastic, and where that enthusiasm started. How did they deal with the involved risks? Did they consciously provide others with opportunities, and did they reward them for their good efforts?

3.5 *Reward: the drivers of change*

Why would anyone invest in creating enthusiasm for adaptive networks? Even if someone succeeds in becoming the proverbial butterfly causing a storm, few people will be able to reconstruct this. Whilst at a personal level there may be several motives, for the sake of the argument I assume that there is some kind of reward if others recognize that the effort realistically may be expected to create impact in the wider world of ideas and in the real life world. If others can recognize such behavior, and if they reward it, it may also improve and disperse through a comparative advantage over objectives-following or interests-protecting behavior. The question of reward is therefore important in the study of co-evolution.

Enthusiasm may be created by a shared objective (a dream that is contagious), but in order to influence power networks, this dream must be realistic. Dreams must be close to what power networks think their supporters will support or at least accept. If that really happens, then the power networks as well as the adaptive networks that give them advice are rewarded. Realistic foresight may be shaped along the lines of complexity theories, but that is no guarantee that power networks will appreciate it. Systems thinking as such should first spread in the system before people can or will reward other people for it.

Connecting behavior may also evolve if it is rewarded in other ways, for example because there somehow is a correlation between connecting behavior and trustworthy behavior. Loyalty may be rewarded in hierarchical organizations, and therefore automatically, connecting behavior would also be rewarded. In such a case, connecting behavior would not have to be based on foresight. On the other hand, power networks are sensitive to political risk. If the adaptive network builds a case and convinces the power network that risk is low, and potential benefit high, reward depends on what actually happens. These chances depend on realistic foresight.

I assume that reward is crucial in the spiral dynamics of trust development – to understand how trust develops in interaction, it should be understood how trusting behavior (connecting behavior) is rewarded, or how people believe it is rewarded. If a next step in trusting behavior, required to endeavor in new enterprises, is not rewarded, trust is unlikely to grow. It then meets a limiting condition. This may also take away hope of getting further to success, and the adaptive network may then dissolve. After a while, even intentional trust may disappear.

Observing reward

If connecting behavior is rewarded, the power networks should show through their behavior (as interpreted by adaptive networks) that they are open for a certain kind of proposals (i.e. giving a broad rather than specific objective), and that they want to share in the political risk of either not being productive or taking initiatives that are not immediately rewarded in the political arena. They should be perceived to understand and reward such proposals, and also the reasoning behind it, which is based on systems thinking. Respondents may indicate that they had legitimized their behavior, implying that they expected at least acceptance of the effort and an open ear for outcomes.

3.6   Tension, interconnectivity and co-evolution

If observations about the themes above are available, it should be possible to assess in some degree how tensions are shaped in society in power networks and how (depending on the human factor; i.e. the presence of skilled change managers) adaptive networks develop. This gives an impression of how interconnectivity develops. In which degree is the nature of *social dilemmas* related to *bifurcations* shared and discussed under higher-order tensions, and the degree in which this discussion leads to evolution of higher-order social tensions, providing new opportunities for adaptive networks to address these problems. These adaptive networks are so to speak invited to emerge and to develop ideas in co-evolution. Co-evolution is manifest if the adaptive network develops complex ideas that influence the public agenda and, in the perception of the power network, diminish some of the tension. As indicated, I assume that this requires coopetition: trust and foresight.

This should be observable through the tensions individuals observe, feel or consciously create in their own context, and the degree in which they have a

conscious explanation of this tension, the explanation for how this tension develops under influence of ideas, and the degree in which this explanation is shared with others. This is the result of a positive spiral of trust and common rationality based on foresight. This depends on people who create enthusiasm and who make a common analysis of the appropriate social tensions. By managing these tensions appropriately, and given appropriate conditions, they can push the composed subsystem in a positive spiral, leading to more interconnectivity. Complex ideas may travel quickly through higher-level subsystems based on joint foresight. In that way, the subsystem becomes more flexible and more adaptable to changing circumstances. The limit might be set by the boundaries to the complexity of ideas that can be hold in the individual mind.

3.7 Research questions

The key research question is: 'How can new ideas about sustainable development be widely adopted, and how can this be evaluated in the case of transition management?' This key question is split in partial questions that I answer chapter-by-chapter. Chapters 4 through 6 are purely empirical chapters, and chapter 7 is an interpretation and generalization of the empirical findings, with the aim of contributing to new theory.

Table 5. Summary of observable characteristics

Interpretation of participants of the content of the network (ideas and meta-ideas about desirable future and action for subsystems)
The ideas participants create about the structure of the composed subsystem they try to influence, and the adaptive network's own position in the structure (i.e. which knowledge and influence does help to create more foresight)
The process of development rounds in which these ideas developed, reconstructing how adaptive networks influenced power networks, achieving a spiraling interaction between power networks and adaptive networks, where trust either diminishes or increases. How capacities of foresight developed in this process (according to the interpretation of participants).
Connecting behavior can be observed by asking participants for which meta-ideas they were enthusiastic, who else were enthusiastic, and where that enthusiasm started.
Reward given by power networks to connecting behavior should show through their behavior (as interpreted by adaptive networks). What makes the content of connecting behavior convincing to power networks?

Above I have defined observable characteristics of a hypothesized adaptive network; summarized in Table 5. These characteristics are assumed to be observable through interviews, where respondents are selected after hypothesizing the adaptive network. They are based on my interpretations of complexity theories, as explained above. The theoretical framework above provides the building

blocks for an analysis of a hypothesized process of co-evolution, under influence of tension in a power network. However, the themes are closely related and it is not useful to give a separate account for each theme. I have chosen to split the analysis into three empirical chapters and a concluding, partly normative chapter as indicated in Figure 8. The chapters 4 – 6 summarize the dynamics I have observed throughout a period of four years, through interviews supported with documents. Chapter 7 summarizes 4 – 6, theorizes about implications, and draws lessons for sustainable change managers.

Figure 8. Structure of chapters 4 – 7
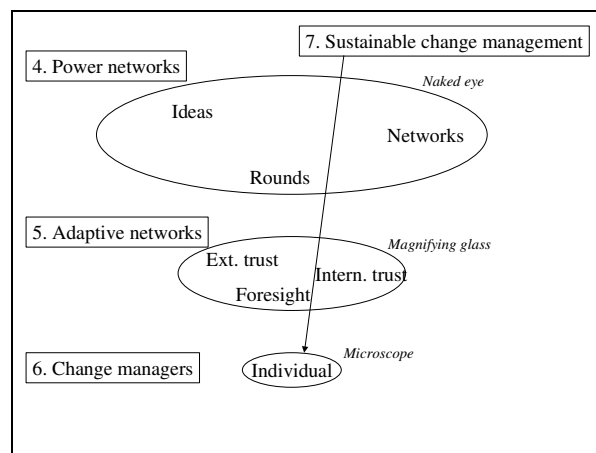
Chapter 4: Power networks. How did power networks evolve, and where can adaptive networks be hypothesized as an explanation of that evolution? In this layer I focus on the most visible layers of content, structure (i.e. power networks) and process (accounting interactions). These are the layers that are visible with the 'naked eye'. Which tensions occurred in power networks, what kind of new ideas emerged? New structures may emerge, split off and die like in an evolutionary tree. I describe how structures and the associated ideas evolved in development rounds. Higher-order subsystems are characterized by meta-ideas, which can be distinguished from other ideas because they are about partial ideas that live in partial subsystems. I reconstruct how partial ideas are influenced by meta-ideas and why these were thought to be in the higher-order interest. If co-evolution can be reconstructed, adaptive networks may be hypothesized.

Chapter 5: Adaptive networks. How did adaptive networks evolve, and where can change managers be hypothesized as an explanation for that evolution? This layer contains explanations in terms of development of trust and foresight. Since adaptive networks are more implicit than power networks, I need a 'magnifying glass'. The implication is that some of the bigger picture is lost. How do participants explain their own conduct – and that of others? Which tensions did they

feel, how did they deal with the tension? Why did they become enthusiastic – or skeptical?

Chapter 6: Change managers. How did change managers influence development? This layer explains the events through the influence of individuals that displayed connecting behavior. These events can only be seen through a 'microscope', which is why only a partial explanation is possible. On what did they base their enthusiasm or how could they convey it to others? How did they analyze their situation and possible effects? Did they apply systems thinking, use exemplars, or reduce distance to power? How did they expect to be rewarded for this behavior (if they had any expectations)?

Chapter 7: Sustainable change management. Which lessons for sustainable change management, contributing to sustainable governance, can be drawn? This chapter reflects my interpretation of the competences that spread in adaptive networks, and contributed to trust. It starts with an overview of findings and general conclusion, which is then elaborated in detail. Then I propose issues that would deserve further attention, including lessons for change managers.

4 Power networks

The purpose of war is peace (Aristotle)

The empirical objects of this study are some of the networks under the transition discourse, which I introduced in chapter 1; there I wrote about what people were telling each other in 2001, and which led to Dutch sustainability policies, laid down in the 4th National Environmental Policy NMP4. The idea was then that a new type of process was needed to deal with wicked environmental problems related to unsustainable development of several societal systems, most notably the energy and mobility systems. The proposed new type of process had similarities to what I have termed coopetition to achieve co-evolution in adaptive networks. That would create hope that in the context of the transition discourse, some degree of co-evolution would be achieved. Based on interviews I have hypothesized several interlinked adaptive networks in the context of the transition discourse, as the title of the present chapter indicates. I distinguish the emergence of the following hypothesized adaptive networks:

- *Development of major sustainable policy papers: the NMP4 process.* The inter-ministerial team that prepared the NMP4 including the ideas about transition management that were accepted by Parliament and subsequently implemented by different ministries. The formally leading ministry was the environment ministry VROM, and another influential ministry was economic affairs (EZ), responsible for energy policies;
- *Think tanks for sustainable mobility: The Innovation Board Sustainable Mobility (IB).* An informal network that emerged in the follow-up of the NMP4. It was an initiative of the transport ministry V&W;
- *Think tanks for sustainable energy: The Energy Transition Process (ETP).* This process also formed follow-up of the NMP4. This process was initiated and guided by the ministry for economic affairs EZ, which was responsible for energy policies. EZ invited transition teams from all domains linked to the energy system and promised a budget of 35 million euro for transition experiments, and smaller subsidies for the earlier feasibility studies. EZ accepted only proposals that created ideas that fitted, in its view, the general idea of sustainable development. To that end, EZ required that environmental pressure groups supported proposals. Explicit efforts were done in EZ to reflect on the process and to create lessons at management level;

- *Strategic inter-ministerial cooperation: the five DG deliberation.* After the adoption of NMP4, several non-environmental ministries initiated transition management processes. VROM, responsible for NMP4, remained coordinator of annual progress reports to Parliament. In that context, the involved ministries regularly met to discuss progress at the level of Director General. The same ministries also cooperated at operational level in the IB and the ETP. The five Directors General (DGs) convened several times a year as of 2001. At first each ministry 'implemented its own transition', relating to the composed subsystem they had most knowledge about (e.g. V&W for mobility, EZ for energy). In 2005 they adopted a joint programmatic approach.

In this chapter I describe content, structure and process of these networks. I describe how ideas and meta-ideas developed and spread in rounds through the structure, but also affecting the structure. The general set-up is as follows:
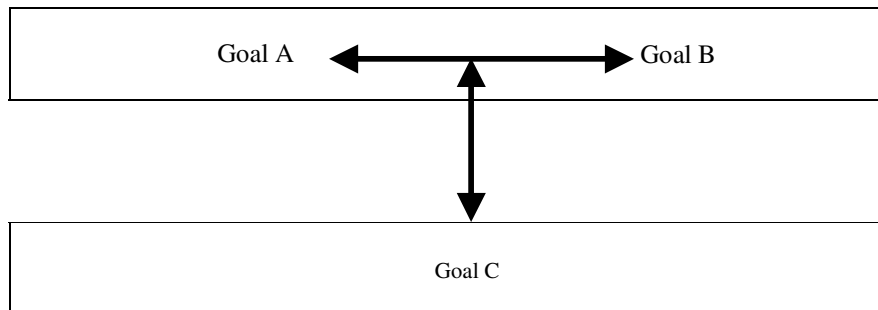
For simplicity I assume that the tensions in power networks can be summarized in the polarity between two goals (A and B), which summarize the main conflicts. *Structure* is formed by a power network and, in its context, a hypothesized adaptive network. *Content* is formed by the goals, the Goal A and Goal B are proposed in a power network, and an adaptive network may propose Goal C that neither fits A or B, but still relieves the tension between A and B. If the power network accepts C to replace A and B by confirming these goals in public, creating expectations before a larger audience, a successful adaptive network can be hypothesized. If a player in the power network changes his public Goal unilaterally with the aim of inviting adaptive networks to produce a third way, he tries to initiate an adaptive network by managing creative tensions, which I define as connecting behavior or change management. *Process* is formed by the consecutive power networks and adaptive networks, which develop in rounds that result from the interactions.

4.1 Development of major sustainable policy papers

Summary of three development rounds in the NMP4 process 2000 - 2001

Sustainable development discourse		Sectoral development discourse
1 – *Environment minister*: an innovative but concrete NMP4		1 – *EZ principals*: NMP4 should be harmless
2 – *VROM principals*: EZ to manage energy *and* mobility transition		2 – *EZ principals:* V&W to manage the mobility transition; EZ only the energy transition
3 – *Believers in politics*: the analysis is correct and deserves our support; it is the road to sustainable development		3 – *Skeptics in politics:* despite the importance of sustainable development this is a waste of time for Parliamentarians

NMP4's Transition Discourse

1 – NMP4-team: vague discourse but supported by the private (energy) sector and by relevant NGOs; at several stages Teljeur, linking the NMP-team with EZ principals, obtained the approval of his principals at EZ to do surveys with groundbreaking questioning lines

2 – Civil servants, in particular V&W, present transition management as opportunity; The Director General of V&W saw the opportunity as well and changed the perception VROM had of his ministry

3 – The Minister for energy agreed to 'manage the transition to sustainable energy' after her civil servants had put her in this position, enabled by the discourse in Parliament. No budgets were reserved, so she was not vulnerable for criticism from budgetary side. By doing this, she created pressure on the other ministers and state secretaries to follow, which they did.

Note: all published documents with respect to the NMP4 process downloadable at www.vrom.nl.

Sustainability research and greenpolder model (before 2000)

In the years before 2000, individuals from the energy, mobility and environmental policy subsystems had become disappointed with results of their efforts toward sustainable development. Despite research projects jointly undertaken by all domains (public, private, academic, NGO), despite innovation policies that encouraged sustainable initiatives, and despite strategic cooperation between all domains around large infrastructure projects (in the greenpolder model, see Page 32), sustainable mobility or energy still had not been achieved, and there wasn't even a shared idea of what it meant. Many shared that disappointment and the

general idea that sustainable development is still an important option. Further more, each one knew that the others felt in this way and were prepared to spend their energy on it. In other words, people from different subsystems had developed personal relationships and shared a sense of urgency of sustainable breakthroughs. They did not know (at least not collectively) how to develop such breakthroughs, however. They only knew that the previous efforts hadn't worked because they had failed to convince decision-makers of required concrete changes.

Round 1: Management support for transition management (around 2000)

Around 2000 the minister for environment Jan Pronk decided to develop the NMP4, which was also mandated by the Environmental Management Act. Parliament, lobbyists at large, and other ministries took this very serious. There was a wide sense in the administration and politics that large policy notes really matter. For example, the first National Environmental Policy (NMP1) was seen as highly influential. NMP4 might also become groundbreaking.

> "The NMP-series was seen as highly influential"

Pronk gave project leader Jan Kort in the environment ministry VROM a free hand to develop innovative environmental policies. Parliament, lobbyists at large, and other ministries took this serious since previous NMPs had received a lot of attention and were said to be effective, albeit insufficient. There was what Nooteboom (2002) terms exemplar trust: the previous NMP's served as exemplar for NMP4. In this context, a close cooperation developed between Jan Kort and Hans Teljeur, who was responsible for sustainable energy scenarios in the Economic Affairs ministry EZ. This team developed the NMP4 text about transition management, in dialogue with their networks of researchers and lobbyists, including companies in the energy, environment and mobility sectors.

A critical moment was when Hans Teljeur proposed to his management to do a survey among the energy sector companies and related NGOs, about sustainable energy and expectations of the role of the government (in particular EZ). The clear outcome was that, given the ongoing market liberalization process in the energy sector, competition was expected to increase and therefore the government should take compensating initiatives to maintain cooperation about sustainable energy. EZ's management then accepted that NMP4 was an opportunity for EZ to claim that role.

The result was a draft NMP4, reasoning that certain environmental problems are too complex to be solved under the responsibility of environmental policies. Previous policies, like hierarchical control, voluntary agreements, fiscal and social instruments (what I term levers of the first kind, directly intervening in market processes, see Figure 6 on page 69), had reached their limits because profound societal changes were required, not only environmental – in the case of security of energy supply, economic affairs was the responsible ministry. All policy domains (private, public, civil society, academic, citizens) share responsibility. The systems resisted the pressures exerted on them through environ-

mental policy instruments, and joint action was needed between corporations, NGOs and scientists and governments to develop better instruments to push the system into a new equilibrium. The role of the government would be to initiate that process and to create interactions between forerunners from all domains. It should help the forerunners to develop joint objectives for the long term and reason backwards, via so-called transition paths, toward short-term action.

"insiders appreciated the idea of transition management"

The NMP4-text about transitions (see also 0) was widely appreciated by insiders from all domains, most of whom were said to have shared the previous disappoint-ments and felt that the key to breakthroughs was in the cooperation between domains. The insiders were persons who worked in all domains but were con-cerned with environmental and sustainability issues. The only pressure group that expressed doubts was the employer's union VNO-NCW. On the other hand, many 'outsiders' or people who had no faith in constructive cooperation thought that transition management was unspecific and unaccountable.

Round 2: Cabinet decision about NMP4 and responsibility for its implementation (Spring 2001)

Environment Minister Jan Pronk initially had doubts because he thought that the texts of draft NMP4 were too vague, but higher management in EZ supported Jan Kort. The draft text was then offered to the relevant ministers in Cabinet. The minister for economic affairs Annemarie Jorritsma, responsible for energy policies, was the first minister who agreed to become charged with the imple-mentation of a transition, as proposed in NMP4 (in terms of the transition dis-course, she became 'transition manager'). For the first time, the environment ministry gave the prime responsibility for an important part of environmental policy to another ministry.

A widely remembered event was a meeting that took place in June 2001 in a popular restaurant on the beach. Representatives from all domains concerned with sustainable development had been invited, and the Director Generals of the ministries who the NMP4 team considered to have the best knowledge and rela-tions in the targeted societal systems, were there. Each DG presented his ideas about sustainable development. Not long after that meeting, it was decided that the ministry of agriculture would 'manage' a transition to sustainable agricul-ture, the ministry for transport (V&W) would 'manage' a transition to sustain-able mobility, and the ministry of foreign affairs would 'manage' a transition to sustainable use of biodiversity and natural resources, which was concerned with the system of international trade. As the energy minister had taken the first step, the ministries responsible for the other concerned societal systems also volun-teered. It is less clear if this really was based on co-evolution of the discourse, or simply the wish to be a match for the en-ergy minister, attracted by the adaptive tension between Cabinet and Parliament and the competition between coalition

"VROM handed its policies over to other ministries"

partners. On this day, the idea was shared that the ministry that has most knowledge and influence about the concerned societal system can best manage transitions.

There were only doubts about mobility. The mobility system is the largest user of energy, but the responsibility of V&W, not EZ – and therefore EZ and V&W both proposed that V&W manage a transition to sustainable mobility. VROM did not trust that V&W would be willing to take that task serious. V&W was said to be a slow adapting, perhaps self-centered ministry. The energy ministry, however, said it didn't have a network in that sector, and the positive attitude of the transport DG at the beach meeting and at other occasions had convinced VROM.

Round 3: Acceptance by Parliament (November 2001)

Despite being unspecific and unaccountable, Parliament accepted transition management. It gave NMP4 the benefit of the doubt, but requested annual progress reports. It was a kind of compromise that might result if there are no major objections, and a limited number of supporters. The environment minister pleaded to spare him the difficult obligation of reporting on progress, but that did not help. 'Transition management' became known in The Netherlands (at least in the environmental sector) as the next generation of environmental policy. Five ministries worked together on four different sustainable transitions. A non-environmental minister headed each transition, and the minister (later state secretary) for environment coordinated the communication with Parliament, and would report on a yearly basis. DGs of five ministries met every two months from then on. At the time, the new concept of transition management gave rise to many questions and publications. Four years later, support was still mixed, as rich discussions in ArenA, the magazine of the Society of Environmental Professionals, show (see Table 1 on Page 27). The adoption of NMP4 in 2001 and the implementation agreement in Cabinet created a condition for cooperation between ministries for several years. When new Cabinets arrived, new Cabinet members defended transition management. The first to do this was state secretary for environment Pieter Van Geel as of July 2002, in Cabinet Balkenende I and II, and the second was Laurens Jan Brinkhorst, who joined Cabinet Balkenende II in 2003 as minister of economic affairs.

Co-evolution and adaptive networks

The ideas that emerged in the NMP4 process were about joint interests of VROM and EZ, and therefore they were meta-ideas. The link Hans Teljeur – Jan Kort, both representing a larger group in VROM and EZ, developed proposals that did not fit the original assignment they had got from their management, but they built a case by using input from the outside world. The outside world was connected with Parliament through all domains. The NMP4-team had sensed that there was support for this line of thinking outside the national government, and used that to create co-evolution inside.

Environment minister Pronk had given Kort a free hand, but at the end of the day was not charmed with the unspecific texts (he personally has deleted texts about transition management that Kort and Teljeur with their team had written). Whereas Pronk may have been forced to support transitions because of other circumstances, the power network in VROM was only partly convinced at the time. Several saw it as a loss of influence for VROM. In EZ however, more people in the energy department seem to have become enthusiastic for transition management. The EZ minister supported this idea as she had been challenged by Parliament to address sustainable development. Parliament had exerted pressure on her by creating that opportunity. The civil servants had, without her involvement in the preparations, given her the opportunity to be rewarded; and this is probably why EZ's principals also were pleased. Hans Teljeur had created that opportunity through interviews and several events, getting feedback from all domains. This had opened the eyes of EZ's principals to the potential of a new role as moderator of transitions. The idea that it was in the interest of both EZ and VROM that EZ would take that role, had co-evolved between VROM and EZ, and the lobbyists in the environment and energy fields. (From that day on, the axis VROM-EZ would remain the driver of the transition discourse, with a key role for environment DG Karel Zijp who arrived just after NMP4 had been approved). Co-evolution stretched further than VROM and EZ. By involving influential people from all domains in the preparation of NMP4, also Parliament was reached. This explains why it accepted the vague NMP4 with a horizon of 30 years.

4.2   *Think tanks for sustainable mobility*

Summary of development rounds in the mobility transition process 2001 - 2005

'Economic progress depends on auto-mobility' discourse 1 – *Skeptical V&W principals:* Don't make any promises 2 - Skeptical high government managers: Don't waste time in the IB 3 – *Delaying CEOs:* New automotives are not in our interest	**'Auto-mobility is unsustainable' discourse** 1 – Enthusiastic V&W principals: We can at least try 2- Enthusiastic high government managers: We shouldn't give up quickly 3 – *Enthusiastic CEOs*: Sustainable innovation may be in our interest

Sustainable automotives Discourse

1 – *V&W civil servants*: get quickly together an influential and knowledgeable group according to the transition discourse

2 –*IB*: defines a mind map and seizes the opportunity of an EU conference with a focus on automotives

3 –*IB*: is so connected throughout Europe, that it can formulate well underpinned social dilemma's for the automotives system, which it tests at the EU conference

Round 1: mobilization of the mobility board (summer 2001 – winter 2001)

In summer 2001, former member of the NMP4 team and civil servant at transport ministry V&W, Bas Harms made use of the political momentum of NMP4 to obtain a statement of the transport minister that she would 'manage a transition to sustainable mobility'. This delicate commitment was enough to legitimize Bas Harms to do a series of interviews with persons who might have been willing to join a transition team. It was not difficult for Harms, making use of networks dating back to the 1990s, to find a group of motivated people from environment and mobility NGOs, oil multinationals, car technology firms, academics, consultants and directors from the ministries V&W, VROM and EZ.

A highly knowledgeable and influential group of policy makers emerged, who together could oversee the mobility system, its problems, and its possible futures, as well as political reality in all domains. Commitment among V&W principals for transition management was low, since V&W had hardly been connected to the NMP4 process. Still the deputy Director General Jeroen Tulp joined this group, which met every 2 months as of 2002 under the name Innovation Board Sustainable Mobility (IB). Jeroen Tulp was widely considered to be

one of the most influential principals in V&W, and V&W was, given its budgets, one of the most powerful ministries. Although insiders saw the emerging of the IB as a breakthrough, it never existed as a formal activity of V&W however, other than the obligation to report progress of V&W's role in transition management. The few individuals from V&W who were involved, had no budgets and limited time. Table 6 presents some key members of the IB, as well as the power context in their domain.

Table 6. Some members of the Innovation Board and their power context

Onno van Dongen, director of the mobilist's association ANWB, had been influential in national and regional discussions about government policies. Most Dutch car owners are member of the ANWB and read its magazine. The ANWB often manifests itself in policy processes, in the press and via its magazine. Their credibility is based on the support of its members who are in the first place interested in cheap and efficient transport by personal car, but increasingly also in a good quality of the living and recreation environment. Van Dongen had before been helpful in policy processes that tried to combine the two seemingly contradictory objectives, but had experienced that in the usual policy processes about single government interventions like infrastructure development or taxing of road transport, breakthroughs had never been achievable. What they had to offer was their influence on the Dutch mobilists and their other European counterpart organizations, and knowledge about the thinking of mobilists through their polls. What they were looking for was a government that would address the dilemma between mobility and environment in a more strategic way.

Piet de Jong, a leading member of the politically influential Foundation for Nature and Environment (SNM). Whereas many environmentalists still have doubts about personal transport by car, he and his staff had accepted the inevitability of the growth of forms of individualized passengers transport, and was prepared to invest in environmentally friendly forms of it and use his influence to defend good ideas before his supporters. SNM also had supported the ministry of environment by suggesting to Parliament that it request yearly progress reports of transition management. Parliament, doing this, challenged the transport ministry with an opportunity show its skills, which the minister accepted (like other ministers also had done). De Jong, in summary, had influence on the larger environmental movement (also in Europe), and knowledge about their behavior.

Arthur Groen, innovation manager at Klingon, had personal relations at the level of Klingon's board of directors. Klingon had been investing in sustainable energy technology for years. Both showed in the IB that they were prepared to contribute with their knowledge and influence for the benefit of the long-term future of the energy and mobility system at large. Both could help through their skills in systems thinking, scenario development for which Klingon is well known, and the knowledge they had of innovations in the fuel and energy industry. Often operating without explicit consent of Klingon's management, they invested many days of their private time in the IB. When through Groen a member of Klingon's board of directors became involved in the preparation of the EU conference, also other oil industries started to show interest. *(Ctd next page)*

The car industry became involved only late in 2003, in the person of Kees van Arkel who represented Takey Europe. He had been invited when the IB had discovered that breakthroughs depend on car technology and on the willingness of the car manufacturers to invest in that. Japanese Takey was relatively advanced because it offered a car with a hybrid propulsion system: petrol fuel and electricity (this car has become auto of the year in Europe as well as the USA). The European car industry was (in close discussion with EU policy makers), focusing more on clean and efficient diesel technology to achieve environmental objectives. Van Arkel, whose primary aim was to support Takey's market, gave an impulse to the development of ideas for possibly sustainable technology scenarios, and through him Takey participated in the EU conference in the person of Raymond Jansen who is mentioned in the introduction, challenging many other car manufacturers to do that as well. The European car manufacturers, participating at high level in the EU conference, were confronted with ideas to which they in the eyes of others had no response.

Three Dutch ministries were represented at the level of directors from the start of the IB: deputy director general Jeroen Tulp and deputy director Bas Harms, two directors of the environment ministry, and a director of the economic affairs ministry responsible for the energy industry. They were all legitimized to spend time on the IB because under the fourth Environmental Policy NMP4, signed by all their ministers, they were supposed to cooperate on transition management, a new and yet vaguely defined role for government. Their respective directors-general, the highest administrators in their ministries with direct responsibility for policy development, had agreed to meet regularly to discuss progress of transition management, and thus stayed committed to this process throughout the study period. Most of these directors entered the IB with a relatively open mind, and supported the joint organization of the EU conference, and other joint initiatives. In interviews, they all indicated that the IB was a unique and useful group to them. The knowledge they had acquired at the IB helped them to test and improve the policy processes at home. They said they had a general sense that the process in the IB could be useful to make steps to sustainable mobility, in particular if the policies of the powerful but independent ministry of transport could be influenced.

Other participants were representatives from the association of car dealers, car maintenance shops and filling stations, recently privatized bus companies, two university professors and a consultant. The contributions of some of these were highly appreciated in terms of knowledge and skills to integrate knowledge (including a professor who had highly appreciated structuring qualities and was able to use knowledge he had as member of several national advice councils to the government (transport as well as environment), and the group's moderator, a consultant who was once explicitly evaluated by the group).

Round 2: Joint preparation of the EU conference Energy in Motion (2002 – 2004)

In summer 2003, three ministries (V&W, VROM and EZ) decided to organize jointly a European Conference on sustainable automotives ('Energy in Motion'), which was to be held in October 2004. This decision has been highly influenced by the IB, where directors of these three ministries participated. The proposal was well received, perhaps because the minister for energy Laurens Jan Brinkhorst and the state secretary for environment Pieter van Geel were personally committed to the ideas of the 4th environmental policy on transition manage-

ment. This Dutch 'Troika' became the host of the conference, and used their influence to get enthusiasm for the conference in their European networks. This cooperation had been unthinkable before, and the outside world was for the first time influenced by the IB, without being aware of that.

The ministries had chosen automotives because they believed that The Netherlands would be an interesting experimenting ground for new technology; the urgency of breakthroughs was shared from many sides (dependency on oil, climate change), and other they expected that EU countries shared in this general feeling. To make the conference agenda as relevant as they could, a common problem description was needed. Thus, the IB members had made a decision in their formal capacity (to develop a conference together), which formed an adaptive tension for them as IB members to look for a problem description for automotives that their own supporter groups would be willing to accept. Thus from then on, organizations where IB members worked started to give coherent signals to their different supporter groups. These signals were in the form of perceptions of the automotives problem.

"Inter-ministerial
cooperation was

Jeroen Tulp and his people, VROM and EZ communicated each in their European networks about the EU conference and the problem description. Jeroen Tulp visited many countries personally. The mobility and environment NGOs in the IB mobilized their own partner organizations in the EU. A Japanese automobile industry provided accurate information about present and possible future car technology. An oil company provided knowledge about energy technology. Participating organizations asked their supporters, in their formal capacity, to participate in so-called 'snowball groups' that had been initiated by the conference preparation team. The preparation team had interviewed about 30 people all over Europe about their views on sustainable mobility, to sense their concerns. The question was, which conference agenda would be timely? The Klingon and Takey IB members approached their managers and CEOs with these ideas, and these were willing to participate in the conference and let their people take part in snowball groups. Other energy industries and car manufacturers who were also invited saw the momentum that this process was taking and participated in snowball groups and in the conference as well.

The snowball groups addressed specific parts of the mind map, and consisted of representatives of industry, mobility and sustainability NGOs, and governments. In these groups, people came to realize in the first place that many others also believed that the issues at stake were important, that sustainable options might be available, and that the relevant actors were prepared for dialogue. One IB member who participated in some of the snowball groups said: 'By giving the right example, we have tried to pass on our ideas about open dialogue, to ensure that the same kind of connectivity could emerge throughout Europe by means of the snowball groups'.

Findings of the snowball groups were discussed in the inter-ministerial team. With feedback from the snowball meetings, the conference's agenda grew in a

year's time. The resulting conference discussion paper is summarized in Table 7. In retrospect, it is difficult to identify precisely where specific elements of this problem description have originated (several people may 'claim' an idea, or people don't remember where an idea has come from originally). Causality, who influenced who in these power networks, is hardly determinable any more. On occasions, the preparation team leader could identify new dilemma's that created opportunities for the organization. For example, the paradoxes between counteracting EU legislation on clean vehicles. Another important new idea was that regional mobility problems have an international dimension, since breakthroughs may depend on new transport systems that should be introduced in regions, and facilitated by European policies. During the preparations, the idea had also spread that several sustainable breakthroughs may be possible, which would require joint leadership.

So, there was wide agreement that a co-evolution of thinking about automotives had occurred, at least temporarily, at European scale and between the auto, energy and environment sectors. IB members believed that the IB itself had been key to that success. However, the interdepartmental team did not recognize this, and indicated that inter-departmental cooperation had been better before. A VROM-representative said, 'other parts of VROM were cautious, and doubtful as to whether V&W would take proper care of environmental issues. However there was no doubt as to whether the conference was a joint effort with V&W'. This suggests that the cooperation was still young. The only higher civil servant that was actively involved in the preparations on behalf of the three ministries, was Jeroen Tulp. If Tulp acted in coordination with the other two ministries, that process would have been in the IB and therefore unnoticed by the civil servants.

> "The IB's ideas resonated in Europe"

Round 3: The EU conference and the automotives platform
(October 2004 – summer 2005)

Early 2005, the Dutch government established a platform for automotives, after a short intermediary situation where there was only a platform for sustainable car fuels. It had the intention of dialogue between major players in the oil and auto-industries, and between them and the government. The DGs for environment, transport and energy, who had been present at the EU conference, believed that sustainable automotives had a chance, because of wide support at the highly successful EU conference.

Table 7. Discussion paper for Energy in Motion

'Energy in Motion'

EU journey towards a clean and climate-neutral road transport system
Amsterdam, 19 and 20 October 2004
Management summary Presidency discussion paper 20 September 2004

How can we secure our future energy supply and make the EU less dependent on imported fossil fuels?

How can we reduce emissions of CO_2 in the EU to a sustainable level?

How can we make our cities healthier places to live, particularly where air quality is concerned?

How can we ensure that the EU becomes the most competitive and innovative economy in the world?

In recent months, we, the Dutch Presidency, discussed these four challenges and the way in which the road transport sector can deal with them with many of our European partners. This 'tour' of Europe showed us many good initiatives but, although considerable progress has been made in some areas, much still has to be done. We observe widespread concern about the challenges Europe is facing. However, there is a lack of common understanding throughout Europe about what level of urgency is to be attached to the challenges, what is needed to tackle these, whether choices must be made now or can be postponed until later, and what role the transport sector can and must play in this.

Many parties express a great need for a clear, common long-term perspective on energy and transport; one that could serve as a guide towards clarifying the short-term steps that bring us closer to achieving the long-term goals; a perspective that could provide industry with stable, long-term incentives to develop their products. We also observe a great need for formulating concrete next steps leading to tangible results that are visible to citizens and show that long-term progress can truly be made.

We believe that there is clearly a window of opportunity, and that it is time for action. We want the 'Energy in Motion' conference to help Europe make use of this window by generating discussion about the key questions and dilemmas and a search for clever choices. Many parties throughout Europe show a great eagerness to act and are looking for other parties to collaborate with because they realize that finding effective strategies and converting them into concrete action require partnerships involving governments, industry, cities, NGOs, etcetera. We call upon all parties to act and to be part of the solution.

During the conference we will look for what is needed to turn possibilities into reality. More than 100 senior representatives of governments, European Commission, industry, cities, NGOs and the scientific community will join us in this search.

We will discuss what partnerships will be needed to deal with the complexity of the issues we are facing; partnerships that could encourage stakeholders to engage proactively in the move to a clean and climate-neutral road transport system. *(Ctd next page)*

We will explore the current rules of the game and see whether they are sufficient to achieve our goals. We will do this by taking on a concrete example: the position taken by the World Business Council for Sustainable Development in their Mobility 2030 Report.

We will discuss the 'sense of urgency' of the four challenges, how this affects the transport sector itself and the realisation of effective strategies for the transport sector, with a special focus on reducing GHG emissions and securing energy supply. This will include the key question of timing: should we act now (and accept current high costs and low cost-effectiveness of CO_2 reduction in the transport sector) or should we act later (and risking that we will not ensure the timely availability of the measures necessary in the future)?

We will discuss the necessity and possibility to come to a viable range of promising options of clean low-carbon vehicles and fuels, in order to guide and encourage the progress to be made in this area. We will look for what should be the most important selection criteria for limiting the range of options, and we will discuss what industry needs from governments to maintain/strengthen its competitive position.

We will also discuss opportunities for short-term options for improving energy efficiency and reducing CO_2 emissions in road transport, focussing on both the potential for improvement of vehicle technology and on behaviour and organisational (logistics) innovations. We will discuss possibilities and in particular the political, social and economic conditions needed to turn these possibilities into reality. We will discuss the key question of how to kick-start markets for clean low-carbon vehicles. We will investigate the roles of the three stakeholder groups (industry, consumers and governments) and the suggestion that the key to breaking the chicken-and-egg dilemma (no demand without supply, no supply without demand) is with the governments. We will look for possible approaches that governments could embrace, and we will investigate what contribution the EU could/should make in solving this dilemma.

Finally, we will discuss how the EU and Member States can assist competent cities and re-gions to overcome perceived obstacles in promoting clean urban transport, with a special focus on the role clean vehicles could play in making our cities healthier places to live. We will also look at the situation in cities in the new Member States, and investigate to what extent it differs from that in the rest of the EU.

The Dutch Presidency attaches great value to the contribution eco-efficient innovations can make to achieving the Lisbon objectives. We want to explore the possibilities for eco-efficient innovations in the transport sector and together convert these into opportunities to make sub-stantial progress on meeting the four challenges and to strengthen the competitiveness of the European industry.

Source: http://www.eu-conference2004.nl/

There were 60 out of 80 invited Director Generals of national ministries from 25 EU countries, corporations (40% of 140 participants were industrials, incl. several major car and oil industries represented at high level), Parliamentarians, NGOs, scientists. Keynotes were given by, among others, transport minister Karla Peijs, environment state secretary Pieter van Geel, European Director-General for transport and energy Pascal Lamoureux, President Director of Shell

Netherlands Rein Willems, and Tadashi Yamashina, Managing officer of Toyota Motor Corporation. Groen of oil multinational Klingon said after the conference: 'I have participated in many international conferences that dealt with energy and mobility, but never one with such a wide and high-level presence of the industries.' Through the well-organized preparations and the fitting agenda, the oil and automobile industries apparently had decided that this conference was different and relevant to attend. And, not only the CEOs who already had committed with sustainable development participated, but also the ones who had not yet done that.

Some CEOs had given indications that they believed the issue was important, and other followed, perhaps because the arguments from sustainability point of view were compelling. According to polls done during the conference, two thirds of the participants agreed on concrete issues like that fiscal incentives were needed to stimulate new fuels and propulsion systems and that innovations should first be introduced at city level. E.g. the conference polls show that 81% of participants believed that advanced biofuels and hybrid car systems should receive more attention at EC level, requires mores harmonized fiscal incentives, and new markets should kick start in cities. As Raymond Jansen, manager government affairs at the auto multinational Takey put it a month after the conference: 'Where strategic cooperation in the car industry is developing in the World Business Council on Sustainable Development, there is still little concrete cooperation in development of breakthrough technologies and technological standards. This is absolutely necessary to keep mobility affordable in the long term, but it requires short-term choices that only can be made by the mobilists, either through their consumer behavior or their acceptance of government interventions. One of the results of the EU conference is a greater awareness that interaction with mobilists about such choices is a joint responsibility of industries and governments.'

The emphasis of European automobile industries, thus far focused on improving diesel systems, was now widely seen as probably insufficient for sustainable mobility. It was accepted that a more far-reaching transition, perhaps to different hybrid systems and ultimately possibly hydrogen systems, was desirable and probably feasible. And finally, there was agreement that further dialogue and joint efforts were needed between the main stakeholders and leading corporations, and that the government should break the chicken-egg dilemma. The platform automotives, led in cooperation between the relevant ministries, offered just that. Raymond Jansen: 'one of the messages was that several governments need to give coherent signals about what they will require from the industries, making use of coherent signals from the industries about what is possible.' For the first time the finance ministry also became involved, as it saw that support for fiscal incentives was increasing.

The EU conference was therefore an event that made earlier agreements that had developed in co-evolution, resonate loudly again, and this had convinced DGs that there was a real opportunity for them to show that the government could do what so many influential people expected them to do. In this new

power context, lagging CEOs were expected to join the platform as well. The DGs invited an IB member to chair the platform and several others joined.

A question is to which extent the ideas in V&W have co-evolved. Despite having three representatives in the IB, among which until 2005 a deputy Director General, not many others of V&W seem to have been linked – in the sense that they understood the IB's ideas and its relevance for mobility policies in general. On the other hand, the expectation was created that if the platform automotives were to propose changes of V&W's policies, V&W would cooperate. Involvement of V&W at high level in the inter-ministerial program created that expectation.

The EU conference was one of the IB's joint enterprises. There are several examples of smaller power actions under their influence, mostly aimed at R&D. Key people in the environment movement were now publicly in favor of the private car (or car like devices) as vehicle of the future. An automobile industry and an environment NGO published a joint ad about sustainable cars. Large fleet owners were supporting low emission vehicles, steps toward the desirable transition.
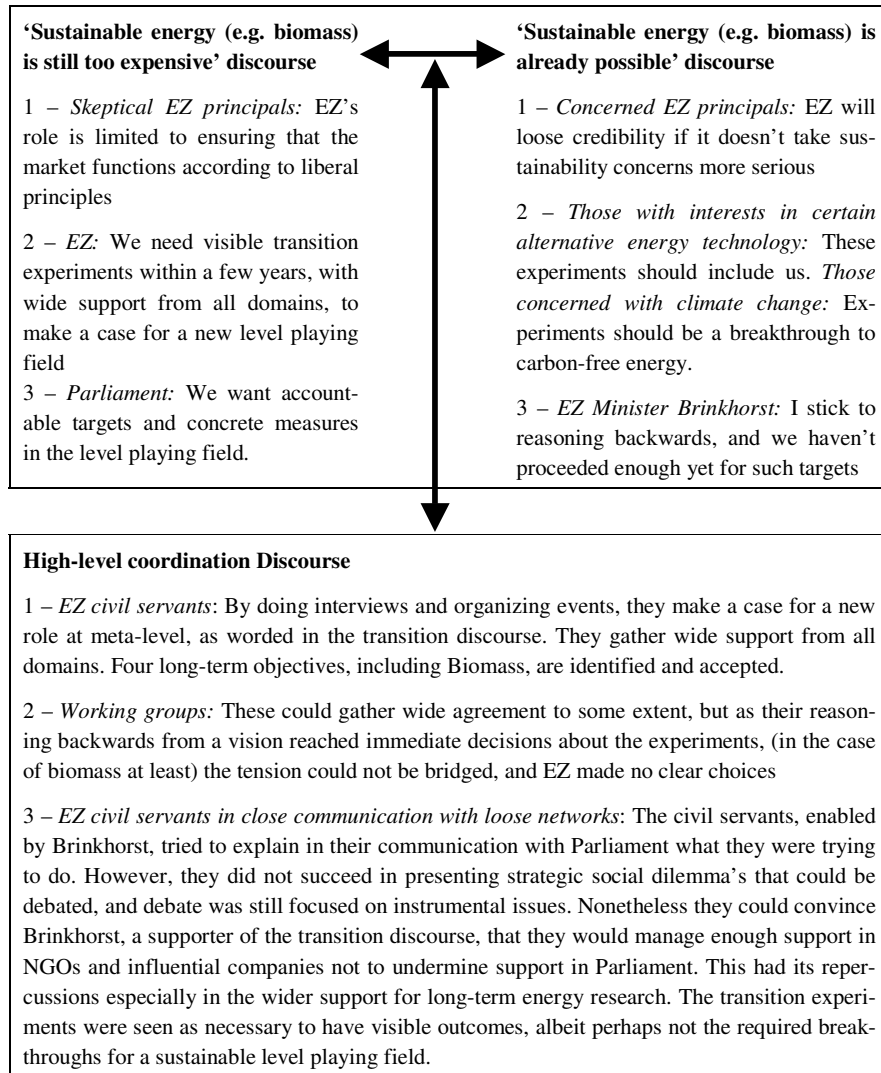
Adaptive tensions and co-evolution

Different policy fields, oil and auto multinationals, mobility and environment NGOs, started to communicate different than before, about sustainable automotives. There was more alignment between their problem descriptions. At the EU conference, new roles for the government became accepted, and urgency of cooperation was widely felt. The European car industry was criticized of lagging. This created an adaptive tension on Governments and industries to engage in that dialogue, and that dialogue was organized in the Dutch automotives platform.

The conference preparations were the start of this European co-evolution process, and behind the scenes the IB kept the actions of the Dutch organizers connected. The IB itself had emerged several years earlier, as it was attracted by the adaptive tension of NMP4 that urged V&W to initiate a sustainable mobility transition process. There were several other examples of co-evolution, more aimed at R&D.

The governmental power network at DG level accepted the IB's proposal to organize the EU conference according to its lines. The civil servants preparing the conference were enthusiastic, but were hardly aware of the IB's connecting role in the background. Their superiors simply gave different signals, or gave them a free hand and enough resources. Ultimately, the involved ministries and the mobilists unions and environmental groups throughout Europe were involved in dialogues about automotives. The result was a co-evolution of ideas that showed clearly in the EU conference.

4.3   Think tanks for sustainable energy

Summary of development rounds in the energy transition process 2001 - 2005

'Sustainable energy (e.g. biomass) is still too expensive' discourse	**'Sustainable energy (e.g. biomass) is already possible' discourse**
1 – *Skeptical EZ principals:* EZ's role is limited to ensuring that the market functions according to liberal principles	1 – *Concerned EZ principals:* EZ will loose credibility if it doesn't take sustainability concerns more serious
2 – *EZ:* We need visible transition experiments within a few years, with wide support from all domains, to make a case for a new level playing field	2 – *Those with interests in certain alternative energy technology:* These experiments should include us. *Those concerned with climate change:* Experiments should be a breakthrough to carbon-free energy.*
3 – *Parliament:* We want accountable targets and concrete measures in the level playing field.	3 – *EZ Minister Brinkhorst:* I stick to reasoning backwards, and we haven't proceeded enough yet for such targets

High-level coordination Discourse

1 – *EZ civil servants*: By doing interviews and organizing events, they make a case for a new role at meta-level, as worded in the transition discourse. They gather wide support from all domains. Four long-term objectives, including Biomass, are identified and accepted.

2 – *Working groups:* These could gather wide agreement to some extent, but as their reasoning backwards from a vision reached immediate decisions about the experiments, (in the case of biomass at least) the tension could not be bridged, and EZ made no clear choices

3 – *EZ civil servants in close communication with loose networks*: The civil servants, enabled by Brinkhorst, tried to explain in their communication with Parliament what they were trying to do. However, they did not succeed in presenting strategic social dilemma's that could be debated, and debate was still focused on instrumental issues. Nonetheless they could convince Brinkhorst, a supporter of the transition discourse, that they would manage enough support in NGOs and influential companies not to undermine support in Parliament. This had its repercussions especially in the wider support for long-term energy research. The transition experiments were seen as necessary to have visible outcomes, albeit perhaps not the required breakthroughs for a sustainable level playing field.

All published documents with respect to the energy transition process can be downloaded at www.energietransitie.nl

Round 1: EZ trying to give shape to its new role

Summer 2001, EZ had become 'manager of a transition to a sustainable energy system' in the context of NMP4. A handful of EZ civil servants, in the energy

directorate and in the management team, became involved with organizing transition teams with forerunners, as indicated by NMP4's discourse. EZ operated in a complex power field. Sustainable energy had been an issue for several years. Alternative systems based on wind, solar and biomass energy had been developed, but breakthroughs to a significant scale had not yet happened. For example, bioenergy, created from plant material (biomass), was in Europe seen as a major sustainable option. According to a European Directive, fiscal incentives would be implemented to promote biomass as component of car fuel (biofuels). Another possibility was bioelectricity production (or production of other carriers like hydrogen). It was said that this also had the benefit of creating a new market for farmers, since organic waste was in limited supply. The implementation of a system for biomass from wastes was faster in neighboring countries, in particular in Germany. There are different technical options for bioenergy. Advantageous from point of view of climate change seemed to be a large-scale 'biomass-to-fuel' plant, since existing biodiesel could be a lot improved. It was expected that the price of raw fossil fuel would rise in the long term, and by early adopting sustainable energy, The Netherlands would not only benefit from reduction of fossil fuel dependency and reduced cost of import, but also from the export of sustainable energy systems. An overview of these positions is presented in Table 8.

Table 8. The involved groups of the energy system and their internal context

The sustainable energy lobby was mainly interested in promoting industrial initiatives in The Netherlands, that may become an interesting export in difficult economic times. Many such initiatives had been started up with idealistic and business aims. They were at different stages of development, but none of them was profitable without financial government support. A large number of initiatives had been taken; small companies had been erected, often together with larger energy companies, and with financial support from EZ. EZ also supported scientific research in this direction, and many researchers depended on that. A lot of knowledge was available in this world, as well as the interest of creating a market context that would allow developed solutions to break through. Market reforms however increased competition, making the role of energy companies less clear. The active role of energy companies had created legitimacy for EZ to support their initiatives: if the market believes in the feasibility of a sustainable energy system and therefore invests, the EZ effort was said to be well spent.

Oil multinationals, like Klingon, had also been investing in sustainable energy, albeit at a low level compared with their total investment. Large-scale investment in sustainable energy production would require more certainty for them about willingness of society and government in enough countries to accept these new systems despite higher cost. At the same time many oil multinationals were opposed to government interventions that would reduce demand for fossil oil and gas. *(Ctd next page)*

The environment movement had a long history in sustainable energy as well. Their point of view was that sustainable energy was needed to reduce climate change, but not create adverse side effects. This had created dilemmas. Wind turbines kill birds, for example. Nuclear energy has toxic waste. All were much concerned with possible adverse impacts of bioenergy, like air emissions caused by impure fuel. One particularly active NGO was the World Wide Fund for Nature, acting mainly on behalf of climate change. Another one was SNM, which was defending the global as well as local environmental interests. Milieudefensie (Friends of the Earth) was also active; it had taken the position that storage of CO_2 emission from the use of fossil energy was not desirable since it was still based on fossil fuel.

The Ministry of Economic Affairs, EZ, was interested in combining sustainable energy (reducing CO_2 emission and fossil fuel dependency) with opportunities for new Dutch industries. Sustainable energy might be an export product, but also the shipment of energy carriers, in particular biomass, in Europe might be interesting for port development. In particular in Groningen, in the North of The Netherlands there was a region that badly needed economic impulses. The Rotterdam port area was another one. However, EZ had internal dilemmas, since market conditions ('playing fields') were mainly created by measures by the European Commission in Brussels, where energy innovation was one of many other negotiation issues. These negotiations were mainly the responsibility of the Ministry of Finance. Proposing changes at that level would make the overall negotiation process more complex, and good arguments would have to be developed and shared between energy and fiscal ministries over Europe. EZ knew that it should somehow make the link between thinking about sustainable energy in The Netherlands and in Europe, but it could make no promises. It was even more complex because the Biofuels Directive was a responsibility of the environment ministry. So, three ministries would have to align their actions. People in EZ had experiences with persuading businesses to develop sustainable policies. For example, Klaas Vries had been responsible for developing the 'multi-year agreements energy efficiency' with the energy-intensive sectors. One thing he had learned, he said, was that it was wrong to start with your own agenda by approaching the larger companies right away – they would have their own agenda. He clearly has used this lesson in transition management, by first listening to the energy system, and collecting initiatives from any corporation that fitted a joint agenda.

VROM, the environment ministry, had a department called Climate change and Industry, which was responsible for general policies to reduce climate change, like the Kyoto Protocol. Interventions in the energy sector with a primary environmental objective generally belong their scope of work. It saw CO_2 storage as a serious option for meeting the targets of the Kyoto Protocol. It was responsible for negotiating with the finance ministry about the implementation of the EU Biofuels Directive. Other parts of VROM were responsible for the other side effects of energy system. However, it was not primarily responsible for energy policies. VROM had implemented several initiatives with acronyms like COOL and DTO, which aimed at system innovation. However, they all had run into barriers, and people in VROM were almost desperate to find ways around these barriers. *(Ctd next page)*

The Finance ministry was opposing an ambitious implementation of the Biofuels Directive – let alone promotion of expensive energy systems without requirement from Brussels - because it either reduces purchasing power or raises the national budget deficit. Production cost of bioenergy was higher than that of fossil energy, and at least for several years this would not change. Political climate in general was not in favor of such interventions that create benefits only, if you are lucky, in the long term. The attitude of this ministry, which was not actually involved in the transition process, had strong influence on it.

To activate the outside world and get feedback on the progress of it agenda and the transition teams, EZ organized several events. These events were mainly used to reconfirm support for EZ's initiative and to improve the process. An event that was remembered by Arthur Groen of Klingon, was a conference EZ had organized on a bus in the framework of Hans Teljeur's project 'The Voyage' in December 2001. He indicated that here the basis was formed of the later successful project groups and platforms. This was in his view the beginning of a more focused and better-underpinned shared focus on stimulation of energy innovations by the Dutch government. In this bus, a shared feeling emerged that a change was needed and that transition management was an opportunity because the government showed signs of becoming more aligned. He personally thought that that was important, since before that time sustainable energy policies hardly had led to successful experiments. From that moment on Groen spent considerable amounts of his personal time in the ETP, until in 2004 Klingon gave him the resources to become Klingon's focal point for affairs of the Dutch energy transition process.

Another event took place on 16 April 2003. EZ thought it was necessary to reemphasize the importance of the energy transition and the serious intentions of the government to facilitate cooperation. EZ organized a major conference. Among the speakers was State Secretary for Energy Joop Wijn, Deputy Director for Energy Klaas Vries, DG Environment Karel Zijp, and Secretary General of EZ Willem-Jan Oosterwijk. Klaas Vries, who had become project leader of the energy transition, characterized the transition discourse as 'governed evolution'. Zijp emphasized the shared responsibility of keeping the process integral and focused on the long term, which EZ should facilitate. Oosterwijk promised to ask the Parliamentary committee on economic affairs their continued support for keeping the activity on EZ's agenda and budget. Afterwards, Oosterwijk said he was surprised by the appreciation of companies, including oil multinationals, of the better cooperation in respect to energy policies. The busiest working session in the conference was the one on biomass (60 participants). All this time, EZ was confirmed that their approach was supported in the energy system, which was enough to keep support for continuation of transition management in EZ itself.

Table 9. Biomass 2040: the green motor of knowledge economy and sustainability: a vision

This vision is by and for the biomass community in The Netherlands. A group from all affected domains has developed it in a period of three months. It is an initiative of the ministry of EZ to initiate a transition to sustainable energy. The potential for biomass as raw material for energy and other products is estimated at 30% of all raw materials in 2040. It can be sustainable if certain conditions are closely observed during its development. It has clear benefits for global warming and may have benefits in rural areas, in particular in developing countries and in the European Union. We expect that European energy policies will facilitate the use of biomass, and that this is an opportunity of the Dutch knowledge economy. It has a strong position with regard trade, economy, science and development. A clear set of conditions for sustainable biomass should be developed, which should take into consideration the emissions, closing of mineral loops, wastes, social effects in developing countries, and prevention of competition with food production. We expect that the bio-energy production chain will be closely integrated with other uses of biomass, where a share of 20 – 45% should be possible. This scenario depends on a European level playing field in the raw materials markets where biomass competes, and where external effects are calculated in the prices. Direct competition between innovative sustainable raw materials and traditional raw materials is facilitated. There is a certification system for sustainable biomass, and emissions in industrial processes are controlled. Biomass is gained from wastes, but mainly produced outside of the Netherlands in agriculture as raw material. Research & development are motor as well as spin-off of the biomass transition.

Source: www.energietransitie.nl (English summary by SN)

Round 2: developing transition experiments

EZ's project director for transition management, Klaas Vries, felt supported by the reactions from society, but also was aware that at some point results of transition management should be visible. This was the consequence of making the ETP a formal project in EZ. According to the transition discourse, transition teams should develop visions, transition paths and market experiments. Since only experiments are highly visible, the accountable objective of the project became transition experiments. EZ's role would be to initiate transition teams. In spring 2002, minister Brinkhorst promised a substantial EZ budget for the energy transition (35 million Euro). Subsidy would be granted if the teams could show that the experiments fitted a vision and transition paths that were supported in all domains, including the environmental domain. EZ would also evaluate the experiments on the basis of economic and financial feasibility, and contribution to the competitiveness of the Dutch economy – these were the responsibilities of EZ.

> "EZ asked understanding for its dilemmas"

To develop such experiments, EZ had initiated several transition teams, and I will focus on one of these: the Project Group Biomass. It consisted of eleven representatives of oil multinational Klingon, an electricity producer, a chemical industry, an international bank, environmental NGO SNM and the ministry of

EZ, which was assisted by consultants. Albert Veenstra of DG Innovation of EZ led the group. The Project Group produced its advice to EZ in December 2003 in the report 'Biomass: the green engine in transition'. The advice consisted of a vision for 2040 (30% bioenergy, see Table 9), possible transition paths toward the vision, promising research avenues, and proposals for concrete action to support the chosen transition paths. Since these paths were not profitable yet, some kind of assistance by EZ may be needed. The biomass community in these cases depended on EZ's Klaas Vries's decision to support their investments. In October 2004, EZ published the Unique Opportunities Regulation for giving subsidy to transition-experiments that contribute to 'EZ-recognized' transition paths (see Table 10). EZ had boiled down the transition paths to these essences – perhaps not to preclude any proposals from coalitions that had not been involved in the biomass project. There was some sensitivity about this. The Project Group had not put forward the idea of BioSyngas as feasible for market experiments. Influential members of the biomass community publicly disagreed with the outcome of the process (see Table 14). In EZ's subsidy regulation, BioSyngas had returned prominently, as a link between biomass (or other raw energy sources) and many applications.

EZ's decision followed a synthesis report by EZ that was discussed by Parliament on 15 June 2004. The report was named 'Innovation in energy policies. Energy transition: state of affairs and follow-up'. It announced that EZ envisaged 'recognizing' transition paths in five 'main routes' to sustainable energy. Candidates were the 23 transition paths proposed by the different Project Groups, including all ten from Biomass. The report presented in total five 'main routes' to a sustainable energy system, and biomass figured in three of them (which were green raw material, alternative motor fuel and sustainable power). It referred to over 80 specific transition-experiments to make a start with biomass and other transition paths that had been generated early 2004 by market coalitions (with limited financial support from EZ). It promised that it would include criteria for subsidizing transition-experiments in the Unique Opportunities Regulation, related to the likely effectiveness of the experiment in terms of the transition path (e.g. demonstrable commitment of private enterprises). The synthesis report asked political understanding for the unspecific transition approach and its dilemmas. It referred to NMP4 and presented the transition approach as a form of innovative governance, since the biomass community (and the wider energy community for the other partial transitions) had developed an advice by itself. It saw innovation of the energy system in this time of recession as an opportunity to create new market for Dutch businesses as much as a need for sustainable energy supply. A third urgency had thus been added above security of the energy supply and reduction of climate change, which affected EZ's policy.

Table 10. Some EZ-recognized transition paths

Main route Green Raw Material:

Biomass production: The sustainable production and transport of sustainable produced biomass ('green raw material') for conversion to energy or as raw material for physical products.

Biomass processing: the processing of raw biomass to (half-) fabricated articles that can be used for further processing or end users.

BioSyngas: The processing of biomass to gaseous products that can be used as raw material.

Bioplastics: The production and marketing of plastics from biological material.

Main route Alternative motor fuel:

Biofuels: Replacing diesel and petrol in motor vehicles by fuels of biological origin.

Main route Sustainable Power:

Biomass: Efficient production of electricity from fuels of biological origin.

Source: www.energietransitie.nl

EZ also indicated that it was too early to set measurable targets for the main routes, e.g. in terms of sustainable energy shares. The main routes should structure a continued learning process between market and government. It should influence 'running (short-term) policies', with measurable targets, as soon as enough lessons would have been learned. By giving examples like the hydrogen economy, EZ suggested that it was trying to achieve a major transition. It also suggested that the bottleneck in achieving it was, still, a lack of trust and cooperation, despite the fact that the previous two years had catered to a significant increase of it. EZ suggested that emphasis on short-term targets would destroy the strategic process. The main long-term dialogue should now be about the 'level playing field'. The term 'level playing field' as used in these discussions referred to all conditions under which enterprises have to work as far as created by the government. The government may intervene by means of fiscal or financial measures, by direct control, but it may also include expectations created by the government about the measures it will take in the future. However, EZ observed a low sense of urgency for such a dialogue, despite the high urgency of sustainable energy itself. It envisaged taking a more active role in the dialogue within the European Union. However, the report urges that its long-term ambitions should not be misinterpreted as targets for which EZ is accountable: it is only a facilitator of the market – but the market has to do it by itself.

"R&D policies were now more aligned"

The transition paths selected market initiatives in some degree. There would be no financial support in this regulation for photovoltaic and wind energy, and the choices were sustained with arguments. For example, experiments with new gas were regarded to be a poten-

tial step toward an energy economy based on hydrogen. However, no all saw all experiments as likely to trigger a market breakthrough. An example was Bio-Syngas: although technology was available, it would only be an attractive investment if major countries would shift to this technology. The Netherlands was considered too small, as Arthur Groen of Klingon indicated. On the other hand, in due time other countries could make the shift and The Netherlands could then easily follow. There was no need for Dutch experiments.

Table 11. Criteria for R&D support by EZ

	Contribution to a sustainable energy system		
		High	Low
Contribution to the knowledge economy of The Netherlands	High	Focus points	Knowledge export themes
	Low	Knowledge import themes	No R&D theme

Source: EZ 2004

As regards other technology that was not proven yet or ripe for market experiments, there was a separate R&D policy. EZ made decisions in dialogue with stakeholders and experts in the framework of their Long Term Energy Research Strategy (EOS-LT), which was leading for subsidies. EOS-LT was not formally linked but conceptually it was coherent with the strategic visions that had emerged in the transition process, and had delivered widely accepted criteria for government R&D support (see Table 11). These criteria created a long-term focus and stability of government support, which was 'strong as iron' according to Arthur Groen. A lot money was saved in his view, and the energy researchers knew what they would be rewarded for.

Round 3: Political continuation of the ETP, and creating a more strategic context

Where energy had been the motor behind transition management during preparation of the NMP4, and the energy sector was still widely supportive of it, in June 2004 Parliament reacted disappointed on the synthesis report. All five main fractions indicated that Minister Brinkhorst should have showed more leadership by making accountable choices for the short term. The synthesis report was in their view full of vagueness and hopes. Parliament was not interested in a debate about governance, and focused on choices for the short term, in particular an existing subsidy regulation, wind power, and bureaucratic obstacles to it. Some asked for solar energy and nuclear energy to be included in transition management. These short-term issues were controversial, and therefore the transition process had not come to terms about them. The whole idea of the transition process had been the opposite: to develop widely shared visions for the long term, reasoning back towards options for the short term that everybody supports.

Apparently the process was stuck somewhere midway the long term and the short term. A socio-democrat and green party member asked about more system regime changes (i.e. new level playing fields) that would create 'a market for sustainable energy' or 'shifting the prices'.

Minister Brinkhorst of EZ said in his reply that he was still accountable for targets for the short term (2010), but an integration framework was needed that had to be based in the long term. Asking commitment of the private sector was a way of reducing uncertainty – but the implication was that the Minister could not be held accountable, and therefore would not set measurable targets. As regards to the short term, he made his own political choices, and he referred vaguely to 'fiscal greening'. Since Brinkhorst fully maintained his transition policies, and published the Unique Opportunities Regulation 6 months later, the Parliamentary debate may be seen as a ritual fight. Brinkhorst could afford to continue spending considerable budgets.

> "the minister defended transition policies with ill understood arguments"

The joint General Energy Council and the Council for Environment, Spatial Planning and Housing worded their appreciation of EZ's and VROM's efforts in an advice to Cabinet in December 2004. Their appreciation was widely shared by many who believed that an energy transition was needed and that this required a new type of cooperation between non-governmental and governmental organization. They also indicated that the process had fundamental weaknesses and improvements were necessary, in particular that politicians should be more (actively) involved.

However, after the synthesis report and the Unique Opportunities Regulation, EZ took initiatives to create a more strategic context for the continuation of the ETP. At the end of 2005, it initiated new project groups, which were called platforms. Five platforms were erected, the four original themes with an additional platform for alternative motor fuels. For each platform EZ had chosen a chairman of outstanding record. For example, the platform 'Green resources', successor of the project group Biomass, was chaired by Paul Hamm, former director of the chemical multinational DSM, and alternative motor fuels was chaired by Frits Hermans, former director of Shell. Each chairman was assigned to achieve innovations that contribute significantly to a sustainable society within four years. In practice this meant a switch from unsustainable to a sustainable energy system at a scale of at least 1% of the Dutch energy system. They received resources from EZ. The objective of EZ was to raise the ETP's profile and to get it closer to implementation power – the multinationals first. To that end an additional 'task force' was established, composed of politically influential people and captains of industry, like Herman Wijffels, chair of the Social Economic Council, the heart of the Dutch polder model. This group was said to have a 'door handle' function – attaining access to organizations at the highest level.

> "EZ tried to connect with implementation power"
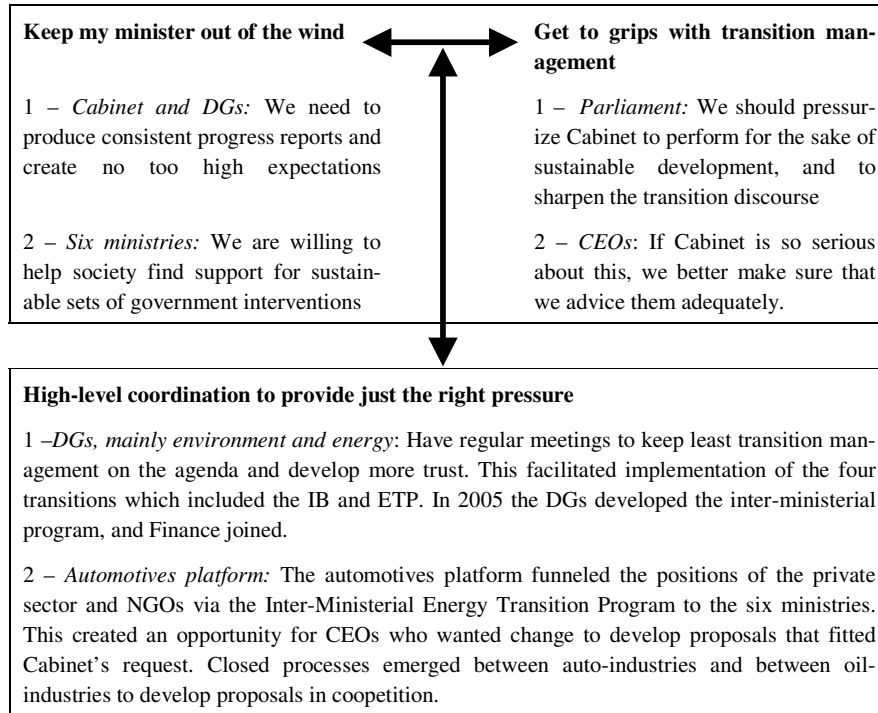
Adaptive tensions and co-evolution

The transition teams worked under the context of EZ's promise to provide subsidy. Until 2004, EZ created no expectations that it would help transition teams to develop wider support for their ideas in the government. EZ itself had, compared with other ministries and lower governments, little competences as regards the institutions that shape the playing field of the energy market. Therefore, there was no adaptive tension toward change, other than the subsidies. Nonetheless the NMP4 had created some expectations, EZ tried to be a really independent moderator, and this was rewarded by positive feedback that gave the ETP the benefit of the doubt. Transition teams produced visions that were widely supported until choices between transition paths needed to be made. The selection among short-term development options was therefore mainly limited to R&D. In that sense the co-evolution was significant. However, oil multinationals were not actively participating in experiments. They were more interested in co-evolutionary thinking about level playing field, and participating in experiments did not help there. Possibly transition teams contained too many people who were heading for specific transition experiments without developing thought about gaining support for the market conditions required for the breakthrough. Successful experiments might, or might not provide the missing information that convinces to provide these conditions. That analysis was not made. On the other hand, less complex transition experiments that fit widely supported ideas about sustainable development still may give a contribution to sustainable development, and might even be a lever for a much bigger transition.

"focus shifted to context management"

Despite these problems, EZ could keep support for the ETP throughout. This was still inspired by the tensions in society; the urgency was still felt. However, where initially the ETP was completely focused on market experiments, in 2004 the focus shifted from there to creating a context where more knowledge and influence could be connected. EZ had become aware that focus on experiments alone probably would not be enough to create conditions for involvement of the more capable players in the energy system.

4.4 Strategic inter-ministerial cooperation

**Summary of development rounds in the Strategic inter-ministerial cooperation
2001 - 2005**

Keep my minister out of the wind	Get to grips with transition management
1 – *Cabinet and DGs:* We need to produce consistent progress reports and create no too high expectations	1 – *Parliament:* We should pressurize Cabinet to perform for the sake of sustainable development, and to sharpen the transition discourse
2 – *Six ministries:* We are willing to help society find support for sustainable sets of government interventions	2 – *CEOs*: If Cabinet is so serious about this, we better make sure that we advice them adequately.

High-level coordination to provide just the right pressure

1 –*DGs, mainly environment and energy*: Have regular meetings to keep least transition management on the agenda and develop more trust. This facilitated implementation of the four transitions which included the IB and ETP. In 2005 the DGs developed the inter-ministerial program, and Finance joined.

2 – *Automotives platform:* The automotives platform funneled the positions of the private sector and NGOs via the Inter-Ministerial Energy Transition Program to the six ministries. This created an opportunity for CEOs who wanted change to develop proposals that fitted Cabinet's request. Closed processes emerged between auto-industries and between oil-industries to develop proposals in coopetition.

Round 1: The Inter-ministerial Energy Transition Program (2001 – 2005)

In November 2001, the NMP4 was discussed in Parliament. It asked Cabinet in a motion to yearly report about the progress of transition management. In the view of some this motion only created bureaucracy. For example, the environment minister Jan Pronk begged in the November 2001 debate in Parliament 'don't do this to me'. In 2005, this was still an idea in the environment ministry. However, in the view of others the progress reports stimulated the ministries to at least continue their communication at DG level about progress to prevent inconsistencies, which would form a political risk. These were difficult to produce, because each ministry who was 'transition manager' had taken its own course. There were little similarities and little progress to be reported other than at process level and therefore in the eyes of Parliament difficult to explain to voters. In 2004 the energy ministry filed its own report in Parliament about progress of the Energy Transition Process.

Official discussions in Parliament were rarely about strategic social dilemmas, and the added value of transition management was not anymore acknowledged openly. One (environmental) parliamentarian said in an interview: 'I believe in certain specific measures that should be implemented in the short-term, and my supporters expect me to advocate these. Where personally I might find long-term dialogues important, Parliament is not a place for that'. Political significance of transition management as such, on the other hand, was confirmed in October 2003 when the Parliament challenged the state secretary for environment to explain the link between the NMP4 objectives, which

> "Parliament is not a place for dialogue, yet it may support dialogue elsewhere"

have a 30-year horizon, and concrete actions taken by the different ministries. It also asked for distribution of responsibilities, and the State Secretary answered that each involved minister was responsible for his own transition, with a coordinating role for environment to prevent 'departmentalizing' transition management.

In Cabinet, Environment Minister Jan Pronk's role was limited after NMP4's adoption. After mid 2002, in Cabinet Balkenende I and II, his role was taken by State Secretary for Environment Pieter Van Geel. He organized meetings with the involved Cabinet members, so that their reports would be coherent. At several occasions at larger meetings of the environment sector (like at the annual congress of the Society of Environmental Professionals), he pleaded for the continuation of transition management, and in a publication in its magazine ArenA he compared transition management with a peat fire that should smolder underground, invisible for most, until the time is ripe. Reactions in the environmental sector were mixed; on the one hand many people understood this, but on the other many were impatient.

At the level of the civil servants, the five Director-Generals met every two months to discuss progress of transition management, which is said to be exceptional. The environment DG Karel Zijp and civil servants in EZ said later that in their view these meetings were important to keep transition management under the attention of all ministries as a joint enterprise. In that context four ministries started to assemble groups they called transition arenas or transition teams, as indicated in NMP4. The IB and the ETP's transition teams are the most notable ones. They tried to vitalize these groups as learning networks, making use of lessons learned before 2000. They asked the arenas their advice about government interventions (as in the greenpolder model of the 1990s, see Page 32), but did not specify the type of interventions nor even the policy fields to which they should relate. The arena should develop proposals by itself through backcasting (as in the sustainability research projects of the 1990s).

As coordinator of transition management, VROM sought other roles. It initiated 'learning meetings' between those closely involved in the implementation of transitions, academics and involved thinkers from different other domains. In 2005, VROM established a Competence Center Transitions with the ministry of EZ and private partners, which still organized regular meetings where good

practice cases of transition management were presented and discussed. Mostly policy makers from the government, academics, environment NGOs and consultants reflected on possible transition paths, and how to deal with barriers.

After the EU conference Energy in Motion in October 2004, the five DGs gave a joint assignment to two ministries (VROM and EZ) to develop an Inter-ministerial Program Directorate Energy Transition (the Dutch acronym eventually became IPE). The Ministry of Finance joined soon. In May 2005, the now 6 DGs proposed to set up an inter-ministerial program for all EZ platforms. The platforms could thus develop strategic proposals to the DGs that were the joint 'clients' of the platforms. Klaas Vries and the platform chairs made public statements about this new approach. He said in the email newsletter about the energy transition in April 2005, 'We are moving from thinking to doing. The past five years, we have sketched a vision for the future. Now we have established five platforms. The chairmen have set up the platforms now, and it is time for concrete innovative projects that will be ready in about two years.' (Two years also was the time frame of the first lot of the subsidy for transition experiments.) He also said 'the platforms are the spider in the web of the implementation of these transition projects. They should listen to stakeholders and communicate with them about the government's objectives and about their needs for innovative projects.' (Which need to be fulfilled by the government.) 'An important success factor is the cooperation with other ministries. (..) An important success was the establishment of a platform sustainable mobility with the ministries of VROM and V&W. In it, EZ does the energy component, V&W the clean engines component and VROM the fuels component.' The chair of the platform Green resources, made this more concrete in his own contribution to the newsletter. Among others, he indicated that politicians and CEOs should be involved, as well as international stakeholders. In December 2005, six ministers signed the agreement about the IPE. The term 'energy transition' was interpreted broadly, since it also included sustainable mobility. EZ's manager of the ETP and a senior civil servant from VROM of the energy transition process led the IPE on a full time basis. To most outsiders, this was only the next government effort, likely to fail. To insiders, it was a breakthrough.

The Task Force Energy Transition, with ex politicians and CEOs, which had been established in the ETP, continued to 'identify the necessary preconditions to realize innovations of the energy system', 'identify focal points that relate to the economic chances for the Dutch economy', 'ensure a sense of urgency for a transition at the highest level of government and industries', 'advise about benchmarks for the progress of the main routes of the energy transition'. It was to work closely with the platforms (newsletter spring 2005). Between the lines it can be read that it should address the main dilemmas related to level playing field, which were too sensitive for politics to discuss directly.

> "Outsiders did not see the inter-ministerial transition directorate as a breakthrough"

> "on behalf of 6 ministers, the IPE would break into fragmented policies"

The IPE would organize dialogue between the six ministries and the private sector (the non-governmental domains) aiming at long-term themes, initially mainly linked to sustainable energy (work plan IPE, Dec 2005). Non-governmental platform chairs with outstanding reputation would be assigned to gather forerunners to develop long-term visions, transition paths and guide the dialogue to proposals for interventions. The IPE would organize a parallel dialogue in the six ministries. As matters would become more concrete (only the automotives platform had reached that stage late 2005), the platforms would set some kind of medium term market objectives. If the platforms would develop recommendations in conflict with ministerial policy lines, the DGs anticipated to 'break into' running policies in the six ministries.

The experiments of the energy transition were still in development in 2005, and the IPE principals believed these to be important, but they were not concerned with them. The IPE was there to develop a strategic layer to enable better underpinning of these and possible new transition experiments. The IPE principals were worried that progress would be difficult to show to politics, if that would remain limited to dialogues between private and public about long-term issues, and about how these should 'break in' running policies. They saw monitoring of progress as important methodological problem, and experiments would remain useful if only to show visible progress in a more opportunistic debate.

Round 2: The platforms under the Inter-ministerial Program Directorate Energy Transition (IPE) (2004 - 2005)

Under the IPE, the platform sustainable mobility was said to be the most advanced in 2005. It had emerged from a previous platform automotives, which, again was created by the five DGs after the EU Conference Energy in Motion (October 2004), by expanding the assignment of a platform sustainable motor fuels that existed under the ETP. Here, I focus on the automotives, which has inspired the DGs to widen their joint approach under the IPE. At the EU conference, the DGs for environment, energy and transport had become aware that there was a momentum for a dialogue between forerunning oil and automobile industries. The platform had as objective to produce a visible market change of 1% towards more sustainable automotives, within four years. It had considerable budget to hire chairpersons.

In 2005 the automotives platform managed to involve key individuals and commitment from several major oil and automobile industries. The chairman of the platform indicated how he managed to attract these by indicating that the government was meaning business this time, that the case for sustainable automotives was widely shared (as the EU conference polls had shown), and that six ministries cooperated to realize the interventions needed to support sustainable automotives. The level of

> "the sustainable corporate governance discourse and the transition discourse went together"

ambition was limited to what would have been achievable in four years, and at Dutch scale. This implied that the ambitions for level playing field (mainly by taxing pollution) were limited, but the steps taken might be considered levers or at least facilitator of further breakthroughs. When this platform started, Klingon and Takey, also members of the IB, were the first to act. Other CEOs of oil and automobile industries were then attracted to the platform because they were publicly committed to sustainable corporate governance. Throughout the year, this process became more and more attractive, and others volunteered.

The IPE, itself government, did not specify any conditions for the chair leading a platform of private organizations. The challenge to him was to organize the dialogue between public and private, so that proposals could be made from both sides, leading to a package of interventions by different ministries and different industrial branches. Any element missing in the package might imply failure. The presence of the NGOs was needed to ensure they would give consistent signals to Parliamentarians. This would have to increase the political influence of the platform, and keep its attractiveness and momentum high. Like the chair a number of platform members were, as might be expected, former members of the IB. The lessons the IB had learned about transition management were applied again in the platform, newcomers would be taken up in this culture and trust would build. This local culture would, in the eyes of the chair, ensure a good chance of success. In his eyes the target of market breakthroughs within a few years, supported by the organizational arrangements of the platform and the history of its participants, formed a creative tension.

Adaptive tensions and co-evolution

The ministries were motivated to at least report coherently about progress to Parliament; there was a light adaptive tension to develop a common language about transition management. However, most they did until end of 2004 was organize competence centers and legitimize their civil servants to spend time on implementing transition management. This was perhaps more than expected with a view on their cooperation before 2001, and NMP4's language of transition management was at least kept alive. In that sense the co-evolution continued in the loose networks that already were in favor of transition management. On the other hand, there was impatience as well. Support for transition management was mixed: on the one had many people were willing to think about it as a 'peat fire', spreading underground, and invisible

"the 6 DGs (through a well-functioning IPE) and societal platforms were believed to create reciprocal adaptive tensions"

as well as closed to them, on the other hand it was unclear what kind of result would be expected, monitoring was widely seen as an important problem, and transition management was not useable as a political term – it was only meaningful to believers, or those who gave it the benefit of the doubt. It was the adaptive tension of this doubt that drove politicians, DGs and platform chairs to keep focusing on experiments within several years. The transition discourse, they all

believed to be important, could not be kept alive without also promising something on the shorter term.

It took four years before the DGs took the step of organizing the IPE, which was an unusual arrangement. The DGs communicated about this as a more credible approach to transition management. In this way they created an adaptive tension for themselves; as the platform would develop proposals to the government, it would have to speak back with one mouth. If that would not be successful, and inconsistent messages would return from different ministries, the IPE would lose credibility. The expectation would not hold that the government would implement the interventions require to facilitate the market breakthroughs developed in the platforms. The thinking of the DGs along these lines, willing to stir-up their own organizations and take responsibility for decisions themselves as a team, was completely new, and was the result of co-evolution.

The better cooperation in the government created an adaptive tension on the industries, and the EU conference had been a key event in that process. The forerunning industries were pressurized to produce proposals that were politically acceptable, and the government had created the expectation that it could manage that process on the government side. The platform chair had resources and a target that fitted the ideas that had been widely shared at the EU conference and in the ETP. Several CEOs were committed with sustainable development and when presented this credible opportunity the platform started-up quickly.

5   Adaptive networks

Trust comes on foot and goes on horseback (Thorbecke)

In chapter 4 I have hypothesized the existence of adaptive networks, in the context of a succession of power networks where co-evolution was observable. In the present chapter I analyze the interactions in these successive networks, looking for explanations of co-evolution. I have interviewed persons closely involved in the change processes, and asked how they explain changes of behavior. The reflections of individuals on the behavior of others and their own behavior give a series of socio-cognitive explanations with or without overlap, which I have merged to a bigger picture. I analyze how interviewees reflected on risk and trust, how they rationalized individual and collective behavior, and how they strived for, and explained, breakthroughs.

5.1   Development of major sustainable policy papers

Sustainability research and greenpolder model

"the government hadn't asked the right question"

At the start of the process of developing NMP4 there were dozens if not hundreds of policy makers from all domains who shared disappointing experiences. Already before 2000 they had learned that proposals needed to be timely for decision-makers who must operate in a political force field; this was a feeling that was vaguely shared in loose networks. In the power networks of the greenpolder model sectoral and environmental policy makers negotiated about large projects, and in this context loose networks of sectoral and environmental lobbyists developed (see Page 32). In these networks people started to respect each other's intentions. Competence developed to agree on complex projects where adverse impacts are compensated and to make this acceptable to supporter groups, whilst formulating conditions for further policy making. However, representatives from NGOs and from the private sector had also learned that the greenpolder model did not know how to create sustainable reforms. The government hadn't asked the right question: under the greenpolder model the government already had a specific type of intervention in mind (a spatial decision) and only asked advice about that specific intervention. Any other advice to the government would be untimely, because

the hierarchical 'government machine' hadn't formulated its operational objectives in that way. It was a closed shop, a limiting condition in the search for sustainable development. Many lobbyists were left with the idea that they should link up with people with knowledge of sustainable reforms under a different power context, but they had no idea how to develop influence to achieve that context, or whom they could trust to work towards that influence; in other words they had no foresight of possible success.

In sustainability research the situation was the opposite. Long-term research and environmental policy networks drove this process, but the sectoral systems were unable to take up their recommendations. Limiting condition here was lack of influence. The proposals were not accepted by implementing power networks, in particular CEOs. The proposals did not match with short-term objectives. Joint research projects, without any involvement of decision-makers at the highest level, develop results that can only be timely by chance – and the odds are small.

These frustrations, which included decision-makers, had led to a combination of trust and a joint challenge: to create a context where governments as well as private groups can learn to develop proposals that do lead to a desired development, and that are politically timely. Several policy makers were aware that this might require patience – not, like in the past, using the momentum of one specific 'power wave' like a spatial plan under development or a sustainable development scenario, but keeping sustainable options in mind and look for opportunities to bring them a step forward. In other words, make sustainable development independent of the pre-existing agendas of power networks.

> "shared frustrations had created respect and trust"

This shared trust and foresight made the unspecific transition policies of NMP4 come at the right time for influential lobbies - whereas thanks to their vagueness they were not perceived as a threat by vested interests. Several were aware that the tensions in the wider systems were increasing: the threat of shortage of energy and high fuel prices, as well the failing belief that congestion would be solvable by creating more traditional infrastructure solutions, were widely supported. Climate change and (later) air pollution added to the widely felt urgency. The right time for breakthrough proposals was nearing, and individuals across subsystems knew where to find each other and where they stood.

There was therefore in the early 2000s a wide sense that environmental policies needed an innovative approach, overcoming the limiting conditions: the closed shop of the greenpolder model and the lack of influence of the sustainability research projects. If anybody knew how, they would be greeted enthusiastically. Some internal trust had developed in these loose networks, but no external trust (the right power context was precisely what was missing) and foresight was a joint analysis of the bottleneck: linking up to implementation power.

Round 1: Management support for transition management (around 2000)

For the loose networks mentioned above, NMP4 was an opportunity to create external trust i.e. a stable power network with adaptive tensions for a new process that would overcome the previous limitations. This is why the NMP4 team developed the transition discourse.

The NMP4 would be co-signed by several ministers, including those responsible for environment and energy. Therefore an inter-ministerial team was established, led by Jan Kort of VROM. Hans Teljeur represented EZ with a few colleagues. Other important ministries were also involved. This NMP4 team took the academic idea of transition management to core environmental and energy policies. In the context of the NMP4 team, a power network where ministries watched out for inconsistencies with running policies, close cooperation developed between Jan Kort and Hans Teljeur. Teljeur also was responsible for sustainable energy scenarios in the Economic Affairs ministry EZ. This team developed the text about transition management. They had concerns about the political acceptance of such an unspecific statement. A strong tradition was to set quantitative targets for environmental indicators, that can be monitored so that Parliament can reward or punish the administration. However, in the transition discourse, accountable targets were thought to be useless and even may produce a misleading appearance of certainty, whilst the transition discourse offered a different way to deal with uncertainty. Uncertainties and risks would have to be more shared in the process, by giving a role to forerunners in all domains. This process should be initiated and moderated by the government.

> "it took courage to break with the routine of accountable pollution targets"

In the NMP4 development process, a series of meetings between national think tanks and academics applying evolutionary economic models and civil servants from VROM and EZ, had led to the joint idea of transition management. According to team leader Jan Kort things got together when at a certain point prof. Jan Rotmans presented his ideas of transitions and integrated thinking. It became suddenly clear to the group that integrated thinking had to develop between organizations that jointly can create enough knowledge and influence to actually make a difference. A VROM-member of the NMP4 team: 'We understood that it was not enough to only be focused on the 2010 Kyoto targets to abate CO_2 emissions – we should already begin to worry what should happen after that.'

Jointly developing storylines for future development of the energy system created a further joint understanding, merging academic knowledge with practical knowledge about the energy system and energy policies. The skills required for integrative thinking and learning were actively discussed, making use of terms like basket of aims, backcasting, joint action, separating strategic thinking from instrumental thinking, 'system governance'. A particular term that later became widely used and communicated was the S-curve. It indicated the stages of a transition, including the possibility to influence the initial stage by strategic integral thinking. In an unpublished paper by the inter-ministerial NMP4 team,

months after the NMP4 had been published, transition management was identified as the third generation of environmental governance, after hierarchical control and negotiations with target groups.

The question was whether politics would accept such a document that made Cabinet seem not to have a clear direction. To get more certainty several meetings were organized with civil society, and there were indirect contacts with Parliamentarians. The transition ideas were received with cautious encouragement. Insiders were aware that this was difficult to explain to their wider supporter groups, but personally thought that the transition discourse had some potential. The transition discourse was first accepted in the administrations of EZ and VROM, whose supporter groups liked the idea.

Rounds 2 and 3: Political decision-making (Spring 2001)

The Cabinet agreement to share responsibility for transition management was enabled by EZ minister Annemarie Jorritsma. In April 2001, she wrote a letter to Parliament that she wanted to become 'manager of the energy transition'. She made no detailed statement at the time. Her responsibility was elusive, and she took no great political risk (other than perhaps being accused of inefficiency, but then no significant budget was initially reserved for managing the energy transition.) But she created an adaptive pressure for other ministers to follow her example.

The Cabinet decision therefore largely had to be explained by the learning process in EZ itself. The proposal made to the minister by her civil servants was the result of a process where ideas co-evolved in the loose networks of sustainable energy, and Parliament could recognize transition management as a credible approach for sustainable development. This proposal was made to the minister because the EZ principals had participated in the learning process. Principals in this ministry, including Norbert Zwaan, Director-General for energy at the time, saw it as an opportunity: it wanted to be transition manager. After the liberalization of the energy sector, EZ would need a new task. However, cooperation between EZ and VROM had not been really constructive in the past, so how could this happen?

Higher management in EZ was not interested at first in using the complicated NMP4 process to reach joint objectives. In the early 2000s, the dominant political stance toward the energy sector was still that it should become more efficient through privatization. NMP4 however was likely to become a highly conceptual process with a scattered action program, creating no major new responsibilities for non-environmental ministries. The management team of EZ was not giving it attention until Hans Teljeur convinced them that a link should be made with another EZ project called 'long term energy outlook' (LTVE). This link proved to be pivotal for transition management to be accepted by Cabinet. Teljeur used LTVE to do a series of interviews in the energy sector (Progress Report De Reis 17 September 2001) EZ received constructive advices about the types of sustainable energy futures to pursue and about its own role to achieve these futures.

Most interviewed market actors said that they were prepared to commit to such a process.

However, as possible energy futures were discussed in more detail, there was some controversy. Biomass was controversial because it was very uncertain if sufficient green supply of it could be organized, and whether it should be used as biofeedstock in power plants, or to prepare transport biofuels. Photovoltaic solar energy was not widely seen as an option that should break through in the clouded country of The Netherlands (though solar panels might be an export product). People differed views about the likelihood that hydrogen would ever be a cheap and safe energy carrier, and the usefulness of investing in that. Nuclear energy was still taboo. Through these interviews it became clear that the energy sector and stakeholders were prepared to participate in dialogues about a new energy system, and several robust options were consistently mentioned. Biomass was one of these.

Norbert Zwaan confirmed later that they believed the transition initiative would be widely appreciated since they were asked by the energy sector to do this. EZ's management team endorsed the idea that 'an energy transition was inevitable, and that society requested a new role of the government to influence that transition to make the energy system more sustainable'. EZ would be the appropriate ministry to coordinate that processes, since it was 'the ministry that ensures that the lights stay on'. The NMP4 was an opportunity to give that role a legitimate basis (i.e. a power context).

> "the energy sector requested EZ to pick up this new role"

On the other hand, support in EZ was mixed – only few people understood the idea. In VROM, several people believed that VROM would be 'giving away' responsibility for environmental problems (and therefore influence) to other ministries, in return for a possible coordination task that was not very politically attractive. Not everybody belonged to the loose networks that shared the experience that 'pushing' does not help. Kort and Zwaan needed to convince the independent thinker Jan Pronk about transition management. Then, the issue became which ministry would implement which transition. Here, Kort, Teljeur and Zwaan offered Jorritsma to take the first step. Kort: 'We were aware that transitions are too big for VROM to manage. On the other hand we wanted VROM to coordinate because we knew that the pitfall would be that the other ministries would quickly redress their transition to ordinary policy, losing the idea of integrated thinking. Coordination at Cabinet level was not an option, so we accepted to do that at DG level.'

> "sustainable development is no negotiable outcome if power comes together for spatial decisions"

Trust and foresight

The limiting factor for sustainable development had in loose sustainable development networks been analyzed as the link between knowledge and power. The greenpolder model brought implementation power together but was a closed

shop; they had learned that sustainable development is not a trick of power; sustainable development is no negotiable outcome if power comes together for spatial decisions. It is too complex to develop and implement a sustainable, alternative development in that context. Sustainability research programs, quite the opposite, produced knowledge about alternatives scenarios, but that was untimely and therefore not accepted by networks with implementation power. They had learned that sustainable development is not a powerless trick. The loose networks had become aware that a more patient process of cooperation with implementation power was needed, and some saw the NMP4 as an opportunity to create a context for that. The limiting factor at that stage, had become the political credibility of the idea of transition management. Credibility depended on a balanced approach of forerunners from the public and private domain, to make sectoral borders permeable. If the government is confronted with a united team of forerunners from relevant corners of society, and society is confronted with a united team of forerunners from relevant parts of the government, both sides will be attracted to each other. There will be more trust that the other side will make credible propositions.

A process of change therefore had to start at both sides simultaneously. The team EZ-VROM developed the idea of transition management in its sustainable development networks. They sensed how the outside world would react to this, and the reactions were favorable. There was wide agreement that the first step to bridge the gap public – private had to be taken by the government, and that this required a coordinated approach. Coordination was therefore the first step, in order to initiate a process with balance between public and private forerunners.

In this context the team VROM-EZ developed transition management as an idea that was not (at least not yet) accountable. The core idea was that the government would moderate private forerunner groups in society as learning networks in order for the government to feel a pressure to respond to the proposals of these networks, which would enable the coordination in the government that was lacking. However, such a proposal would be against traditions in the government, and took some courage to develop. The NMP4 team gained support from especially businesses in the energy sector, next to many individuals sharing the experiences of before. The team succeeded in preparing a formulation that was acceptable to both the minister of environment and of energy, despite being unspecific. NMP4 was accepted but political credibility of transition management depended on a small number of enthusiastic members of Cabinet and Parliament. The credibility was temporarily improved because politicians gave the ministries of VROM and EZ the benefit of the doubt, trusting in their intentions and competencies. In short, the NMP4 team succeeded to make the ministerial borders permeable, at least for a while.

The involved outsiders dispersed the idea, although it was difficult to understand for outsiders. There was an implicit expectation, based on previous interactions, that in the other domains the discourse would also be defended. This chain of trusts extended into Parliament, where they created an opportunity for minister Jorritsma. Where foresight in the loose networks was limited to a vague

feeling that power and knowledge might be brought closer together, Zwaan, Kort, Teljeur and others speculated about the implementation of transition management and the possible effectiveness of a shared responsibility with coordination by VROM. However, this only had become possible because Teljeur and Kort got along so well and convinced EZ's management. At large, the idea of transition management was still hardly understood in both ministries. The VROM-EZ network had operated on their joint foresight, relied on each other for support, and hold on to their arguments.

After the adoption of NMP4 by Cabinet, the new limiting condition became the continued political credibility of the idea of transition management, so that political players would allow each other to give it attention and to manage the process together, enabling their people to work together rather than work in parallel. The NMP4 team had temporarily created that credibility, but transition management still had to prove its value.

5.2   *Think tanks for sustainable mobility*

Round 1: mobilization of the mobility board (summer 2001 – winter 2001)

Failing attainability of travel destinations and the contribution of transport to climate change and disturbance of the local environment already had been on the public agenda for years. IB members sensed in 2001 that breakthroughs were necessary, urgent and possible, if only cooperation could be created to enable successful ideas to develop. An idea about how to achieve such cooperation was missing, but several IB members were aware that this needed time to grow.

The NMP4 and the V&W (transport) minister's formal commitment legitimized Bas Harms's initial efforts. Transition management was not an idea of the transport ministry itself, and despite NMP4 it could easily have focused on other priorities. A mixture of personal commitment with the idea of sustainable mobility, and the small possibility that this could develop into something bigger, drove a handful of V&W civil servants to do this. Harms did a series of interviews to see whether enough people could be interested to start a dialogue about transition management in the mobility system. Positive signals returned, and the IB quickly self-organized.

These signals were also paradoxical: whereas transition management was seen

> "the IB quickly self-organized"

as an open concept that could lead to anything, it was precisely this openness and the involvement of several ministries that created expectations. Several envisaged participants were personally interested in the theme and they were not scared off by uncertainty. The mobility and environment NGOs, as well as several people from the industry, were already aware that an open commitment of the government would one way or the other be necessary for breakthroughs. The same is true on the side of the energy and environment ministries where people with similar experiences to those of Harms, De Jong (environment movement) and Van Dongen (mobilists' association) had developed the idea of transition

management which had become prominent cabinet policy and were now supporting each other to participate in the IB.

The group was therefore attracted to each other because they were prepared to invest in an uncertain process with a common end, and because they knew that the other participants were influential and knowledgeable in important parts of the mobility system. They believed each other's intentions and competencies, and that if any, this group would be capable of make steps. In particular the participation of Jeroen Tulp, the influential deputy DG of V&W, created an expectation that the group could have influence. Some of the others perhaps were more attracted by other opportunities this interesting group might offer. The group came together every two months, and in 2002 it called itself Innovation Board.

Round 2: Joint preparation of the EU conference Energy in Motion (2002 – 2004)

The first good year of the IB was spent on orientation what the group may be doing, and how they would do that. It was quickly agreed that the IB would focus on sustainable mobility as defined by the World Business Council on Sustainable Development, and that it would not be given any formal status. All members

> "a year was needed to develop self-confidence as a group"

needed to participate purely on their personal behalf, and not on behalf of their organization. The group shared a feeling of unfulfilled potential. There were widely felt and urgent problems with mobility, but the social structure of the system was complex and inert. Many previous initiatives to implement sustainable innovations had failed, for example because environmentalists protected, or the investment was too high and reduction of environmental impact did not return on the investment. Now, for the first time, a group like this was together and prepared to discuss these sensitive issues, and it knew that the governmental representatives were legitimized to give this some attention, driven by the political expectations NMP4 were said to have created. In hindsight people indicate, 'Apparently a year was needed to build trust among the participants and to get things going'.

Participants agree that their working method as of 2003 started to function better and brought new insights and opportunities for joint action to light. The working method developed in interaction, and was not 'invented' by any single actor. It consisted of six-weekly two-and-a-half, sometimes three-hour meetings with a combination of scanning and in-depth analyzing. The scanning was about current events in everyone's domain, discussing actions taken by IB members and lessons learned, and in depth analysis concerned specific topic, often with a guest speaker.

The idea of an EU conference appeared in summer 2003. The IB quickly realized that this was an opportunity to create impact in the mobility system. He ensured that this task was assigned to personnel with the appropriate process skills to ensure that the preparations would not be dominated by the agenda of

the transport ministry itself. The IB members of the ministries for energy and environment did the same, and they made a joint proposal to their ministers.

At a certain point, the issue of fuels and propulsion systems was chosen for the conference. It had potential since it was close to the knowledge and influence of the many group members, and it also had an international dimension. They saw The Netherlands as a potential and credible area for experiments for new automotives systems, since it did not have its own automobile industry, but several conditions for such experiments would have to be fulfilled internationally. Climate change and reliability of energy supply had already been on the European agenda, but there was no breakthrough in sight. The European Union was still mainly focused on diesel systems and decoupling of economic growth and transport growth, and this was clearly not going to solve the problem. This made fuels and propulsion systems an appropriate issue for the EU conference.

The group realized that a more common mindset in Europe would be needed to create more support for specific interventions. Yet, such support could only emerge in dialogue, and the required interventions could not be known in advance. This general idea led the IB members who belonged to the ministries to let their ministries work closely together in the conference preparations, and the industries and NGOs to stimulate their arenas to

> "the IB members complemented each other's knowledge and influence"

have an active stance toward the conference. The IB sensed that they needed to connect primarily with the oil and automobile industries, the only ones who would be able to implement sustainable automotives. They consciously tried to create a context for that, but they needed to be sure that everyone would work from a coherent mind set. One participant said afterwards about this period: 'Participants were really complementary, since some could offer long-term scenarios and possibilities, others could identify the possibilities to adjust short-term policies, some were skilled in creating systemic overviews and technological possibilities. Yet, others could take this knowledge home and align it with actions.' Certain members were able, through their interventions, to integrate that thinking: individuals started to see connections and possibilities in the same way. People could also make use of their personal networks in their own organizations, to find additional knowledge and to check the validity of assumptions.

This is how their vision emerged and how it was applied and updated. Attracted by the EU conference, they developed by the end of 2003 a set of roads to sustainable mobility futures, which they called a mental map or mind map (Figure 9). Many of these options consisted of combinations of technologies under development in subsystems (a portfolio of innovation initiatives). Many would have difficulties breaking through without supporting government policies. The system descriptions focused on its physical appearance, and the steps focused on actions needed by relevant stakeholders. The map was drawn as a matrix, and the narrative behind it was largely shared in meetings and quickly summarized on paper. The mind map distinguished innovations at the level of technology, individuals and society that would be conceivable within time spans

of 0 - 4 years, 4 – 8 years or more than 8 years. In this way, the linkages between the long term and the short term, as well as between system components, became visible.

Figure 9. The mind map of the IB early 2004
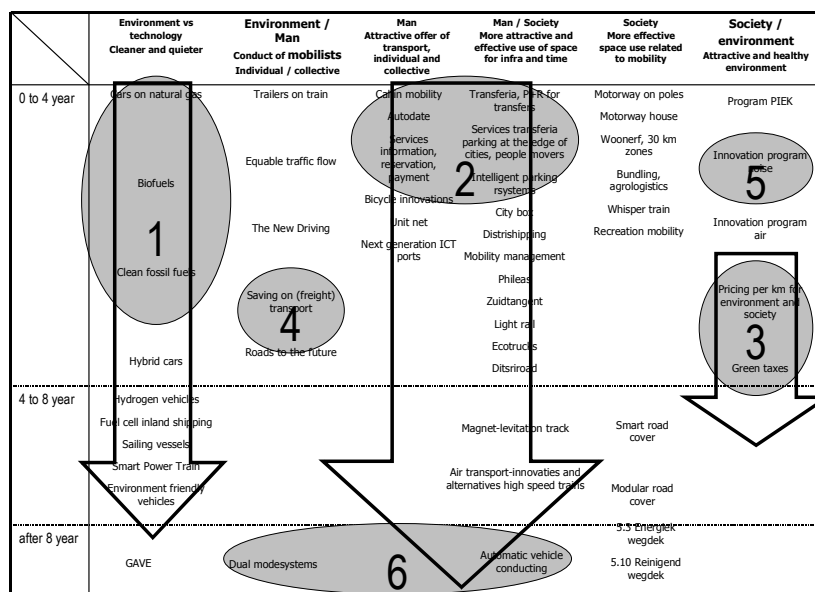
Explanation: most terms in the mind map are only comprehensible for insiders since they refer to Dutch innovation processes or ideas. Shaded areas represented closely interdependent ideas. They were 1) automotives, 2) demand driven system innovations in transport production chains, 3) pricing and fiscal greening, 4) reducing transport demand, 5) noise package, and 6) dual mode and vehicle conduct systems. The arrows cluster the whole and formed the three main the transition paths to sustainable mobility.

By iterating between possible developments and their implications for human welfare, six more or less interlinked routes to sustainable development were discovered. Each route assumed a natural order of events, from certain innovations being introduced in the market, conditions put in place by the government, consumers reacting, and so on and so forth. One route concerned the relatively autonomous subsystem of fuel and propulsion systems of vehicles, which was related to reliability of energy supply, climate change and local environmental quality. Another was aiming at the behavior of travelers, reducing pressure on the environment, within a given supply of transport options. A third was to develop new transport modes that intrinsically cause less use of environmental resources and maintain a fair attainability for all. A fourth one was to increase

the efficiency of the use of physical space for transport, in particular in sensitive areas. Finally, there are the innovations that mitigate side effects of the present system, and the general idea of putting pressure on the system to change by calculating a price for side effects of behavior.

The IB now had a coherent set of ideas of what a sustainable automotives system might be, how it fitted in sustainable mobility at large, and they would be capable of separating truths from clear nonsense and certainties from uncertainties, and they knew all would be consistent about that in their power interactions when the prepared the EU conference. The IB did not communicate this complex idea as such to the outside world, but the IB members knew that they could now develop concrete action and had a common language to verify if the actions of other members fitted the common interest and to pilot ideas based on that thinking in their communication with the outside world.

The moment that this mind map emerged in the eyes of the group as a whole is therefore remembered as a breakthrough. The ideas were in themselves not new but they were linked together in a collectively meaningful way. The group explicitly used the map from that moment on to explore and prioritize options, identify crucial uncertainties and undertake actions to reduce these uncertainties, for example by means of R&D. All members interviewed in this period indicated that the process had become unique and important. Many also said that at this time the transport ministry should not institutionalize the IB, since that would imply a possibility of political control over the process. Several of the ideas on the IB's agenda did not match the public agenda of the transport ministry, and the ministry itself was still hardly connected to the IB.

As during the conference preparations several IB members acted in their formal role as representative of an organization, they started to communicate in their own circles in

> "members connected their new knowledge with their formal role "

careful steps about slightly different perceptions of automotives. As they received feedback, the IB collectively determined how that affected their mind map as regards automotives, combined the new knowledge. Without being too explicit about it, Jeroen Tulp took this with him as leader of the conference, and the organizing team of three ministries hardly could see that he based his behavior on the IB. Only the IB members, and sometimes their superiors, could see the significance behind the scenes of the IB. This was a conscious line of action that had been agreed from the start. The arguments would have to have their own influence, and not the force of who said it (the IB), or the organizations in the mobility system could easily fall back in power struggles.

In this period the IB consciously tried to remain balanced – in the sense that all domains that are key to sustainable automotives were involved in IB and therefore the IB as a whole would maintain sight on technically and politically feasible implementation scenarios. This is why at a certain point they invited Kees van Arkel of car manufacturer Takey. Takey was a well-known forerunner with automotives. In the dialogue several scenarios were discussed, and the link between fuel and car technology brought new interesting scenarios to light. Van

Arkel indicated at a certain point: 'But this is not consistent with Takey's strategy'. Then Groen of oil multinational Klingon helped Van Arkel to find arguments that could make the scenario interesting for Takey.

Round 3: The EU conference and the automotives platform (October 2004 – summer 2005)

At the EU conference itself several IB members were present. They were satisfied with the conference, because they saw that the level of agreement at the conference influenced power networks. They were also satisfied because they had shown that the IB could function as they had intended, moderating behind the scenes between organizations that normally have difficulties to work together. Afterwards, the IB member from EZ said, 'My ministry probably could not have organized such a constructive conference'. Other IB members indicate that it had been critical that Tulp had become, through his interactions in the IB, open to a wider scope for the EU conference: not only focusing on technology, but also on consumer behavior and spatial aspects.

On the other hand, few civil servants in V&W had picked up this thinking, and IB members realized that continued tensions would be needed to keep V&W in motion, in particular with a view on the opportunities created by the conference. IB members felt that pressures needed to be built on the auto and oil industries, since the energy could now be used constructively rather than wasted on a standoff situation where initiatives from the fuels sides did not match initiatives from the auto side, which made the whole process less credible. Tacitly, a few IB members had realized that the crucial uncertainty was in organizing the influence on vested industrial interests, and that these could only be challenged to cooperate if the government would organize itself more integrally and create serious expectations for action.

"cooperation in the government was needed to attract vested industries"

The IB itself had therefore an uncomfortable feeling around the time of the EU conference. In autumn 2004 some members decided that it was time for a self-evaluation of the group. Certain members had been pushing for joint experiments in the market but there was insufficient belief that this could be successful. And the most telling sign of lost energy was that people started missing meetings after the success of Energy in Motion. It felt as if the source of their inspiration had disappeared. The evaluators talked individually with all other IB members, after which the group came together again. Both the interviews and the resulting plenary discussion indicate that there still was some energy, but that in particular Tulp and some of the less engaged IB members were disappointed that apparently the group had failed to develop a more concrete perspective on next steps after the conference.

"the IB's ideas resurfaced in a new context"

At the time they did not realize that the conference itself would create its own momentum, the IB would be overtaken by the DGs, and IB's members

concerned with automotives would be getting together under that new power context. Having an opportunity to sit in the now really influential platform, or in its supporting working groups, rewarded IB members for their earlier efforts. They could see that their ideal was closer to becoming reality, and they could now contribute in a more formal capacity. In addition, the success of the transition path automotives motivated the IB to continue working as an informal group toward breakthroughs in other transition paths.

Trust and foresight

The IB created several breakthroughs in thinking about sustainable mobility. The domains that could implement and legitimate the government's role seriously discussed alternative scenarios for automotives. NGOs with large supporter groups helped each other. The Dutch mobility system was widely known as inert and complex. There was a tradition of conflict about infrastructure and encouragement of transport. Different subsystems, like the environment ministry linked to environment NGOs, the energy ministry linked to the energy sector, and the transport ministry linked to the transport sector and mobilists' NGOs, all had developed their own prior way of reasoning about sustainable transport, and had positioned themselves in the political arena. For example, parts of the environmental movement favored a limitation of car transport, the mobilists' group had been against road pricing, the car industry and the oil industry did not know where to invest because they said the government should first 'choose a future' and put the appropriate incentives in place. The government's reflex had been to return responsibility to society since it neither had the knowledge nor the support for drastic decisions. Several IB members realized, that this 'game of not sharing responsibilities' never was going to lead to a pro-active breakthrough in policies, unless connecting analyses were first shared more widely. This foresight motivated the group.

Several IB members had known each other from the previous conflicts (the greenpolder model), and they were quickly mobilized as V&W initiated the transition team. There was trust in a stable context in Cabinet, at least for a while, so directors of three ministries participated. They also trusted that sustainable mobility would remain an urgent issue in societal organizations, and a potential opportunity for industries. Therefore, the context in these domains also seemed to remain favorable. When the group became interesting enough for deputy DG Tulp to join, it combined an unprecedented span of knowledge and influence in the Dutch mobility system. There was an atmosphere like 'we are going to help each other to act for sustainable mobility'.

However the first year was completely spent on developing an identity: what do we want to achieve and how to do that. It was clear that given sensitivity of the issues there needed to be absolute certainty that no one was driven by partial interests, which was why the IB was never a formal group, and nobody was paid. Trust was explicitly governanced (see Table 12 at the end of this section). By freely exchanging information about developments in the

"trust was governanced"

parts, combinations of IB members could be made who linked their knowledge and influence for joint R&D type of activities.

The IB was aware that sustainable mobility is a broad ranging issue and focus was needed. This subject was quickly chosen for three reasons: a majority was knowledgeable and influential in automotives, they saw chances, and it was appropriate for an EU conference. The EU conference and the choice of automotives gave the IB a clear focus and their actions were in a considerable degree led by foresight of the social process needed for market breakthroughs. To be sure that everyone agreed about the idea of sustainable automotives, however, the mind map was seen as crucial – it was seen as a language, a tool for managing internal trust – that ensure all worked from coherent ideas. Under the creative tension of the EU conference this mind map quickly emerged, and it formed a trust basis needed to let knowledge flow freely across the European mobility system, through the IB. Whereas some specific participants consciously pointed to the need to guard coherence, functioning as a kind of conscience for the IB, all saw this overarching problem description for mobility as a breakthrough for the IB's functioning.

Foresight also is observable through remarks IB members made in interviews about management of tensions to move the oil and automobile industries, as well as the ministries, in a position where the gap public – private could be bridged. It seems as though this was not discussed really that explicitly in the IB's meetings, but several IB members clearly were directional in their actions. They consciously tried to build cases they could use in their own organizations to see reality slightly differently, and made use of the knowledge acquired in the IB. This is for example how the environment NGO made a case (in small cautious steps) that cars may be sustainable. It is how Klingon made a case that there may be a possible momentum for sustainable motor fuels where the forerunners may have a benefit (despite competing with its own traditional activities). Finally, the IB tried to focus on the weakest link in their case. At a certain point they saw car technology, and willingness in the automobile industry to support change, as the weakest link, which is why they consciously invited Van Arkel. Van Arkel was new to this network, and it took some time for him to adopt the same kind of systems thinking and to invest in the tension between sustainable automotives scenarios and the strategies of Takey.

The IB was taking slow steps, attracted by the EU conference, in a direction they sensed was necessary to link to implementation power. They facilitated co-evolution in power networks. They made no hasty choices for scenarios where critical implementers were not linked to the process. However, the power context they sought at the end of the day organized itself and was even rather unexpected. Late 2004, the IB had no further ideas about what next after the EU conference, but right at that time the five DGs came with a proposal for the automotives platform. Important was that soon after, the finance ministry also was linked. This was a power interaction – it had become clear to Finance that momentum was building up around them. At the same time it was clear for this group, that ambitions had to be tempered – there was still no political support

anywhere in sight for drastic change of the fiscal structure of the fuels or motors market. Purchasing power was still sacred, and the EU posed limitations on what The Netherlands could do. Therefore, in 2005, the automotives platform sensibly aimed at breakthroughs that would be feasible within these limitations, and that also would be consistent with the mind map. In other words, the short-term market breakthroughs should form a lever for further changes. For example, like the hybrid car might be step toward a hydrogen car.

This makes the point clear that the limiting factor of trust for the IB always had been their span of knowledge and influence. They only could moderate co-evolution in parts of the mobility system that they were connected with, and where 'political movement' was conceivable. The complexity of their own mind map and the coherent actions derived from that, had a limit. Their implicit strategy had been to connect the parts that together can create momentum to take further steps – in the direction of Finance and the European Commission. The IB seems to have had no hope of creating a span of influence that would include organizations that may create wide support for measures that would go at the expense of purchasing power. In other words: switching to sustainable automotives should not go at the expense of that. Yet, within that boundary a lot was thought to be possible, if enough cooperation between market and political competitors could be achieved.

The question is, in which degree have all these thoughts been shared in the IB. It is my impression that this was limited to a core group, and not really made explicit by them either. They, and the rest of the IB, simply had an understanding that all would act from the point of view of the mind map, and some individuals (the best systems thinkers) created at critical points support for inviting new participants to address the weak links in their case toward sustainable automotives.

> "the gap public – private was bridged at the highest level"

In 2005, a whole new power context had emerged for automotives. There was an expectation that social dilemmas about sustainable automotives and power interventions could be discussed in the automotives platform, which could be fed by a dialogue between the public and private sectors at the highest level, perhaps even with a direct link to Parliament. There was an expectation of overcoming the bureaucratic inertia in this way, whilst making use of all the available knowledge. This expectation gave life to the whole automotives subsystem – this would not strand prematurely as other initiatives had. This power context also attracted the laggards. Several IB members participated in the platform and continued their mode of operation there. Other than that, IB members also undertook other joint activities that matched the mind map, and at the end of 2005 the IB itself was discontinued, and several of its members participated in other platforms about sustainable mobility, which were comparable to the automotives platform. They took their mindset and their working method with them, and it may be said that the IB itself was a temporary manifestation of a local culture that lived on in other networks. Among several members of this network there

was a wish to link this more to international networks, since after the EU conference multinational corporations remained involved, but the process was mainly aimed at market change that could be implemented without cooperation of other European governments. On the other hand, as one IB member said: 'it will be difficult to export the IB's working method as a model for learning networks.' The international snowball groups organized by the conference team were only partly successful – IB members had observed that Dutch civil servants displayed power behavior rather than adaptive behavior, trying to convince others of their point rather than engaging in dialogue. The snowball groups quickly died afterwards.

Table 12. The explicit dealing with trust in the IB

The IB increased its internal trust significantly during its existence. Intentional trust was there in the initial group, but the group still had to develop joint steps to take toward possible interventions. Such steps entailed risk before the vested interests. Gradually, the IB developed a competence to do that, by making use of opportunities and by defining small steps toward support.

The importance of trust. Many IB members claimed that they would not have changed their behavior had they not trusted other IB members or trusted the continuation of transition management as wider government initiative. Only when IB members were confident that the IB's complex ideas could be underpinned (and that other IB members were faithfully offering their knowledge), did they stand up in their home organizations and test new ideas before a larger public. 'Sworn enemies' like the SNM and Takey could make a joint ad in a national newspaper in February 2005, because two people had come to trust each other in the IB. Offering strategic information about the attitude of significant parts of the supporters group, and developing shared strategies for change toward each other's supporters, required a confidence that such information would not be used for other, more opportunistic causes.

Development of trust, an increasingly efficient working method (clearer perception of the process required for success) has swept each other up throughout the life of the IB. Smaller breakthroughs, only visible to the IB itself, were crucial. The initial IB group must have had basic trust and dialogue skills. These were perfected in interaction to an efficient working method. The integrators gave the example, others followed. As Johan Cruijff has said, 'you only see it after you get it', or in the words of one IB member: 'you only appreciate chocolate after trying it'. The IB was a success because it was informal. The process in the IB from 2001 up to 2005 was so fragile that many members said it should not be institutionalized since then it would become dominated by short-term interests. If this were to become an official V&W program, the V&W agenda would have dominated it. There was no trust that V&W even had intentions to apply 'transition thinking' as it was called. Having no mandate allowed the learning process to take its own course irrespective of any prefixed political objectives. This gave it the possibility to freely develop a joint language and a working method. By letting official political targets go, a process could develop that took some years but which eventually formed influential ideas about sustainable mobility. *(Ctd next page)*

Not even the team preparing the EU conference had fully appreciated the IB's role behind the scenes. It did not want to claim success, in order not to be seen a threat to others. IB members aligned the actions they took in their formal capacity, but the outside world could not see or understand that.

Joint communication skills. The IB developed the competence of developing its ideas 'in dialogue with the mobility system' via representative and knowledgeable actors. Much of this dialogue was indirect, by jointly influencing the preparation of a EU conference through a preparation team that had interviews around Europe. The IB gave the preparation team easy access to NGOs and industries and enabled it to ask the right (integral, unbiased) questions. The information returning in this dialogue helped to better make a case for further steps. This explains the high attendance of high-level industrialists and civil servants at the conference, which again enhanced their enthusiasm for the later platform. If a mandated organization had proposed the platform it could easily have been perceived as biased by partial, short-term interests. Now, the initial idea formally came from the joint DGs, and IB members developed the detailed proposal in their 'other' capacity.

Consciously managing trust and expectations. The group consciously developed trust that nobody would take advantage by making ideas public prematurely or by leading the group to premature conclusions for their individual sake. This was for example done by developing long-term views and reasoning backward in time, and as they got close to concrete interventions or investments that were not yet widely supported, to start with cautious communications in the home networks about possible alternative ways of looking to the future or courses of action. The people developing the NMP4 as well as the people starting up the IB had sufficient trust in the intentions of the others, but in the process other people needed to be invited as well to complement the pool of knowledge. The IB tested people by not allowing any payment for participation. People were tested for their active contribution to the whole. Some people were invited only once, but a core group, who were particularly influential in the administrative, political and private system stayed together, never betrayed the 'whole' in their communications in the own organizations, and actively spread ideas that were ripe enough. Before that stage, they looked for ways of filling gaps in knowledge or for opportunities to bring ideas forward to test them and create an impact in the wider social system – this may be called the 'piloting of ideas' by communicating about them in the wider system, to see what kind of feedback returns. Other ways of piloting that were applied in framework of transition management were facilitating experiments in the market, and asking feedback from citizen's panels.

5.3 *Think tanks for sustainable energy*

Round 1: EZ trying to give shape to its new role (2001 - 2004)

It is possible to distinguish an EZ-network of civil servants who really believed that EZ should try to moderate cooperation towards breakthroughs, and were legitimized to experiment with that new role. The NMP4 had created room for EZ, with Hans Teljeur closely involved, to spend attention and resources to transition management. Director-General Zwaan had almost gone away, but in his place Secretary-General Jan-Willem Oosterwijk strongly supported transi-

tion management in the EZ administration. He believed that to remain a credible ministry, EZ had to find a new role and focus in the long term. He also strongly believed that policies to influence the energy system, also if these are motivated by environmental reasons, should be developed by EZ – which had most know how. Transition management was to him an opportunity to improve cooperation.

Table 13. EZ's dilemmas in 2004

Should transition management take the place of (or incorporate) business as usual policies (no)?
Should EZ admit that the ten promised transition-experiments were delayed, rather than avoiding this by focusing on (much less concrete) transition paths (no)?
Should EZ make choices for certain transition paths, as the outside world demanded ('leadership') (no, but we do apply criteria of general public interest)?
Should EZ give quantitative targets for sustainable energy production, under very uncertain conditions (no, except it should be a considerable part of energy supply)?
Should EZ reward market actors who invest in the transition process through a 'special relationship', whilst this would distort the level playing field (only with forerunners)?
Should EZ propose that The Netherlands display leadership by risking investing in sustainable technology? (yes).
Should EZ propose that the EU creates incentives for specific transitions, or leave it completely open (Netherlands tries to create support in Europe for the transition approach, and as transition paths develop specific regulation may be adequate)?

Source: internal note EZ, February 2004

These civil servants felt an adaptive tension – to change the way it operated and become a credible transition manager. For the next years they would continue its communication with the outside world about transition management at meta-level, despite the fact that Parliament did not support it in 2004. Positive feedback kept returning – at the meta-level. At the same time EZ struggled with its role in stimulating debate about the wider long-term dilemmas of future energy systems. In an internal note dated February 2004 Hans Teljeur proposed to share some of EZ's dilemmas with the outside world (see Table 13). EZ's struggle is also illustrated by what happened to its internal report 'policy innovation', prepared in parallel to the four partial transitions in 2002 by a project team headed by Hans Teljeur. The report summarized what the outside world had said in interviews about the performance of EZ. When it was internally discussed with the DG and the deputy DG, they were worried that this could bring the Minister in problems. The criticism may be interpreted as a way of projecting the problems of the energy system to EZ as problem holder, without acknowledgement of its dilemmas – and the fact that these dilemmas are in fact caused by wider social dilemmas. Whatever EZ chose to do, it would always be easy to criticize

from either side of the dilemma. For support to long term R&D, this was easier, since here EZ could anticipate more significant changes of the playing field in the long term. It could make decisions about support linked to the visions of the project groups.

Round 2: developing transition experiments (2002 - 2005)

In 2002 and 2003, EZ's Albert Veenstra led the Project Group for biomass. The aim was to start a societal transition toward sustainable biomass by the end of 2003. The involved people were not paid by EZ, other than consultants who supported the Project Group as a whole. The idea behind this was that all should be willing to invest, showing that they really believed in their ideas. The year 2002 was largely used to get the biomass community warm for getting biomass options and uncertainties more clear, and for making choices about the process that would be needed in 2003 to get a widely supported advice to EZ. The outcome was that major knowledge gaps were, first, the options for a market place to trade biomass as a commodity, second the side effects of possible technological systems, and third, conditions for successful continuation of the process. These conditions were: a long-term vision with implications for most feasible transition paths, market niches to start up transition paths, coherent government interventions to facilitate these niches, and an 'arena' to keep direction and coherence in the transition.

In 2003, the biomass project continued; the Project Group's composition was refined and better geared to address the uncertainties that it had identified. EZ had refined its request to the Project Group by indicating that the project should define transition experiments, which could be supported by EZ. The Project Group checked its results in a widely distributed questionnaire, two busy workshops, and in meetings of its soundboard group. The soundboard group had about ten members of the energy industry, two environmental NGOs (SNM and WWF), academics and three 'transition ministries' (EZ, VROM and LNV – the latter is responsible for agriculture and nature development). Moreover, three working groups, with in total about 80 participants, were set up to address partial questions. The working group Vision was led by Energy Technology Consultancy, the working group Sustainability by SNM and the working group Trading place by Rabobank.

Summer 2003, there was still unanimity in the biomass community, when the Project Group presented the results from its supplementary analysis and merged all knowledge into a 'vision' for biomass. It was clear to the group that biomass could be sustainable and had great potential. Such a situation could be reached in many ways, which could not all be supported. Focus would be needed, if only because 35 million is a limited amount. This analysis was shared in a workshop on 1 July 2003, with 160 participants. There were no protests. Since a significantly 'biomass-based economy' depends on import of biomass, impacts would be felt in the countries where biomass would be produced. Although these countries were not represented in the process (they were unknown), this issue was a major topic in the discussion, as were other kinds of possible side effects. The

unanimity was based on the idea that the government should create a level play-ing field for all transition paths to compete. This would include the fair pricing of (or equal limits to) environmental impacts (in particular climate gas emis-sion). This issue went beyond biomass, but it included importance of market breakthrough of a system on short or long term, and whether a system would generate livelihood in The Netherlands or elsewhere. These issues were left for EZ.

Table 14. The BioSyngas discussion

One of the four ideas that was given less priority by the project group biomass, was called BioSyngas: the large-scale production of synthesis gas from biomass. SynGas can be con-verted to biodiesel, methanol, hydrogen, synthetic natural gas and basic chemicals. Main argument by the project group was that BioSyngas depended on large-scale investments by the oil industry, which were uncertain given the fact that these industries were not involved in the experiments brought forward to the project group. Active participation by the industries that should make a transition path work was seen as a prerequisite by EZ, and most other members of the project group.

However, influential people from the biomass community did not agree with this choice. Sible Schone of WWF and academics Cees Daey Ouwens and A. Faaij posed in an article (Transition Biomass: a dead end? In: Stromen, 2, 2004) that from point of view of the global environment and economy, BioSyngas was in many influential studies proven to be feasible and very clean. They urged EZ to disregard the advice of the Project Group, and make a clear choice for this transition path. The reaction of Albert Veenstra, EZ's moderator of the project group, was that most members of the biomass community were not only interested in global sustainability, but also in Dutch economy. So, there was a dilemma – and therefore conflict of interest - between solving the problem of global warming and the problem of stimulating Dutch economic growth. Moreover, the investment in such a plant is enormous, and depends on long-term guarantees of fiscal encouragement of the use of biofuel. The three dissidents made in their article the point that this depends on actors who had not been involved: oil multinationals, international governments. They suggested it was EZ's responsibility to get the commitment of these actors for a joint framework for sustainable development. Someone in Klingon said later that this is not realistic for a small country like The Netherlands.

Nevertheless, the Project Group had to limit the number of transition paths, since that had been the request of the leader of EZ's Project Implementation Transitions Klaas Vries. It invited market coalitions to propose transition paths and related experiments that could be supported by EZ. It set up a jury of experts to evaluate all proposed transition paths on the basis of the vision. They chose seven transition paths to do experiments at market level, and four were consid-ered to be interesting only in the long term. At this point, the biomass commu-nity did not reach agreement, and the working group's proposals were contro-versial (see Table 14). This was partly corrected in EZ's decision; the synthesis report of April 2004.

| "the level playing field was critical" | The assumptions about a sustainable 'level playing field' were critical for many initiatives. People participating in the project group biomass knew this uncertainty, but the group did not formulate its own |

strategy of influencing the general debate about a sustainable level playing field for the energy market. They centered on a vision of what would be sustainable and theoretically possible in the long term ('30% biomass'), and technological pathways to that vision. The non-governmental participants implicitly assumed that EZ should be responsible for creating the level playing field necessary for sustainable development, whereas EZ perhaps had even less influence on fiscal policies than the energy sector. Albert Veenstra of EZ and moderator of the project group biomass indicated that the coalitions putting forward transition experiments would have to develop such strategies, but it was not generally expected that these scattered initiatives would actually be able to do that.

Round 3: Political continuation of the Energy Transition Process (ETP), and creating a more strategic context (2002 – 2005)

A fair number of transition coalitions had developed, thanks to this process – joint in 23 transition paths altogether in December 2003, of which ten in the 'main route' to develop biomass to replace oil and gas as raw material for products, materials and energy. These all fitted the vision shared by all identifiable stakeholders of sustainable energy, and were actively supported by industries and environmental movement. The question remains, to which extent these coalitions actually might become levers to a sustainable transition.

In 2004, there was still wide appreciation of the ETP, as was also shown through a report by the scientific VROM Council and Energy Council in December. The meetings EZ organized, as well as the transition teams, were still widely attended, despite some controversies and reservations. Insiders said that a learning process had happened that led to more focus in R&D and useful experiments. These reactions probably represent the understanding many policy makers in the loose networks around the ETP had for EZ's dilemmas, and their continued belief that the ETP was on the right track. Despite the negative debate in Parliament in summer 2004, the ETP as such was not politically threatened. Businesses and pressure groups were mostly cautiously positive about transition management. Civil servants from EZ, looking back on the debate in Parliament summer 2004, indicated in hindsight that it is apparently difficult to have constructive dialogues with parliament – with voters watching. Parliamentarians have difficulties being open for alternatives that are not in their party line, since that is too early for part of their audience. Some civil servants therefore speculated about other ways to communicate with Parliament. The 'transition managers' in EZ, as well as others in the loose networks, also realized that there was a need for a more strategic process to address the wider societal dilemmas related to the level playing field.

A level playing field was defined as a set of

| "the project group had a temporary assignment" |

economic conditions, created by the government, to correct market failure by giving a price to pollution. Other legislation and standards should not distort the market as well. However, many interpretations are possible, in particular because the level playing field should allow for international competition. Some level playing fields might be feasible in the short term, others in the long term because more governments would have to work together toward a common interpretation. The Project Groups, however, only had temporary assignments; that visible transition experiments should be set in motion by 2004. They did not have time, not the vision, to connect with sufficient influential actors to develop any outlook to a specific level playing field. They depended on market coalitions that would be willing to invest in 2004, under uncertain conditions of playing field. These coalitions would require government action to take away barriers and change the playing field. Coalitions investing in 2004 would have to assume that the playing field was difficult to influence – they needed to assess their investment against plausible independent scenarios for government action. The Project Group was therefore forced to limit to supporting initiatives that assume no drastic changes of playing field, which might foreclose theoretically better options for the longer term.

If more credible expectations could develop that a sustainable level playing field may be politically acceptable, more ambitious experiments, related to more complex transition, may have become possible. In this sense, the term 'management of expectations' was sometimes heard. Parliament would not create such expectations, and so it would have to be presented with different dilemmas in the first place. EZ had not been able to developed widely shared dilemmas on its own. These would have to be the result of a wider social learning process.

With such questions in mind, EZ undertook two actions. First, in 2003, EZ financially assisted a group of twelve influential organizations[1] in the energy world in developing a joint vision, making steps to 'resolving their dilemmas' as Hans Teljeur put it. They published the Manifest market and Environment: Toward an innovative climate for a sustainable energy supply in September 2003. However, Teljeur was disappointed. The group had not succeeded to frame their dilemmas in a way that was meaningful enough for political discussion. The manifest presented no new concrete perspective on cooperation; the choices

> "lead to agreement about the nature of social dilemmas"

between different level playing fields were still completely left open for 'the government' to decide about. The second initiative was to set-up an 'intervision group' for the energy transition, consisting of ex-ministers, industrials, academ-

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[1] Akzo Nobel Energy BV, Echte Energie, Essent, Federatie Nederlandse Vakbeweging, Gasunie Trade & Supply, Koninklijke Vereniging MKB Nederland, Rabobank, Shell Nederland BV, Triodos Bank NV, Milieudefensie (Friends of the Earth), Wereld Natuur Fonds (WWF), CE.

ics and influential NGOs[2], a delayed implementation of environment DG Karel Zijp's idea of a 'transition council'. It was formally installed in January 2004. Klaas Vries said around that time: 'these people can be the political ambassadors of the energy transition'. The intervision group was rather surprised at first that such a group would have to give advice about 23 small projects, whilst there clearly were major dilemmas related to the energy future. During the formal installation of the group, one of its members, Wim Hafkamp, already gave an advice – in public – to the minister: he should lead the process personally, together with his colleagues. In the course of 2005, EZ had learned from these initiatives, and decided to set-up new transition teams, and this time they were called platforms. The main lesson was, in the words of Klaas Vries, that 'the chairmen have to be really good'. He aimed at their qualities of systems thinking and of managing co-evolution by leading the dialogue to the social dilemmas that, as understood by enough parts, could lead to shifts in policies.

This new phase of the energy transition process had, according Hans Teljeur, a bright side: more credibility that a sustainable level playing field was within reach to facilitate breakthrough of more complex experiments. One the other hand, Teljeur also saw a dark side: in the eyes of the larger public, for example the environmentalists, the platforms and task force could be seen as the third restart of a process (after NMP4 and the project groups) that still had not delivered visible success.

Trust and foresight

The analysis makes clear that the transition discourse was widely supported, or at least it was not controversial enough to be politically threatened. Parliamentarians were not interested simply because their audience was not ready for 'complexity speak' like that. By applying the general rules of transition management, the coherence of thinking in the energy system seems to have increased. Hundreds of policy makers from all domains had worked together in different transition teams (called working groups) on partial steps toward sustainable transition paths, and the coherence of their knowledge has certainly increased. The teams were independent from EZ, and had a broad composition. Their visions and transition paths were widely shared. This was said to have resulted in more focused R&D policies for energy.

However, there was no identifiable group of policy makers, connected with many parts of the system and with coherent views, which could really explain why the 23 selected transition experiments might become levers for a large-scale sustainable transition. This probably explains the BioSynGas controversy. Theoretically a proven sustainable option, but there were no widely shared ideas

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2 Winnie Sorgdrager (fm Minister of Justice), Pieter Winsemius (fm Minister of Environment), Henk Dijkgraaf (president of Shell Netherlands), Sible Schöne (WWF), Herman Wijffels (chair of the Socio-Economic Council), Wim Hafkamp (professor environmental sciences), Felix Rottenberg (former chair of socio-democrat party PvdA), Gertjan Lankhorst (Director-General for Energy).

about its success conditions, and how EZ or anyone else could influence that. In 2004, EZ realized that it was not able to manage expectations about level playing field in the market by itself. It tried several options and finally chose to set up platforms that would have to manage a more strategic process.

The conclusion may be that trust in the ETP networks has been sufficient for less complex, and therefore less sensitive, breakthroughs. Only later in the process more foresight emerged in EZ that for more complex breakthroughs, tensions would have to be created that could make expectations of level playing field more credible. Coalitions for new experiments may then emerge on their own initiative.

The limiting factor in the ETP had therefore been the span of knowledge and influence of the loose networks that concentrated in EZ and in the transition teams (working groups). The process suffered from the same problem as the earlier sustainability research programs: they did not link enough to implementation power, because they were fixed on the short-term objective to do experiments.

5.4   Strategic inter-ministerial cooperation

Round 1: The Inter-ministerial Energy Transition Program (2001 – 2005)

Around 2001 the loose sustainability networks extended into Parliament and supported transition management, despite its elusive objectives and 30 years horizon. This was a break with traditions in Dutch environmental policies, where quantitative targets for a four-year period were customary. Supporting transition management was not politically attractive (it was only understood by the loose networks and not by the voters). Despite sharing the transition discourse in a general sense, it is questionable if Parliament has asked for progress reports with the aim of creating an adaptive tension for Cabinet. Progress reports may also have been a means to keep the illusion that measurable progress would be expected every year. Openness of individual Parliamentarians can be attributed to their personal experiences in the greenpolder model and their contacts with lobby groups. In particular, one Parliamentarian had been closely involved in the greenpolder process Extension of Rotterdam Port.

> "the environment movement played a linking role"

The environmental organization SNM played a linking role on the background. Transition management was difficult to explain to their supporters. A member of SNM's management said that the first time he had heard about transition management, he and his direct colleagues thought that this might create opportunities for them. Others in SNM thought that transition management was intended to delay urgent interventions. SNM organized meetings with Parliamentarians, and political parties, to clarify the discourse. Part of the urgency came from the idea that progress in normal environmental policies was slowing down. This is why members of the environmental movement on the one hand were critical about State Secretary Van Geel but supported transition manage-

ment. Likewise, other policy makers also used their influence behind the scenes, and they did that without explicit support from their voters, shareholders or members. The loose networks also extended into two VROM and Energy Advice Councils, which wrote encouraging advice about transition management, and so did the Socio-Economic Council SER (said to be the heart of the Dutch polder model) in August 2001. Its core recommendation was that transition policies should be separated from other policies in discussions in Parliament, to ensure that long term needs receive attention in their own right. Parliamentarians quoted the SER in their discussions.

Support in Parliament seemed to diminish after the elections of 2002, and in the debate about EZ's synthesis report about the ETP, spring 2004. Doubts were expressed also in informal meetings like in September 2003, when SNM had organized a closed discussion about transition management where three of the main parties were present. They showed a real interest in the discourse, but saw no way of linking it to their day-to-day work. Yet, the loose networks continued

> "doubts about competences"

to support the abstract discourse, whilst sometimes expressing doubts about how it was implemented. VROM and EZ regularly asked input from outside, like in November 2003, when it organized a 'round table' with State Secretary Pieter Van Geel and leaders of NGOs and industries[3], where the discourse was once again supported. It was said that still too many groups were not participating in a leadership role, which was said to form a risk. Another remark was that the government should change its culture: it is still too much focused on preventing mistakes rather than learning from them – a prerequisite of transition management. All this can be interpreted as a positive basic attitude, but doubts about the competences. There was pressure to show more, and trust not to break it down politically. As a Parliamentarian said: 'I am not interested in all these stories. I know what needs to be done for a sustainable breakthrough. Why don't they just make it happen.'

The five DGs deliberation was aware that the outside world asked for more coordination in government. DGs participated in open debates, and the group tried to be critical about the approach to the individual transitions, to 'take each other's measure' as the DG Energy said. The DG for environment indicated later that his aim of organizing regular meetings with the five DGs therefore had simply been to keep transition management on the agenda in the first place. There was some tension in the five DG group, as the environment and energy DGs were, according to reports, more ambitious than the others. However, their agenda was only at the meta-level; there were little discussions about sensitive concrete government interventions. Their civil servants offered no such inte-

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[3] Guido Van Woerkom, director of mobilists' union ANWB, Ad van den Biggelaar of SNM, Annemarie van der Rest of Shell, Edward Bosman of Siemens, Willem Ferwerda of IUCN and professor Jacqueline Cramer.

grated social dilemmas to them, and they did not ask for it. Policy-making process was still fragmented.

The tensions can be seen from the perspective of monitoring progress. VROM, eager to show their wider stakeholder groups that transition management was actually on its way to success, pushed EZ at occasions to show what they were doing. However, EZ reacted 'it can only be monitored when it becomes more concrete'. The ETP itself already made all available information public, and what happened behind closed doors to enhance public-private cooperation was too sensitive. All conduct in public was management of tensions, but others could not oversee its true nature or motive. On the other hand, VROM's impatience can be understood, since if the EZ platforms were to succeed within four years, the first visible market breakthrough would still occur eight years after NMP4.

This started to change slowly in 2004, when it became increasingly apparent that a bottleneck of transition management was the lack of credible cooperation in the government, and therefore the process was not attractive to private parties that might want to cooperate on real breakthroughs. They were worried that their proposals would not 'land' in the government or would be exposed prematurely by opportunistic and impatient civil servants or politicians. The debate in Parliament in spring 2004 made this failure clear. A crucial moment was a meeting of the five DGs in November 2004, where V&W's project leader of Energy in Motion and the chairman of the EZ platform sustainable motor fuels, reported about the EU conference Energy in Motion. The DGs expressed their wish to organize a second international conference and asked them to organize a joint platform – the platform automotives.

From interviews in that period it seems that the issue was only partly understood, but that there were some people, at the core of the process, who made the dilemmas clear for the DGs. For example, Klaas Vries had participated since 2001 in the Innovation Board Sustainable Development, which was part of the transition process to sustainable mobility organized by V&W. There, he had got to know and trust someone who later became chair of the automotives platform. One of the things he had learned, he said, was that 'you need more than excellent chairpersons'. Mid 2004, Vries still said, 'the level playing field is not the most difficult part of transitions: first you need to collect initiatives in a logical way, aiming at a system change rather than just promising technology, which is a major change in the way we support the energy system.' In 2005, collecting initiatives had succeeded, and focus could be given to the next weakest link: the level playing field. In May 2005, the DGs accepted the idea to set up an interministerial program for the EZ platforms.

The fact that the DGs accepted the idea to establish an IPE illustrates that enough trust had developed between the DGs and between the DGs and the involved civil servants, to take a step of which the consequences were difficult to oversee. However, the IPE was seen as a step toward more coordination and therefore credibility, and the six ministers signed the agreement and provided budget. Visible success was now defined not only as concrete transition experi-

ments, but also as large influential conferences, and perhaps also as growth of the loose sustainability networks, which could see at these conferences how transition management succeeded in creating more consensus about what the right questions and social dilemmas are (like the option to develop sustainable automotives had become widely supported at Energy in Motion). In that way, loose networks would generate invisible political support, like it had done when it approved NMP4.

By approving the IPE, the DGs and the ministers built an adaptive tension for the DGs to show results – the IPE may be more politically sensitive than the four individual transition processes. It depended on trust that steps made in the dialogue between the ministries and the private sector would be reliable, and Cabinet would be consistent in its behavior in these dialogues. It was precisely this adaptive tension that made the process more attractive for private organizations, which had their own, internal tensions, and would have to engage in coopetition. That also created uncertainties. Tulp put it like this in 2004: 'Governments getting together with industries in this way are taking a risk. You have to find a joint problem definition and the process needs to become more formal and more in public. It is difficult to make a decision about this. Parties need to take a vulnerable position since whatever comes out of the process is not completely without engagement. There is also a risk that results cannot be implemented, which politically can be seen as failure.' The fact remained that the process between industries requires a delicate, gradual build-up of trust, which takes time and needs to be done behind closed doors. And finally, there are limits to what can be done in The Netherlands alone. An insider said: 'our platforms are often misunderstood in other European countries. It has the appearance of cartel formation. Therefore it may not be easy to develop European agreement about transition proposals'.

> "it depended on trust that Cabinet would be consistent"

Round 2: The platforms under the Inter-ministerial Program Directorate Energy Transition (IPE) (2004 - 2005)

Despite positive intensions of several CEOs at Energy in Motion, their process had to cope with unforeseeable complexities and vested interests. Where the EU and the European car industries would be willing to invest in cleaning up diesel engines through soot filters, a measure needing 10 years to become fully effective, the US and Japan, where health is claimed to be a bigger political issue, try to jump directly to systems based on gas and hybrid systems. On the looks and feel of this divergence, the European car industry seemed to be less prepared for a substantially more demanding but more sustainable breakthrough.

It was not difficult to make a quick start with the automotives platform. The networks of the ETP and the IB, as well as new members that had showed their interest at the EU conference, were easily mobilized. The chair developed a joint problem description, and organized separate strategy groups behind closed doors, one with the automobile

> "the chair played with openness and closedness"

industry and one with the oil industry. He played with openness and closedness of the process by sharing problem descriptions in the larger group, which could serve as adaptive tensions for the competitors to discuss scenarios of coopetition. When agreement would be reached, the larger group would make the next step. If the coopetitive scenarios would require government interventions, the government would be invited for dialogue. Progress on all sides had to be coherent and would depend on the weakest link. Since a deal could only be made after agreement about the whole package would reached expectations should be explicitly managed. The risk that a different political context may emerge after elections made the government unreliable by nature and legitimacy perhaps the weakest spot. And, finally, the deal would depend on the joint competency and willingness to play this game, since it would be sensitive for premature exposure. The chair was aware of these needs and risks, and was confident that it could be done.

Arthur Groen of oil multinational Klingon had higher expectations than before, because the discussion about a level playing field now had a strategic client, since the joint ministries asked specifically for their advice about what the government should do. He said 'The explicit task of the platforms is to give the government advice about regulations. Preparing legislation takes years and procedures therefore need to be started up years before the urgency is really felt'. Perhaps this makes the paradox clear of this process: politicians should be willing to support processes years before the urgency is really felt, and they can only be rewarded for that in their informal networks.

In some degree, the negotiators of organizations in the platform were better embedded in their own organizations and had a clear mandate. They were now closely linked to their highest management. Klingon, for example, had assigned Arthur Groen as coordinator for energy transition policies.

Trust and foresight

Trust and foresight have grown from two directions. From the top down, the five DGs developed personal relationships, and started to trust each other. It took the EU conference for them to realize that the government, their civil servants, were capable of organizing events like that and to use these to create more societal alignment about action scenarios (in this case about sustainable automotives), i.e. about social dilemmas. However, the core of the loose networks, including these civil servants, understood that such kind of cooperation would remain an exception if there would be no structural context for it. Some of them suggested the IPE, and the DGs accepted. There was confidence that the loose networks would stretch far enough to continue the process if well managed. There were more insights now about that management. Management of openness and closedness, with an eye on development of trust for new interventions, was key. The ultimate bottleneck in these processes was legitimacy; that is political approval of market interventions by Cabinet. The closest insiders believed that as their process would gain momentum, politics would follow, thereby reducing this bottleneck. In other words, they had more trust in the external power context.

This was among others based on the implicit idea that the adaptive tension between sustainable development and economic growth would continue, whatever the outcome of the next elections.

6   Change managers

… the biggest fools are those who ware cuffs of cobweb and think they are powerless
(Hella Haasse)

It is truly remarkable how a few powerful individuals affect the lives of everybody else. We
sometimes associate power with negative effects, but these individuals actively keep the
peace, and in doing so strengthen the social fabric (Frans de Waal about pigtailed macaques)

In this chapter I analyze the role of individual behavior in adaptive networks. Change managers, by definition, take initiatives for change of power networks. To reduce risk for CEOs and political leaders, they first build some momentum behind the scenes; that is, they start adaptive networks. Yet there is a risk because it is unknown how the larger social system will react. There is investment of time in building the adaptive network, in particular if the change manager wants to contribute to the solving of complex problems like sustainable development. One question is with what kind of reward this risk and that investment is compensated. It is not possible to reconstruct all connecting interactions behind the scenes in the transition discourse, and it is clear that at times connecting interactions must have occurred in many places, with many individuals taking localized initiatives, pushing the process a bit further in what they considered a positive spiral, and thereby being a change manager. I don't aim at a comprehensive overview of all change managers, but focus on ones who many recognized as influential.

6.1   Development of major sustainable policy papers

The success of transition management in NMP4 has depended on the initiative of civil servants in VROM and EZ who had an intuitive idea of the limits in the approach to sustainable development and who trusted each other to seriously seek a new approach, and to implement that later on. VROM and EZ had developed close relationships earlier in sustainable energy policies. Two key players in the NMP4 team were Jan Kort, VROM's project leader, and Hans Teljeur, energy strategist in EZ. They used the opportunity of NMP4 to seek new approaches with their networks, and Jan Kort

> "Teljeur and Kort invested in the relationship"

did the interview series in the energy and sector. As the ideas of transition management resulted and the team could show there was support, EZ principals realized there was an opportunity. However, it would never had developed without the initiative of individuals that broke with the tradition of making policy paper that was harmless for other sectors. Transition management had become a joint approach. It was only possible because Kort and Teljeur invested in their relationship. Kort was willing to take this up in NMP4, as they both saw an opportunity for a debate about the role of the government. Kort had to convince the minister, and Teljeur had to convince his principals. An open debate about EZ's role was not normally done, but EZ principals were open to suggestions from the energy sector (which they saw as their clients). When NMP4 was almost ready and EZ's management had accepted the idea of becoming 'transition manager', the minister saw it as an opportunity to show Parliament that she wanted to address sustainable development, which gave her political appreciation. An EZ principal indicated to me that transition management had been a good proposition that answered to a need in EZ's 'market', and that it resulted from civil servants who had seen this opportunity and found a match with VROM. In VROM, many people were cautious about allowing non-environmental ministries to implement transition management, but Kort was willing to defend that. People like Kort and Teljeur were in my view driven by enthusiasm for sustainable development and were struggling with a practical approach. They found others in their network, who followed. They also found enthusiastic people in other ministries, but at first not in higher management.

Next to the necessary administrative handwork and gathering of support, many interviewees mentioned the importance of creative ideas that were offered by scientists, in particular prof. Jan Rotmans was mentioned several times. His analysis based on recent thinking in evolutionary economics, and introducing the term transition management to this process, appealed to the civil servants. This thinking was shared in a series of meetings and by preparing a report about a possible transition of the energy system (Rotmans et al. 2001). It matched the gut feeling of many that such a transition approach could work, and Rotmans helped the civil servants to find their own words for explaining transition management, to influence the political stakeholders and decision-makers. Despite the fact that the term 'transition management' did not appear in the NMP4 at the request of the minister, it became widely used and gave the discourse its name.

6.2 *Think tanks about sustainable mobility*

The Innovation Board Sustainable Mobility (IB) was an initiative of the transport ministry V&W under environmental policy. This legitimized civil servants to spend a little time in it. Other than that, it completely depended on personal initiatives. All members participated from the beginning because they believed in it personally. Many have never been rewarded in a material sense. In the NMP4 team, the V&W representative and his superior became personally enthusiastic for these ideas and, because they too were part of the adaptive networks of people frustrated with the greenpolder model and sustainability research, it

was not difficult for them to get a core group quickly together that later became the IB. The Director-General for transport had played a key role when he declared his support at a beech event with a large audience, but his commitment was limited.

To the surprise and enthusiasm of several IB members, deputy DG Jeroen Tulp of V&W joined. Tulp later declared in an interview that

> "Tulp wanted to connect to the private sector in a non-formal setting"

his objective had been to develop ways of interaction between the public and private sector. He used the IB to discuss that in a non-formal setting that otherwise would have been impossible. He was rewarded when the EU Conference Energy in Motion was such a big success in 2004. His contribution to the IB was the linkage to implementation power – having a shared foresight, a strategy to close in on power was for him a condition for participation. It was not a social club. When the EU conference had been prepared he saw little further use for the IB, and it was in a small temporary crisis. By investing so much time in the IB, Tulp had taken the risk that this time would be wasted. Yet, he was prepared to use his influence to communicate some of the lessons he had learned in the IB, as other IB members perceived. He had become an innovative force in the automotives debate. The enthusiasm of Tulp, and the line of reasoning of the IB, continued in the project leader for the preparations of the EU conference. She was carefully selected. Several times, she was invited to the IB to tell about progress. Several IB members indicated that she (and others) were rewarded in a different way – for showing initiative along the lines of transition management.

The IB depended on personal initiative from others. EZ's Klaas Vries, project leader of ETP, was member of the IB from its beginning, which was a significant time investment. This link was crucial to obtain the link between the IB and the ETP in 2005, when the IPE emerged. The mobilists' union ANWB millions had of members and was experienced in lobbying about infrastructure and (against) policies like road pricing. It had built-up considerable experience in the greenpolder model, and there were many personal relations with the other NGOs involved in transition management. ANWB representatives were active in the IB, and they were prepared to discuss dilemmas and options that were not in line with their formal positions, for example what they had written in the commen-

> "I tried to be a role model of systems thinking"

taries in its magazine. They were looking for ways of bringing up these issues without losing the trust of their supporters. With this state of mind ANWB played an active role in the development of the EU conference energy in motion, activating their counterpart organizations in other EU countries, and contributing to preparatory dialogues along the line of the IB's visions (the environmental group SNM did the same with its counterparts). The ANWB's director was on the background involved and committed to this process.

The person from environmental lobby group SNM had used ideas from the IB in communications with his supporters. Slowly he found arguments that cars may not be so bad forever. In 2005, SNM produced a report termed 'The car of

the future', which showed the result of that learning process. It had become acceptable in the environmental movement to speak about a future with any kind of car. SNM also published a page wide ad in a national newspaper, together with an automobile industry (also in the IB), to support sustainable automotives. These were the personal initiatives of individuals in SNM who connected the SNM core with the mobility system. Members of energy companies, oil multinationals, auto multinationals and consultants also played an active connecting role in the IB. Most notably representatives of oil multinational Klingon and automobile industry Takey were prepared to search with other IB members for scenarios they could explain in their own organization, and helped each other to look for conditions. One consultant helped the IB with systems thinking. In interviews he explained what he did in terms of complexity theory, and indicated that he tried to convey this type of reasoning to the group without imposing it ('present chocolate and hope they will like it'). He said, for example, that he tried to make the social subsystem of automotives meta-stable, creating a context where CEOs who had advocated their own role in sustainable development would be attracted to a change dialogue, for their own credibility. This consultant also had intervened in the IB's process behind the scenes, when key persons with links to power became less enthusiastic. He always tried to make a case for continuation, by stimulating to thinking in 'what if' scenarios. He helped others see opportunities. His skills were appreciated and he became chair of the automotives platform.

As the EU conference was prepared, IB members could motivate their CEOs and ministers to commit with statements that went one step further than they otherwise would have done. Trust in the IB enabled this, which made CEOs believe that they could make that statement without much risk, and it was thanks to willingness of the CEOs to invest in sustainable development. They did not expect quick reward by shareholders. As management recognized the process of change management became more as an activity that had a value in itself, change managers were rewarded by officially getting time for making connections and participating in dialogues behind the scenes. This happened in Klingon, Takey and other firms, and of course it also happened in the government with the IPE. The highest management gave this recognition because they saw the value in the long term, but their shareholders or voters did not directly reward CEOs and ministers. In that sense, transition management still depended completely on personal initiative.

6.3   Think tanks about sustainable energy

Klaas Vries who became director of EZ's transition program made the ETP politically acceptable by focusing on transition experiments, whilst holding on to the transition discourse of 'reversed

> "EZ put energy in keeping connections"

evolutionary thinking'. The Secretary General and later EZ's Minister Brinkhorst and Director General Boer enabled the ETP, without interfering. Vries was enthusiastic because he really had come to believe the transition discourse, and

he could relate it to his earlier experiences in making deals with the energy sector about sustainable development. Vries and his colleagues created enthusiasm in the larger energy community to start the transition teams, among others by organizing events. They managed the relationship with policy makers in NGOs and academics who at a certain point did not agree with the outcomes. There was a tension between the desired progress in terms of experiments and the complexity of the transition that these experiments could address. EZ put a lot of energy in keeping connections, not breaking them in total disappointment, but looking for new opportunities.

That enthusiasm also showed when Teljeur gave an assignment to a bureau to facilitate a dialogue in the energy system about dilemmas in the level playing field, or his project policy innovation, exclusively aimed at the learning process in EZ. Vries sought support for these choices through a high-level intervision group, with (ex) politicians and CEOs. High management in EZ still trusted that Vries and others were making steps in the direction of a more shared rationality. The energy community still largely supported the process as such, as EZ found out through the meetings it organized. Although it hadn't really led to short term choices about playing field, it did have impacts on short-term choices about subsidies for research. As regards playing field, EZ in 2004 started to think about the power network required for further steps.

Energy Minister Brinkhorst had key contributions when he approved the budget of 35 million euro, through his general communications and defending the ETP before Parliament. He also was supported by a wider discourse that the government had lost its credibility and would have to be less fragmented and more flexible (the 'Program Different Government', led by another minister from the same party). In the eyes of many, traditional politics was under pressure to become more transparent, more participative and more effective. In many eyes, the government was too bureaucratic and too slow to adapt to changing circumstances in society. After NMP4 had been approved, Teljeur did the study 'policy innovation' about EZ's role, and the report that wrapped up the results was not approved for publication by EZ's management. It was considered politically dangerous. In 2004, it became clear that EZ was managing the dialogue in society, but not in the government. In the light of these discussions, in particular the fragmentation of the government, Vries initiated the intervision group that later became task force.

"relative outsiders were skeptical"

Though transition management was an initiative at work floor level at first, some EZ principals soon embraced it and later also the minister did that. This gave civil servants room to implement the ETP. However, the larger part of EZ never had really understood the concept, and neither had Parliament. It was kept in the air by a chain of 'believers' who felt the pressure of developing new added value and using it as an opportunity. The ETP, of course, also depended on contributions of many enthusiastic policy makers and innovators who tried to get their ideas implemented. For many of these, their participation was unpaid and had to occur in their own time. An employee of a small enterprise in sus-

tainable energy, a relative outsider participating in one of the conferences, was skeptical: 'What is EZ expecting? Sustainable energy will always depend on subsidies.' This person was clearly not willing to invest, since EZ was only promising limited subsidies. The promised 35 million was nothing more than partial seed money.

6.4   Inter-ministerial cooperation

The transition discourse had started under an adaptive tension in Parliament, which was created in loose networks. Initially, Cabinet only followed in that process. However, after elections, support or at least understanding seemed to decline in Parliament. On the other hand, Van Geel and later Brinkhorst took up the role of enabler. There was hardly any political reward, other than perhaps created by the discourses about 'different government' that lived especially in Brinkhorst's party. Support also still came from individuals in the environment movement who used their influence on Parliamentarians. Mid 2001, Director General Karel Zijp arrived in VROM. He picked transition management up enthusiastically and pragmatically, in the first place by keeping it on the table by actively facilitating the five DG deliberation. Such a regular development-oriented deliberation was uncustomary, and it would have been easy to neglect it. In that group it was difficult to have a debate or a decision about the coopera-tion process. VROM had agreed that other ministries would lead the transition management process, and Zijp had no intentions of putting pressures on the other DGs to take risks they did not want to take. The annual progress reports were mainly produced by the four separate ministries, and tied-up by VROM before submission to Parliament. The preparation of the progress report was mainly a process of political risk reduction by keeping the text unspecific.

> "an active role of DGs was essential"

An active role of the DGs was essential, since in their departments the chain of believers was thin, especially in V&W. There was more reward for contribut-ing to politically sensitive files than to long-term dialogues. In 2005, unexpect-edly perhaps, the DGs became aware that some of their civil servants had learned to work together and would be able to make joint proposals to the DGs that could offer opportunities to adapt the processes aimed at the short-term. Zijp and the DG of EZ asked support of their state secretary and minister, and initiated the Inter-ministerial Program. They had confidence that this would not be an extra wheel in Cabinet, but manage connections between ministries by managing platforms of forerunners. However, outside the inner circle, few peo-ple were aware of the possible significance of this initiative, whilst they ran the risk of complete failure. The inner circle consisted of a limited number of civil servants in EZ, VROM and V&W. However, consultants, one from the IB and one who had given strategic advice in the ETP, have also significantly contrib-uted to their enthusiasm; they at a point confronted the DGs with the fact that they hardly had any proactive role in transition management, and that this was what the private sector expected them to do. They sketched the perspective of a

joint undertaking in the form of an IPE. It seemed impossible for any of the DGs to make this intervention. It would be difficult to take shared initiatives if one of the DGs would take the initiative and other then would have to follow. The consultants, as independent moderators, could create adaptive tension for them by confronting them with the tension between their words (transition management) and their conduct (not using any pressure to make their civil servants align better).

The IPE formed an opportunity as context of platforms that may bridge the gap public private, but the DGs were aware that success depended on adaptive networks in the government itself. The IPE should also form a context for that. Setting up the IPE was therefore an act of trust in the competencies and personal initiatives of at least a considerable part of civil servants. That was a risk the DGs were willing to take. Also, the dominant culture of setting measurable targets remained, but adaptive networks are difficult to monitor since the issues are by definition volatile and as implications for running policies become clear, sensitive. At the end of 2005, the leaders of the Directorate were wrestling with the question how to monitor progress, and to that end how to formulate the assignments of platform chairs.

"the DGs trusted in the connecting competencies of their civil servants"

6.5   *Enthusiasm, uncertainty and reward*

In the transition discourse, dozens of people have participated in loose networks that supported it without often being able to explain the idea even to direct colleagues. It is a personal disposition that has been triggered by the participation in the greenpolder model and sustainable development research programs. The emergence of such loose networks probably also has been a latent possibility in the general 'polder' culture of The Netherlands. The irony of the situation was that sustainable development was imaginable but due to lock-in the resistance seemed unsurpassable. These policy makers dealt with this situation by looking for constructive, development-oriented propositions. They had a real concern for sustainable development, as they were easily mobilized for the think tanks IB (for mobility) and ETP (for energy), or to support the transition discourse. As interviews show, all participants had skills of systems thinking, which formed the basis of the cooperation. Different roles, often combined by one individual, can be observed in the adaptive networks:

- *Enablers* could connect ideas with power, had the capacity to enable others to interact behind the scenes, and to intervene in power networks when others were skeptical;
- *Initiators* inspired others to focus on complex, long-term options;
- *Networkers* formed the particle around which a crystal was formed, because they could mobilize individuals from throughout the composed subsystem with the appropriate attitude for networks with adaptive capacities;
- *Moderators* (or connectors) helped others to perceive joint opportunities and to develop trust and foresight; they helped separating the adaptive inter-

actions from visible power actions (playing with openness to visibly manage tensions and closedness to create internal trust);
- *Systems thinkers* could inspire into joint visioning, making new combinations and identifying possible joint action;
- *Letting goers* passed over their idea to others and did not mind they would profit less from the eventual success. (With major example: non-environmental ministries implemented the environmental policy paper.)
- *Experts* contributed by showing possible developments at market level, as well as the impacts of these developments.

Most participants actually may have been driven by intuitions rather than explicit system analyses and foresight. However, a limited number of people played key roles in the management of tensions in a localized way; these were exceptionally skilled in moderation and systems thinking, and appeared not to be interested in widely visible personal success.

In the government and in larger corporations and NGOs, civil servants sometimes have time to 'develop a hobby'. In the transition discourse, several hobbyists actually created impact in power networks. This was not only a result of enthusiasm, but also of competence. The number of the more competent policy makers spending some of their time in hobbies may be increasing. Jeroen Tulp is perhaps the clearest example, since he was one of the most influential civil servants in the mobility sector and felt the tension between the need to bridge the gap public – private, whilst not being able to do that in his 'power' role. He was prepared to 'double think' for at least a year in the IB, until the EU conference made the short term and the long term coincide. His behavior, and that of others, could also have been contagious to other civil servants who saw them operating. Some said it was a conscious strategy to try to serve as role model. Policy makers who had been involved in the IB and the automotives platform, seem to have tried to transfer the competencies of adaptive interaction to other platforms.

Several organizations engaged in the platforms have assigned persons who participated in several related platforms as a kind of 'proactive diplomats'. As someone said, 'the IB members have been looking for wind in their sails, and they have gotten good at it'. Their management has recognized their skills and added value after the success of the IB. The transition discourse is actively applied to create an understanding and trust in these relationships. It seems that the language of transitions has become alive and creates a measure for rewarding change management in adaptive networks. On the other hand, this competence still seems to be personal.

It seems important that these change managers be embedded in loose networks that understand their transition language. The loose networks surfaced regularly in several events where prominent Dutch policy makers and (ex) politicians made a case for transition thinking. Other examples were dozens of publications in ArenA, the magazine of the Netherlands Association of Environmental Professionals. In the academic world there was increasing attention for transition management, with significant support of the government. Governmen-

tal knowledge organizations gave support to all interested in transition management (www.transitiemanagement.nl). The Environment and Nature Planning Bureau (www.mnp.nl), an independent think tank responsible for producing sustainability outlooks, took up the progress monitoring of transition management. It is difficult to imagine that all these efforts are not rooted in strong and lasting loose networks, and that they will not actually create better understanding of sustainable change management.

7 Sustainable change management

You must become the change you seek in the world (Mahatma Gandhi)

The chicken and the egg are products of co-evolution (this book)

This book starts with a breakthrough in thinking about sustainable mobility and I asked the question if such breakthroughs could be managed. Based on complexity theories, I redefined such management as conduct that helps a societal system become more adaptable to changing circumstances like depletion of resources. This is therefore sustainable change management. From my study of the transition discourse I draw the three following main conclusions, which I think are useful for sustainable change managers.

Adaptive networks as living organisms: complexity theory offers understanding of social change

First, because sustainable development is a wicked, complex problem, it helps to analyze such a situation from the perspective of complexity theories. This offers an analysis method that helps understand how the transition discourse has emerged and developed in connection with the sustainable development discourse. The conceptual distinction between power networks and adaptive networks helps to understand the conduct of policy makers, and how at times they self-organized into power-free groups I termed adaptive networks, which either were temporary and mixed with power networks, or separated and lasting longer with an increased success rate that gave them their own energy source comparable with a living organism. Complexity theory helps to describe power networks in terms of adaptive tensions that attract emerging adaptive networks, which facilitate a co-evolution of ideas, first in the adaptive network itself and then in the power networks. This co-evolution leads to new adaptive tensions and the cycle repeats, one step closer to sustainable development. The ideas and ways of an adaptive network reproduce and adapt to evolving adaptive tensions, like an organism. Action in the whole social system becomes more aligned and geared toward dealing with the common problems on the long term. The fact that adaptive networks develop complex ideas that cannot be generated in power networks may suggest that they know better, but that may not be always the case. Adaptive networks are power free and only can make proposals that may com-

pete with those of other adaptive networks, and power networks select, like always. Power networks, e.g. the primacy of politics over civil servants and societal platforms, therefore remain fully intact, but they are better informed. Adaptive networks can only survive if power networks are open for the inspiration they offer.

The organism's metabolism: under complex conditions individual behavior creates more 'fitness' than collective behavior in hierarchies (the idea of forerunners)

The second main lesson is that these adaptive networks depended on policy makers who were prepared to make the link between the short term and the long term by investing personally in making social and conceptual connections with policy makers in other parts. They found their personal motivation in the tension between current unsustainable practices and the desire for a sustainable development in the societal system they were concerned with. This capacity may be defined as double think, which for example may allow a CEO to act in an adaptive network, developing ideas that undermine his formal corporate policies, and which may not be understood (yet) by most other policy makers in his corporation who do not share his (capacity of) double think. Outsiders asking for sustainable development, seeing only the visible actions may then remain critical about that CEO. Even if power networks accept a breakthrough proposal, the CEO will hardly be rewarded, since his contribution occurred behind the scenes. What makes it even more unlikely is that solutions for complex problems like sustainable development are difficult to find, and take long series of interventions in power networks, creating a much wider social learning process in waves, before an adaptive tension emerges that is open for visible market interventions. A major obstacle is the cultural gap between public and private sector, and leaders on both sides may have to invest for a long time before it culminates in a context that enables a non-fragmented dialogue across that gap.

All this was in the mind of public and private leaders involved in transition management, and their right hands, since they had developed such competencies to some extent, individually and collectively. This enabled knowledge to flow more between parts. Each time a power network accepted a proposal, which could be the communication in public of a new problem definition, the social system was one step further in its thinking about sustainable development. Key to this success was that participants were driven by the common interest and not by individual material reward. One adaptive network, the Innovation Board Sustainable Mobility (IB), perfected these skills and made them explicit. They found success in developing new problem definitions in power networks, which created adaptive tensions for further steps. Because this process did not yet lead to visible market changes, the paradox emerged that they were successful in their own eyes but not in the eyes of the outside world.

The idea that adaptive interactions must be power free, and therefore depend on individual willingness to manage sustainable change, is therefore key. Before adaptive networks can offer their complex ideas to power networks, there is no way to give their efforts legitimacy or resources. It is fundamentally unknowable

if they are going to develop useful ideas, the ideas are too sensitive to be widely understood since they require double think, and creating expectations of results by allocating resources already disturbs the required closedness. Just the fact that they are adaptive networks does not create legitimacy in the eyes of outsiders, which is why they depend on their own rationality.

Finally, sustainable change management can be done at different levels of complexity. Adaptive behavior can help to create relatively small changes in R&D policies or investments in sustainable products. Such initiatives may be successful even without major government market interventions, but they may still require adaptive behavior to develop more sustainable products that may not have developed without concern for sustainable development. At the same time, these successes may not lead to a chain of events that creates a sustainable transition. Sustainable transitions may actually depend on breakthroughs in thinking about government policies to facilitate market changes, and there a different kind of sustainable change management is needed. It is this second kind of sustainable change management that has mainly been addressed in this book, but both depend on personal initiative, and an orientation towards change.

The understanding of linkages between scales can make change management more credible

A third main lesson was that complex change processes can be better understood if they are studied at different related time scales. On a time scale of decades, I have observed that in several waves (successions of large scale adaptive tensions) loose networks of individuals emerged who had the basic competence to develop trust across societal domains and to roughly develop a common way of thinking about acting for sustainable development. These people had a shared history of unsatisfactory experiences, which made them tend to apply systems thinking and postpone their judgment in dialogues based on mutual respect of the person and his ideas. This was a process of cultural evolution. On a time scale of months, however, people from these networks could self-organize into adaptive networks that connected several societal domains. These then would develop a working method that, if they were successful in their self-defined terms, subsequently evolved on a time scale of years. Self-organization was induced by opportunities like the 4th National Environmental Policy (NMP4), and evolution was induced by the capacity of adaptive networks to 'jump' from one such opportunity to another, under different names and compositions, adapting to the changing power environment of the adaptive networks – i.e. the large scale evolution and the sudden political opportunities of adaptive tensions in power networks.

By singling out the goal-seeking component of governance, as was the intention of my book, it looks like society as a whole has become more connected and adaptive. The focus on the IB, an adaptive network that was successful in self-defined terms, suggests that this is a trend. However, that may not be the case and their influence may be local and temporary. However, these networks depended on people who were personally willing to engage in sustainable

change management, and who could develop the capacity of double think in adaptive networks. These groups have grown in the past ten years in the mobility and energy systems, but they may still be small compared to groups who focus on the accounting component of governance.

Further elaboration of my arguments

The three conclusions above are based on my empirical research, but they need more explanation. I give that explanation hereafter. Since I write about concepts from complexity theory to explain what I see, I first summarize the theoretical thinking behind these terms again, and find illustrative examples from the empirical cases. Then I explain my conclusions with a focus on the IB, where adaptive interactions were the clearest and that comes closest to a temporary manifestation of a living organism. Then, I describe the metabolism of that organism, applying trust and personal motivation as main factors. Finally, I identify issues that need the attention of sustainable change managers.

7.1 Adaptive networks as living organisms

Adaptive networks attracted by power networks

On several occasions, networks have emerged with the explicit objective of learning. Because they enabled co-evolution to some extent they can at least partly be seen as adaptive networks. The first case I have analyzed is the NMP4-team. It was established as a power network, because initially management of different non-environmental ministries did not have the intention to do more than prevent harm for their ongoing policies. However, the NMP4 team took it as an opportunity to develop a new discourse about governance of sustainable development; it was termed transition management. The second adaptive network was the Innovation Board Sustainable Mobility (IB). The IB was established as an initiative of V&W, the ministry for transport, as follow-up of the NMP4. However, it did not receive any budget and was not mentioned in V&W's work programs, because the participants believed that such would bring power interactions into the IB. The IB had strong influence on an EU conference about automotives. The third adaptive network was the Energy Transition Program (ETP). It was kept power-free to some extent, but the energy ministry EZ attracted participants with the promise of subsidies on the condition that they did market experiments within two years. The ETP therefore was not credible to the power networks that might have been able to decide about level playing field for a sustainable energy market. Attracted by the need to annually report progress to Parliament, high-level cooperation in the ministries emerged as a power network (the five DG deliberation, and interactions between ministers). However, they said they intended to learn from the processes initiated by each individual ministry, and be critical about each other. Their role in co-evolution was on the one hand passive, until after the EU conference energy in motion they and their min-

isters approved the establishment of an Inter-ministerial Transition Program Directorate with the explicit and exclusive aim to facilitate co-evolution.

Only the IB was completely power free, all the other adaptive networks were in some degree mixed with power networks. Or, within power networks substructures have emerged that may have had a changing composition, but interacted to achieve co-evolution of ideas that was not based on previous formal objectives. I will return later on to separation of power interactions and adaptive interactions, and to co-evolution. First I ask how these adaptive networks could emerge.

Self-organization

Self-organization is, like the synonyms 'social systems' and 'social networks', a term from complexity theories. It is applied to the process where spontaneous interaction patterns emerge in a social system as result of changing conditions. The interactions can only emerge if the agents in the network are capable, and somehow willing, to show that behavior. They don't quickly learn that behavior – it was already an option to them. In the case of adaptive networks, that behavior is by definition power free: it is not driven by predefined measures of success, so there must be another motivation. In the cases above, such a quick change of interaction patterns after a change of conditions could nonetheless be observed on several occasions.

In 2001, when NMP4 was under preparation, many people shared similar frustrations and hopes. They also *knew* that about each other, as they had had interactions in the Greenpolder Model and the sustainability research programs. They shared disappointments and general ideas. They also knew that others would be prepared to join in action that would help take away the previous barriers to sustainable change. This, and trust in a power context that would support new ideas for sustainable development, formed fertile ground for the transition discourse. NMP4 attracted people from many domains, like the environment movement and the energy sector, who together formulated and supported the transition discourse, which was then accepted by Cabinet and Parliament. The loose networks of people who shared the sustainable development discourse, who were everywhere, quickly self-organized at the occasion of the NMP4, to develop and support the transition discourse.

These loose networks stayed important in the following years, when the NMP4 was implemented. The acceptance of transition management by Parliament, created an opportunity for Cabinet to show implementation power. The next Cabinets (as of 2002) contained at least two persons who enabled continuation despite eroding support in Parliament. They supported the transition discourse actively at many public occasions and one of them, the energy ministry, made extra resources available. They did that immediately after their appointment in Cabinet, which rules out that they quickly learned what others had to learn in years. They were already sensitive to the transition discourse, which is why their participation in the adaptive networks may be seen as self-organization. The same is true for the Director General for Environment Zijp.

However, the clearest case of self-organization was the establishment of the IB in just a few months. About 20 persons came together with roughly the same idea; to link their knowledge to power. Many of these people actually shared similar experiences or actually knew each other. As V&W initiated a group to 'manage a transition to sustainable mobility', it was easy to find this group from all relevant domains and sectors. The IB subsequently functioned within a year as a kind of hyperlink in the Dutch and European mobility system, feeding its components with knowledge about other components. They proposed stepwise innovative communications in power networks, and used the feedback for a next step. They focused on automotives, but also functioned as a kind of turning table for Chinese banquets, where each IB member could present latest trends in his system component as a dish to the others, and each other IB member could pick a dish that was to the taste in his world, matching it to trends in his own component.

Other cases of self-organization in adaptive networks were probably the people who were first attracted to the EU conference on automotives. These people believed in the questions asked at the conference, and wanted to support that. As people were attracted from several domains, other people might have been attracted to defend their vested interests, and that would have created power interactions. At the conference, there was wide support for the ideas that the European car industry, itself present at the conference, was lagging with respect to sustainable development.

The next self-organization may have been the attraction of participants to the automotives platform. A number of participants had already acted in the IB, but in this context new participants joined as well. Some of them probably quickly showed adaptive behavior.

Autopoiesis

The loose sustainability networks at occasions coagulated (i.e. self-organized) to active adaptive networks that somehow were connected through ideas and persons. My hypothesis is that this structure has come alive. A structure is alive, that is, it shows autopoiesis, if it reproduces itself, dissipating some form of energy. In this process, agents should be replaced with new agents and the relative frequency of fitter agents should be favored through a selection mechanism. The term agent is easily interpreted as a person, but it could also be the ideas that lead the conduct of persons. As a person learns, he builds up his view of the world over and over again, together with others. In this process the ideas in his brain may be replaced with (or dominated by) 'fitter' ideas. The ideas, developing in interaction with ideas in other people's brains, and expressed through people's conduct, are then the co-evolving agents. This is the view of memetics. In the case of the loose networks under transition management, the ideas about the operation of the network evolved – i.e. ideas developing ideas by means of co-evolution (meta-ideas).

The clearest example is, again, the IB. The IB consciously developed a common vision about sustainable mobility, which gave direction to all its ac-

tions. It consciously tried to improve the vision in several rounds, and detailed it out by focusing on 'transition paths', where the IB could have some influence on power networks. It consciously worked toward that influence. Its ideas about these transitions paths were gradually adjusted (ideas), and the collective working method itself was also improved (meta-ideas). The working method consisted of what might be termed a Chinese turning table, a scanning of latest political developments in all parts of the mobility system with the aim of identifying opportunities to link to power, and focusing on some specific transition path in more detail. This was first the transition path sustainable automotives, and later a new focus was chosen.

Through this process, the IB became better at what it did (the ideas evolved and were perfected), in its first year without replacing the persons and developing it vision and basic working method. On the other hand, as a person may not be appropriate to develop a kind of ideas that would make an adaptive network as a whole fitter, the network would need to adapt its composition (looking for people with the right characteristics, i.e. added value in terms of, for example, knowledge or influence). In the case of sustainable development, the network eventually has to connect with the power networks that can implement a sustainable development. The IB and its offspring, among others the automotive platforms, were steps in that direction. As the IB discovered that it lacked knowledge about the automobile industry, someone from there was asked to join. The composition of the set of connected persons gradually changed, in order to get closer to power. In 2005, the IB's ideas and several of its members returned in the automotives platform, where it connected with CEOs in the oil and automobile industries. All this time the IB as a whole reproduced its vision to verify if they were headed in the right direction. The IB's meta-ideas in some degree radiated to other networks, because change managers took these ideas with them.

So, it can be concluded that ideas traveled between minds and between networks, as long as this migration is facilitated by meta-ideas, which first must develop, about the operation of adaptive networks, most centrally its common vision and how that is continuously reproduced and fed with new ideas and steps in the direction of power. The energy source of this adaptive network can be hypothesized to be successful co-evolution itself, since these ideas, leading to the observed conduct, were selected and survived in the struggle for life. The selection mechanism was created by an adaptive tension.

Adaptive tensions

Adaptive tensions create energy potential that a system can draw on as source for its own development. The studied adaptive networks thrived on large-scale societal tensions. They linked many parts of a large societal system. They were motivated to address the sustainable development of that system, since that development currently was (in their eyes) not sustainable. The adaptive tensions that drove these adaptive networks were thus actually as wide as the tension between the economic growth discourse (or competitiveness in a global market)

and sustainable development discourse (in the Netherlands and in the world). These interests were represented in the adaptive networks. The IB focused on the mobility system and the ETP on the energy system. For the NMP4 team it was even wider. Apparently, somehow these adaptive networks were able to use these tensions as energy source for their own development. This was the competence that has evolved over the years, and it was closely connected with co-evolution.

Co-evolution

Co-evolution of ideas implies that ideas in different parts of a composed subsystem like the (social) mobility system, which is a nested conglomerate of living systems, do not evolve independently. There is a social link that ensures that ideas, and therefore conduct, in different parts become more aligned than they would be if conduct in each part were only the result of interactions in the market. Since each part has its own 'autopoietic dynamics', it has a natural tendency to maximize the returns it is geared for, and that forms the primary selection mechanism for its ideas. There is no autopoietic reward for being sensitive for ideas in other parts. Some other mechanism has to develop for adaptive conduct connecting the parts at this scale. My hypothesis is that the mechanism that evolved in the transition discourse was reward for co-evolution itself. This can be seen from the conduct of the adaptive networks, which was increasingly aimed at co-evolution.

The awareness of a need of co-evolution was present at the start of the NMP4. The greenpolder model and sustainable research programmes both had led to a shared awareness and trust between individuals in all domains, indirectly from Parliament to CEOs. This shared awareness can be interpreted as a result of co-evolution, despite the fact that a clear line of thinking about co-evolution, or a working method to facilitate co-evolution had not evolved yet. There was no sufficient linkage to implementation power, as celebrities like Arie de Geus remarked at NIDO's final congress in 2004 (www.nido.nu). It is my assumption that this meta-discourse about sustainable development was the result of a large-scale, relatively slow (taking up at least 10 years), cultural evolution process, where members of sustainability knowledge systems (networks that used research projects to push for sustainable development but did not succeed) became aware that it did not help to project sustainability problems on power networks, but even more patience would be needed to look for acceptable solutions by seeing it as a shared problem. In other words: these people had become aware that jumping to solutions and pushing does not help, 'the system pushes back', and perhaps that pushing even can make these solutions unacceptable for a long time, while technically they are still interesting. In complexity speak, if this analysis is adequate, these loose networks shared an awareness that they should contribute to requisite variety of the societal systems they were trying to influence. On the other hand, the pushing of sustainable solutions had been a useful phase to build up the tensions that now were widely felt, also by CEOs. Around 2000, the sustainable development discourse and the unspecific

idea of sustainable governance were increasingly advocated by CEOs. The challenge now became to tap this energy source for a goal-seeking process. Before 2001, there was no discourse yet on ways to achieve that.

The NMP4 succeeded in developing such a discourse, the transition discourse. It put in words what the earlier emerged loose networks intuitively understood. Academics helped to find these words. The ideas of systems thinking, teams of forerunners from all domains, visions, transition paths and learning-by-doing form a representation of the idea of co-evolution. The NMP4 team also put transition management in practice itself by involving the groups from all domains in the development of the discourse, asking open questions, so this idea became shared among several domains especially in the energy and environmental sectors. Of course, it was theoretical and only some people in each domain participated in the discourse, but it was enough to make Cabinet and Parliament accept the NMP4.

The ETP tried to perfect co-evolution by setting-up transition teams that applied the tricks of the transition discourse. Behind the scenes there was an adaptive network that learned that the approach of the ETP did not generate requisite variety to address key issues like level playing field or investments by major industries. This contributed to the proposal of an Interdepartmental Energy Transition Program: the other relevant ministries would be able to join in the process of co-evolution, which was necessary to increase the complexity of the adaptive networks on the side of the government, which would, again, help to attract the industries. It also contributed to more alignment with respect to R&D for energy, which led to a better focus, through less controversy, of government support of that R&D.

The IB did as the ETP, but was more aware of requisite variety: if complex change is discussed, the IB had to link to the sectors that would need to participate in the change. So the IB had to be as complex in the knowledge it could link. It did not jump to easily to transition paths and actions that either were not credible because major sectors did not participate, or only had limited effect on sustainable development. As they focused on a specific transition path they involved key domains and sectors to enable co-evolution there, which is needed for joint implementation of sustainable scenarios. This can be seen from the initial composition of the IB and the fact that it extended itself with a member of the automobile industry. The IB's efforts facilitated the cooperation between three ministries in the preparation of an influential EU conference, where views about sustainable development were widely shared between all domains and sectors in the automotives system.

The five DG deliberation was less clear in its language and its efforts. However, the DGs for environment and energy focused on maintaining the link with the three other involved ministries, to at least maintain a basic involvement at the level of civil servants from a larger number of policy sectors. This probably helped in particular for the IB, where four directors from three ministries participated. The Inter-ministerial Energy Transition Program, established by the DGs in 2005, had the clear intention of being nothing more than a link between

the six participating ministries and between the public and private worlds. In some degree, the DGs had developed joint ideas about their own role in sustainable development.

Coherent specialization

The IB perfected its capacity of co-evolution in a way that may be termed 'coherent specialization'. It wanted to enable co-evolution in many parts of society, and looked for a method to deal with the complexity without losing requisite variety. Whilst no participant could oversee all parts, they developed enough shared knowledge and trust to use that as a common basis for action. To overcome limited individual cognitive capabilities (bounded rationality), they specialized according to content. It did not try to change the mobility system as a whole in one time, but focused on power networks where they thought they could have influence, and certain participants contributed by influencing power. The group focused on specialization in a limited group that still was able to meet and ensure that their different ideas were coherently based on joint ideas. They all could explain the link between their own knowledge and the vision, and trusted that everyone understood the vision in the same way, and that there also was coherence between the knowledge and actions of all other participants and the joint vision. In this way, the IB as a whole could hold enormous complex ideas, more complex and adaptable than a single person could hold. A third kind of contribution was making this mode of operation explicit to ensure trust that coherence would be maintained. This division of roles was clearly visible in the IB, for example, since roles were explicitly addressed in its internal communications. For example, when I asked members how the group produced its analyses on which it based its actions, they usually referred to the same persons to create enthusiasm for certain lines of thinking and acting, whilst these often did not personally possess the knowledge for the analysis, or the influence to implement the actions.

A great deal of the enthusiasm in the IB was formed by its capacity of facilitating co-evolution. They were close to power in many parts of the mobility system (they belonged to the rank and file), and had much additional knowledge about mobility. As via their backwards reasoning they conceptually approached social dilemmas, they prevented internal competition by proposing these dilemmas to power networks, where they were piloted. In this way they did not jump to solutions but maintained requisite variety for themselves.

Other networks, principally the Energy Transition Process, also tried to follow the transition discourse, but were not completely power-free, jumped to certain solutions that should be implemented via experiments, and lost influence on major players, i.e. it lost requisite variety. However, they still ensured co-evolution in the parts on which their success did depend, and it created co-evolution about possible solutions on a much longer term. It was nonetheless unlikely that the ETP had the requisite variety to address large-scale transitions. The enthusiasm therefore declined a bit, in particular when this became clear to more ambitious participants who regressed to old-fashioned power behavior of

pushing for specific solutions (the letter about the failure of the biomass transition in 2003). It can be interpreted that adaptive networks in the ETP, primarily in the ministry of EZ itself, became aware of this problem, and proposed the Inter-ministerial Program in order to attract the missing subsystems to the dialogue. The DGs, sensitized by the success of the EU Conference for the connecting capacities of these civil servants, approved. The conclusion about coherent specialization in the ETP can be that it was less successful than in the IB, because it was not power free, and not as much linked to implementation power for large-scale breakthroughs.

Natural selection

More than the ETP, the IB had perfected the art of coherent specialization, therefore could maintain requisite variety. It could create influence toward more complex changes. It enabled co-evolution at a larger scale. Socio-cognitive forces drove this behavior: the IB had explicit ideas about co-evolution that they put in practice and improved, learning by doing. All members at least were prepared to apply double think – willingness to take the joint vision, rather than their personal interests, as selector for action, making that action coherent. Others were specialized in systems thinking, helping the others to see the bigger picture and act accordingly. They also helped the others to consciously deal with trust – by keeping the IB power free. This combination of skills enabled the IB to select ideas that contribute to co-evolution, and because co-evolution was their joint meta-objective, these skills constantly improved. This led to stepwise nearing, through co-evolution, of more concrete 'implementable' ideas, which eventually were discussed between capable CEOs under the automotives platform.

A live connecting subsystem

My research gives indications that the transition discourse was more than 'complexity speak'. It inspired dozens of policy makers in the mobility and energy system to engage in goal seeking, and this actually led to a co-evolution of ideas in different components of a composed subsystem – principally in the automotives system, but also in the larger mobility and energy systems. However, I have not explained yet how co-evolution led to recognizable successes, as a market breakthrough in mobility of energy systems has not yet been achieved. There must be some other way than observing market breakthroughs, in which adaptive networks recognize (meta)-ideas that successfully contributed to co-evolution. This way of observing success as steps in the right direction that create more hope of actual market breakthroughs is the basis of the natural selection mechanism.

7.2   The organism's metabolism: feeding on connections

Willingness to contribute to sustainable development

Now it is clear that the IB and other adaptive networks aimed at making connections between thinking and acting in different parts of the mobility and energy systems, the question becomes, how does that work? The adaptive interactions are power free, to allow trust to emerge that persons act for the common good of sustainable development and not for their private benefit on the short term. If there is any benefit on the short term, that is the result of a goal-seeking process to match long-term goals with the short-term goals in power networks. Result of that goal-seeking process is, however, uncertain, and the considerable time investment is at everyone's own risk. The IB needed a year, about ten meetings, before they saw a real perspective of influencing power through the EU conference. And even then, the IB and the time spent in it were not visible to the outside world. The civil servants in the ministries preparing the EU conference were hardly aware of the significance of the IB behind the scenes. There are other examples of policy makers who invested time or took some (limited) personal risk by participating in adaptive networks and make proposals for change in power networks. It seems safe to assume that their motivation was personal, or at least not given by reward that power networks had promised. I therefore assume that their conduct was in the first place personally motivated, and in the second place motivated by an expectation of success. That success was defined in the first place by an adaptive tension they felt, and in the second place by believing in their own judgment of small successes, which are steps in the direction of relieving that tension. Each successful step then may actually be experienced as a source of energy, an encouragement to make further steps. The judgment of small successes was in effect the selection mechanism for ideas, and, at the next order, the judgment of how their own conduct had contributed to that success was the selection mechanism for adaptive behavior (meta-ideas). The purpose of this section is to describe how that worked.

Cognitive separation as energy source (i.e. creative tension)

Interviews make clear that the participants all were capable of explaining their role: they saw a current reality and they had a dream that did not match with that reality. They were able to describe both, and explained how they were looking, with others, for proposals that could take reality one step closer to the dream. It is my assumption that all members of adaptive networks, if they are to contribute to co-evolution, should at least be able to sense that tension and combine the rationality based on sustainability of the whole societal system that the network intends to connect, with the rationality in the partial system where they have influence or knowledge. This is what Teisman (2005) terms double think. They should be prepared to invest energy in developing with others, together having knowledge and influence of other subsystems, views about the whole. Simultaneously they should be looking for opportunities to bridge the tension with their own part, making knowledge development in their part more consistent with the

whole. They should have the skill of creating trust among other members of the adaptive network that they do all that. At the basis of this skill is, in my view, cognitive separation between the part and the whole, whilst using the tension between both as 'energy source'; a source of inspiration, always based on the internal drive to match the future with the present (or the whole with the parts).

As I have observed several times, cognitive separation or double think occurred several times in loose networks; members of power networks self-organized for a while into small, temporary adaptive networks. What perhaps contributes most to giving life to these networks, is the recognition that cognitive separation can be strengthened by other kinds of separation, like separation in time or space. IB members were aware of this, which is why they emphasized that the IB should be power free. This is what, for example, the IB's moderator said to me in 2001. This enables collective cognitive separation – it is clear for everyone that when others act from the joint interest and when from the separate interest. It is also easier to visualize the steps necessary to bridge the tension – in other words to become creative (this tension was therefore termed a creative tension by Fritz 1989).

Once cognitive separation occurs, an adaptive network can find its own identity and develop its own rules. This also entails finding a new composition, whilst maintaining the common understanding where it all began, the trust and the mode of interaction. As the network begins to influence power networks, it may consciously try to improve that skill, and have a common basis for evaluation of success. Driven by previous success, and by the desire to solve the complex problems of power networks, where the same people may participate in another role, they can become better.

The acknowledgement that transitions are needed is an expression of a creative tension; it is in a way the first step toward problem solving: acknowledging that change needs to be managed. This acknowledgement has driven the adaptive networks in the transition discourse.

The tension between knowledge and power

Where creative tension is based on an analysis of content, it is matched with a tension in social networks. An adaptive network has to link with power networks in order to facilitate co-evolution. However, by definition power cannot be forced to listen. This tension is the other driver of adaptive networks. One adaptive network may be said to be 'fitter' (in terms of natural selection) than another if they are better able to connect with power – making better cases for interventions.

How is the term 'fitness' defined? The following answer may be hypothesized. The energy source are the successes based on the network's belief that (a) it has a socio-cognitive basis, a common vision, which it can apply to test which ideas are in the long-term benefit of all, and (b) which can lead to series of short-term successes, visible to themselves, defined as interventions in a power network that fits the vision and might create reactions that change the system, and (c) each person also believes he can trust the others to have the same under-

standing of this belief, and that they will act to that. If this belief is strong enough, reconfirmed by such successes, and even grows stronger through a learning process where the fitness of ideas increases, a living system has evolved that 'feeds of' its connections with several subsystems to create successes. The primary energy source, however, is still the personal will to act for the common benefit rather than the personal short-term material benefit.

This is the will and competence to engage in coopetition. If a power network develops a way to create such belief and such competence, the rules of its games can theoretically change. In theory Cabinet members and CEOs do not have to spend huge amounts of time, as long as they trust that the adaptive networks that propose interventions also match what they, personally, believe to be appropriate ('logic of appropriateness'). In that way, CEOs can concentrate on their usual power games, whilst remaining open to sustainable development of the system on which they too depend, in the long term.

This has occurred in some degree under the transition discourse. The IB was independent of short-term political success, was hardly visible for power networks, and thrived of the interventions it developed, without outsiders being aware of their role. It created joint perceptions about several societal subsystems (subsystems of mobility) at the same time, but focused its interventions at first on automotives. Several Cabinet members and CEOs supported the automotives platform. When that was successful (in the IB's own eyes), it shifted focus and adjusted its composition accordingly. It is therefore not dependent on success in one specific power network; it spreads its risks.

Management of tensions

Whilst the IB, and to a lesser extent the ETP, explicitly managed their internal tensions by cognitive separation to enable a goal-oriented search process, they tried to influence the tensions in power networks. This external tension management was visible for the outside world, because communications in power networks changed (although the sources of this change were not visible).

The momentum of sustainable automotives has been created in a series of small interventions in power networks. The first is that the occasion of the Dutch presidency should be used to organize a conference about automotives. The second is the role of representatives in several ministries, the environment movement and the mobilists union, who were member of the IB, started to act in their formal capacity on behalf of the conference. The organizing committee, civil servants from three ministries, organized several pre-conferences where IB members acted on the basis of the case for sustainable automotives they had developed in the IB. They tried to take small steps trying to sense the reactions in the rest of Europe. As the reactions were favorable, the agenda of the conference was set-up so that it would attract a lot of participants to discuss about sustainable automotives. Deputy DG Jeroen Tulp of V&W did important power interventions, where he talked in public a language that had significant influence on the events, and which is completely attributable to his membership of the IB. In that way he increased the pressure on the power network for automotives to

discuss alternative scenarios. The EU conference was widely attended, and polls showed that the problem analysis was widely shared. The tension on the European automobile industries to participate in a process of change increased, and soon after that the automotives platform was established.

In the ETP, there was a mix of tensions at several levels of complexity; where wide encompassing problems descriptions were expressed, CEOs of influential industries hardly acted in public in this debate. The link with implementation power was primarily made through influencing investment decisions about transition experiments that could be defined within a few years. EZ managed tensions by requiring that these experiments would be supported by environmental NGOs and implementing industries. However, EZ could not develop a credible tension between public and private sector, since the government was not organized integrally: the only tension EZ could create was that of subsidies. Whereas the experiments therefore were seen as steps in the direction of sustainable energy, they were contested as being step in the direction of a really significant energy transition. The Inter-ministerial Program was the answer to this problem, and created more credibility in the eyes of the private world that the government was serious in its intentions to take the measures required to facilitate a sustainable level playing field, and make sustainable energy a business case.

In some degree, tensions were also managed to keep the transition discourse as such alive in the much larger loose networks of the polder tradition that had supported transition management in the beginning. Progress reports by Cabinet to Parliament obviously did not show clear progress toward sustainable development – the process in the IB and the ETP was too uncertain, fragile and sensitive. To foster the loose networks, the transition discourse was kept alive through relatively 'safe' power interventions, like transition research programs, helpdesks, and, finally, setting up an interdepartmental program.

The public – private gap as management challenge

Whereas smaller industries can be innovative in a technological sense, they still largely depend on a sustainable level playing field in the market before they can break through. This was one of the outcomes of the ETP, and it was one of the sources of inspiration of the IB. The basic question was, how ambitious should one be as regards the calculation of external effects in the prices. For implementation of the more ambitious scenarios, linkage with the finance ministries in the EU was required. A less ambitious scenario would still depend on the support of large industrial players. Jeroen Tulp, deputy DG at V&W, was aware of this, and said that a main motivation for his participation in the IB was that there he could get to know some of these industries, and with them seek ways of dealing with the barrier between the public and the private world. He saw this as the final challenge before sustainable scenarios could be implemented. Where the private world is focused on business cases that should bring result in the relatively short term, the public world is aimed at the next elections. As the playing field is strongly influenced by the government, any scenario had to be imple-

mented by the private and public sector together. In the process of taking steps in the right direction, both see the other as unreliable, given their different auto-poietic behavior (business cases and cooperation based on trust, versus public interventions with widely understood benefit that can easily be turned around after the next elections). A tension needed to be managed that could attract both the public sector and the private sector to a dialogue about sustainable automo-tives, and sustainable energy at large, and where both parties would believe in the trustworthiness of the other. At the EU conference, on both sides, statements were done that created expectations. The Inter-Ministerial Program, signed by six ministries and with significant budget to facilitate the dialogue and to hire competent chairs, increased the credibility. The involvement of NGOs increased the expectation that elections would not force the government to return expecta-tions it created in the earlier steps of the public-private dialogue.

In hindsight, several IB members indicated that all the time they had been trying to build up tensions to bridge the public-private gap. However, they were dependent on feedback from the social system to build that tension. They suc-ceeded, because favorable feedback returned in the preparations of the confer-ence and on the conference itself. People around Europe had created expecta-tions that they would seriously participate in a dialogue about sustainable auto-motives.

In terms of complexity, the IB's metabolism was based on small successes in the building-up of tensions to bridge, mainly, the public-private gap. The IB created waves in the social system to build up tensions if there was resonance – if the power network reacted favorably by creating new expectations and there-fore new tensions. Several members of the IB explained how they consciously tried to disrupt the autopoietic balance in the automotives power network, in a way rocking the system by clever power interventions that are reinforced in the larger social system, and bring it out of balance. They interpreted the feedback as successes, whereas the rest of the world ever would have made that interpre-tation, since a social transition only is only widely visible after the balance flips to another state. By developing a common language (in some degree) about this process of influencing, the IB had a common frame of reference for success, and could consciously try to improve its skill of 'rocking the system'. As they got better, they had more successes (in their own eyes), and more motivation to continue their efforts.

The metabolism emerged slowly and quickly

The IB, the ETP and five DG deliberation and the Inter-Ministerial Program are all said to be unique, at least by many people who are acquainted with these groups. Since these groups, and what they do, and how they measure success, are only visible to insiders, this is a subjective proof. On the other hand, this group is well acquainted with the culture in Dutch national policy systems with regard to sustainable development. It is probably different than previous policy processes in these sectors.

It may then be concluded that a new metabolism developed in the early 2000s, of an invisible organism that grew by feeding on co-evolution in the energy and mobility systems. This organism is small, and limited to insiders from all domains in these societal systems. However, it is embedded in larger loose networks of people who do not share the competences the IB and the ETP developed, but who are sensitive for their reasoning and probably willing to contribute when asked. This was shown when the IB's and the ETP's ideas emerged in other networks, carried by persons who had participated in both, but also transferred to new participants who were asked to contribute their knowledge and influence. The adaptive networks created its own feeding ground – new social tensions in slightly different power networks, that offered opportunities for new manifestations of itself. While the IB as such may die, it's spirit may live on in 'offspring networks', where the competences coagulate again, attracted by a new tension in power networks. In some degree the ideas are carried by the same persons, and in some degree, susceptible and willing persons join from the loose networks. As this energy source doesn't dry out, and as its interconnectivity skills are gradually improved, it will live on, and improve, and it is clear that it is actually the ideas that are alive, and the persons that carry this organism. The organism might die, whilst the persons live on. So, whilst the organism has slowly evolved in the 1990s as a result of disappointment and emerging trust, it has quickly boosted its competences on several occasions in the transition discourse, and has become better in living on, feeding on small successes.

The question is how long the adaptive networks will survive. The continuation of the discourse is by itself no guard against complexity speak. The Inter-ministerial program, like the NMP4, is no adaptive network, since both are highly visible, and create expectations that are susceptible to punishment and reward in power networks. By communicating about their activities, these networks engage in power games. They create expectations of result, which either is indefinable, or depends on other expectations it has to create of reward and punishment. This is the fate of most strategy departments. Established for the best reasons by managers who saw the need of co-evolution, they often become an extra player in the field, and one without resources of its own. If they are going to connect and let knowledge flow, they should do that in an invisible way, and they can only do that if the other departments (the sectors) are open to connective behavior, so that adaptive networks may self-organize. In other words, power is not an energy source for live adaptive networks, but it can be a context for self-organization. If that succeeds, the power networks can evolve under influence of co-evolution, facilitated behind the scenes by adaptive networks.

7.3   *Understanding the scale linkages as extra motivator*

Cultural evolution and large-scale adaptive tensions

In chapter 5 I describe the rise of adaptive networks as a process that took more than a decade. A portion of the population of policy makers in all domains of the

energy and mobility systems was sensitive for the adaptive tension between the economic growth discourses and the sustainable development discourse. In that climate, the NMP4-team could self-organize and get favorable feedback on their ideas, the NMP4 could get politically approved (despite its unspecific and unaccountable character), the IB and the ETP could self-organize and, in the context of these networks, the DGs and Cabinet could keep their hopes that there would be clear outcomes, and enable continuation.

This process was driven by several adaptive tensions; some weakly felt by a large part of the population (primarily the tension between economic growth and sustainable development), and some felt strongly by a small part of the population (primarily the tension between the political dynamics of the public sector and the private sector). The process of the past decade enhanced the collective capacity of making constructive use of the latter tension (through the automotives platform), by somehow tapping the energy of large scale but weakly felt tensions. It seems like a redirection and concentration of social energy, enabled by the connectedness of adaptive networks. Where political opportunities emerged to make a further step in this building-up of tensions, groups like the IB quickly self-organized. It almost seems as if a subpopulation has emerged that has an intuitive grasp of management of tensions. Interviews do hardly give indications that this is conscious behavior; change managers who can describe the process in terms of successions of tensions are rare. More likely this gradual change should be seen as a cultural evolution where persons in the loose networks reward each other for connecting behavior. They see small steps to a wider consensus about sustainable development as encouraging, and they are willing to engage in this process without material reward. Geert Teisman and I (in prep) describe how this sensitivity was built not only on the personal characteristics of these persons but also on the general polder tradition in The Netherlands. There is natural tendency to look for consensus. The socio-economic Polder Model was built on this and it has been applied for decades, as was the greenpolder model that was applied for less then a decade and then abolished. The emergence of a part of the population that was sensitive to the transition discourse, the loose networks, probably should be seen as a relatively slow cultural evolution process. It also should be seen as a subculture that is enabled by double think, and that is difficult to perceive for those who form no part of it. The proportion of all policy makers actively participating in these loose networks is difficult to estimate, but most probably it is limited. On the other hand, the networks are sometimes close to power, like in the case of deputy DG Jeroen Tulp, and later in the automotives platform. The loose networks seem to consist of persons who have achieved what they wanted in the material and career sense, and therefore can afford to spend a corner in their mind on double think, ultimately driven by the tension between economic growth and sustainable development, plus the idea, shared with others, that it is not hopeless to manage sustainable change if one only acknowledges the complexity and can find others to act together.

Context for self-organization

Where the cultural evolution process is by definition a hidden process, its manifestations become more visible, also for the involved persons, when adaptive interactions are clearly separate from power interactions. This is the clearest in learning networks like the IB. In the ETP, it was slightly less clear, and this seems to have given a sense of doubt about the process that participants find difficult to explain. Major oil industries did not really participate, which gave a nervous feeling. EZ's transition teams seemed to feel the tension between what power networks expect of them, and what really would create sustainable development, but they had difficulties in using that tension constructively. It took EZ's adaptive networks several years to propose a much stronger inter-ministerial cooperation that would enable a process more credibly aimed at sustainable energy transitions. Yet, the existence of the loose network of people with the capacity of double think seems to have enhanced the probability of emerging of self-organizing adaptive networks that separated their learning process from the power process. It may be hypothesized that these competencies have slowly improved in the past ten years, enhancing the probability of adaptive interactions. These temporary or longer lasting coagulations of double thinkers can be hypothesized as localized factories of individual and collective skills of adaptive behavior, which make the metabolism of the organism more efficient, feeding the loose networks again with competent members. On the other hand, of course, the participants who were prepared and capable of connecting major societal subsystems were a minority. Their linkage to power was still localized, as far as visible to me, to the automotives, and a breakthrough in the market had not yet been achieved.

What you see depends on where you stand

The mixture of skepticism and optimism about the transition discourse and the implementation of NMP4 as enabler of sustainable transitions was still present in 2005. Visible to the outside world were only the NMP4 itself, the unspecific reports to parliament, and the platforms under the Inter-ministerial Energy Transition Program. Many people who did not take part in the adaptive networks underneath these visible power structures, seem to have a tendency to be skeptic about them, whilst people who take part in the adaptive networks have a tendency to be optimistic about what they do – otherwise they would not have done it. Both observations are correct from where these observers stand. Thinking in positive and negative spirals, the observable world can be in a negative spiral whilst an adaptive network anticipates a greater sense of urgency and (in a local positive spiral) prepares itself for interventions that they hope might turn around the large-scale observable development at some point in the future. There may be several adaptive networks active that compete for the attention of power networks rather than develop coherence (and given complexity this is likely to happen). From where these networks stand, they may not have the same view and recommend differently.

The loose networks of complexity acknowledging policy makers, extending into Cabinet and reaching CEOs, still believed in the validity of the transition discourse, and kept the Inter-ministerial Program in the air, despite skepticism all around them. When asking involved persons about this, they pointed to the importance of trust.

What participants say about trust

Participants have identified trust as essential for the required level of dialogue to make influential proposals and to implement these proposals. Trust has enabled in their view the flow of knowledge. Interviews reveal that participants frequently base their decisions about their own behavior on an assessment of the future behavior of others. In their accounts, the distinction between the conduct of power networks and the conduct of other members of the adaptive network were important (external and internal trust), and this had led to the analysis in Chapter 5, where a long-term trust dynamics was observed in external trust and a short-term dynamics in internal trust. The long-term dynamics was based on the expectation that power networks would maintain adaptive tensions or their sensitivity to proposals that would adjust these adaptive tensions (to form an adapted context for a adapted adaptive network). The adaptive networks seem to have been more confident as their linkage to power in many domains was stronger (as was the case in the automotives platform). Because the evolution of adaptive tensions in power networks is closely linked to a larger-scale social learning process (since power seeks legitimacy through public communications) the learning in power networks is slower, and larger-scale than the learning in adaptive networks.

The short-term dynamics of internal trust were required to ensure that the adaptive network (in particular the IB) was confident that it made the right assessment of adaptive tensions and of possible aligned interventions. They indicated that the distinction between intentional trust and competence trust was important: some people's intentions can be completely trusted, but their added value is insufficient, and vice versa. As people have the right intentions in the eyes of the rest of the group, but little added value in terms of knowledge, influence or systems thinking ('connecting power'), they only might slowdown the overall process. However, participants who did not intend to share in the double think but rather protected vested interests formed a risk, and the IB checked newcomers. As the IB developed an adequate composition in terms of knowledge, influence and connecting power, it gained self-confidence, i.e. internal trust in its own performance as a group. The IB's dynamics from coming together with the vague hope that NMP4 would attract the right group of people (all domains), and making its first joint interventions, took about a year.

Chapter five indicates that the adaptive networks were in some degree aware of the factor that limited their development of more self-confidence; in a way this factor was the weakest link in the linkage to power networks in order to acquire requisite variety to address a complex problem like sustainable development. By focusing on that factor they could wind the spiral up step by step.

They first developed internal trust before making propositions to power networks, and if successful power networks adapted and created new adaptive tensions. If the adaptive network trusted that the new situation was stable and therefore had external trust, it adapted to the new context and built-up new internal trust in order to make a next step. Trust in this way becomes a socio-cognitive variable: it is explicitly discussed in the network and it gets many faces according to what the network thinks is the weakest link. In a way it is a process of constant looking for identity – because identity determines the next step, which determines required adaptations to the network, which determines the weakest link. As the network does not succeed to agree, it may split-up, or it has to admit power-interactions.

Chapter five presents the successive limiting conditions in the external trust development as interpreted from the interviews. The limiting factors were, as adaptive networks gradually got better:

- The closed shop of the greenpolder model (learning is not a trick of power – we should not create direct pressure for sustainable solutions because that only evokes countervailing powers and even is not discussable);
- The lack of influence of the sustainability research networks (learning is not a powerless trick – we need to link to power before power is used to create pressure);
- The political credibility of transition management (how can we make a focus on the permeability of the borders between domains for ideas politically attractive);
- The span of knowledge and influence (can we create enough coherent specialization to come with acceptable proposals?);
- Legitimacy (how can we ensure that the public sector creates reliable expectations about what it will accept in its dialogue with the private sector?).

The word trust does not occur in these stepping stones in the learning process, but on the other hand trust (the self-confidence of the group) was increased if a group agreed about its goal, the limiting factor to focus on, thereby able to use that tension to drive its own thinking process – what should be our next step? Where is the weakest link?

The analytical role of socio-cognitive trust

Trust can be analyzed, depending on the type of research, in much more detail and in different ways. For me a question was, given the many different ways of structuring trust, how can one be sure which approach is valid? The analysis of trust as a variable that emerges in a socio-cognitive process seems somehow to intuitively catch the emerging patterns of trust in the development of the transition discourse, from Greenpolder Model to Inter-ministerial Program. Trust was socially constructed, like any other idea that emerged from adaptive networks. As far as trust was intuitive for the participants, it was in my view in a significant degree part of the local culture of the network – it was a collective intuition. As people acted on the basis of that cognitive and intuitive trust, it becomes

difficult for a researcher to analyze in more detail how trust dynamics can be explained. It would be like reconstructing the butterfly that has created a storm.

Therefore, in order to understand adaptive networks, the important point is in my view rather that in larger adaptive networks trust must be an explicit part of the interactions – it should be consciously constructed to identify the weakest link. In my view individuals in the IB, those with the best capacity of systems thinking and the moderators, took this into consideration. Participants seek more coordinated behavior through co-evolution under complex conditions. The limits of individual bounded rationality need to be crossed by developing overlapping and coherent sets of ideas (shared knowledge), and policy makers who are aware of this, deal with it consciously. They are aware that, as the societal problems and solutions are complex, many subsystems should be connected, and the overlap between the knowledge of the individuals becomes smaller (or: the vision that is really shared and reproduced by all individuals becomes more abstract).

Coherent action, especially innovative proposals to power networks that may entail political risk, requires an accurate perception of what others will do, and on the truthfulness of the information given by others. There should be no misinterpretations, not of content nor of mutual expectations. Proposals that members of adaptive networks make to a power network should be based on solid interpretations of the joint argumentation of the case (in order to be less sensitive for opportunism), and the anticipated behavior of competitors in the power network. There should be trust that others don't make premature proposals, and that they are competent to assess the future conduct of leaders in their own subsystem.

So, the members of adaptive networks see trust as a compensation of (individual) bounded rationality and consciously build and verify trust. In chapter five I have reconstructed how participants analyzed trust, how they identified a limiting factor in trust, and focused their next effort on that factor. As an adaptive network has an adequate self-image, it will probably know where its focus should be. A researcher may, as a kind of psychoanalyst, ask questions that could improve the adaptive network's self-image and that also could reduce misinterpretations between members of the adaptive networks. In that case, the researcher in effect becomes member of the network with connecting behavior as added value.

The balancing of trust (and risk)

Through intuitive analysis of the interviews external trust, internal trust, intentional trust and competence trust, all identified in the literature before, emerge as important limiting factors at several stages. By dealing with that consciously, the networks in effect are managing critical uncertainties in their foresight, which on an individual basis is necessary to compensate for bounded rationality. In the backcasting exercise from joint vision to joint action (or from coherent vision to coherent proposals), the greatest uncertainties appear to be not in the technology or in the market, but in the conduct of social systems and their leaders ('We have discovered that sustainable development is not a technological problem, but a governance problem').

The effects of joint proposals primarily depend on the anticipated reactions in the power network. A chain is as strong as its weakest link. In the causal chain from far future to action today, the weakest link might easily be the first in the external effects of adaptive networks: trust in power networks; based on external trust, the trust that on the short or middle term power networks will be open to a certain type of proposals. The weakest link might also be inside the adaptive network. The network as a whole therefore needs to continuously re-establish its external trust based on its observations of the life world and how power networks deal with that. The networks also need to continuously re-establish its trust that the internal chain is not broken, as the IB as well as the ETP did, for example, by not allowing any payment for participation.

What the networks constantly implicitly try to do is to balance the uncertainties along the chain of effects. There is no point in making one specific link much stronger than the others (this is basically what happened in the sustainability knowledge networks of the 1990s, by improving the strength of arguments all the time, while the weakest link was in the missing adaptive connections with implementing power.) The IB went as far as making the IB completely power free – it was not allowed to become an official project of the ministry of V&W, even though the implication was that it had no resources. Their implicit belief was that the slightest suggestion that short-term interests would enter the arena would disturb the balance of the strength of the links of its internal chain of trust. For the same reason the ETP was developed into an Interministerial Program, where six ministries cooperated on an even basis – with no ministry in the lead, formally. The directors of the program were completely aware that success would depend on retaining credibility that this balance would not be disturbed – internal trust for adaptive networks in the government, external trust for adaptive networks that would be attracted to the Program's platforms.

In the above perspective, the balance of trust can be seen as a requirement for coopetition, like I indicated in chapter 1. Shared foresight becomes content: the rationality for joint action, assuming there is a balance in trust. And trust itself almost becomes, linked with knowledge, the energy that flows through the adaptive network that has become a living social system that feeds on connections.

A trust threshold for living adaptive cultures?

In my analysis, the adaptive system that during a certain period was labeled IB has become alive and is reproducing and improving itself by natural selection. The IB was born in 2001, needed a year before it made its first intervention, discovered it was successful (in self-defined terms), and now hops from transition path to transition path (from power network to power network). The basic drive is genuine concern for sustainable development, but an enabling condition is a success measure and self-confidence: trust in own competence to achieve further success; a kind of collective competence trust. The IB has apparently gradually developed such self-confidence. Since it also still has external trust, it continues and may give birth to other networks. It is perhaps more the adaptive culture, as complex behavior of persons that is alive than the network itself as

group of persons. On the other hand such competences seem to be rather difficult to learn or copy form one individual to the other.

However, it may be assumed that from the start of the IB in 2001 and even before, there was some level of intentional and competence trust. An interesting question therefore is, has trust grown in a linear way, the IB coming more and more alive, or was there a quick growth of trust after reaching some threshold level? The interviews clearly suggest that in 2002, when the IB had developed its vision as basis for socio-cognitive trust, it made a jump. It may have made another jump in 2005, when it became aware that it does not depend for its success on one major transition path (which had been automotives until then). However, this critical mass seems to depend on the localized context of the Inter-ministerial Program. The adaptive network may be severely set back after the next national elections, if the Program is not continued or if the new Cabinet does not share willingness to participate in these adaptive networks.

Change management at different levels of complexity

As problems are less complex, creative competition is frequently applied to stimulate creativeness and effectiveness. For example, a small power network may seek solutions of which it only can define the contours, of which several may seem to be conflicting. Different consultants or teams of civil servants may then be invited to develop the best idea that fits these contours. Reward is a contract for implementation.

However, as tensions become more unspecific and general, as is the case for sustainable development, power networks almost always either define the contours of partial solutions, or they define these contours very general. In both cases it may be difficult to find investors. Commercial firms are only willing to invest if they expect contracts on the short term. If the conditions are general it becomes a lottery, or the winning proposal may not be close enough to the formal objectives of any party in the power network. There is too much investment risk.

Creative competitors and adaptive networks are two extremes on the same axis. They are both driven by an adaptive tension, the former even consciously created with that purpose. As complexity increases, commercial action becomes unattractive. However, as adaptive networks find another energy source, they too may develop in competition, developing competing ideas that are all offered to power networks. This opens the option of intermediary forms – adaptive networks that mix idealism with commercial interest, by addressing issues of intermediary complexity. The proposals of such networks might be assumed to lead to market change on the medium term, and the participants, having time to prepare for this change, can profit from that. There are some indications that the IB also addressed issues of medium complexity (after verifying whether these were consistent with their long term ideas). This may have been part of the drivers for enthusiasm ('wind in the sails' as one IB member remarked). The energy source of adaptive systems may therefore also be created by what I term a forerunner's benefit. By participating in adaptive networks, there can be some wind-

fall, or lessons that can be 'cashed' by a strategically thinking board in their own organization. One consultant in the IB organized a session in his firm to find support for his unpaid activity by referring to this benefit. His session was highly appreciated.

If intermediary forms emerge, competition between different adaptive networks may create an additional selection mechanism, favoring the best goal-seeking capacities. On the other hand, it seems contrary to requisite variety: as an intermediary network has an interest of its own, it may be less credible in the eyes of power networks. It may be accused of seeking one-sided alternatives (like the ETP was accused in the biomass discussions), requisite variety is lost, and such a network may either be successful if weaker interests are not represented in the power network, or they may meet countervailing powers. Therefore, perhaps the term 'triple thinking' should be invented: taking into account not only the joint interest (defined as sustainable development) and the interest of the systems represented in the adapted network, but also the interests of other, but not connected systems. This is precisely what the IB and the ETP tried to do, for example by letting the weaker interests (like those of children in developing countries) be represented by Dutch NGOs.

This downside, the fact that it is not possible to connect everything, may perhaps be overcome by linking to as many parts of the societal system as possible, as long as coherence can be maintained. Intermediary forms may share visions for the long term. Such a system can still create communication 'waves' in the social system, i.e. large- scale movements of tensions, and receive favorable responses throughout (resonation). Such a competition may perhaps be a guard against mistakes – by offering competing ideas to power networks, chances are that the one based on the most adequate self-image prevails.

Theoretically, if in the whole population adaptive competencies would be present, it would become much easier to reward people for adaptive behavior, and more would engage in it. It would become a competitive asset. For the private world, Hamel and Prahalad (1994), who used the term 'competing for the future', have applied this kind of reasoning, and distinguished several complexity levels of competition. The limit is perhaps given by the complexity of behavior persons can develop, given their necessarily restricted mental capacities.

Connecting scales for inspiration about sustainable governance

The IB was a 'pocket' of high levels of trust that emerged from the loose networks that formed a potential due to their attitude. It, like the ETP and the Interministerial Program, were embedded in loose networks of transition thinkers. They knew that to be adaptive to changes in context they had to easily find new members with the appropriate knowledge and influence. They also had a feeling that the transition discourse, as carried in Cabinet policies and widely communicated, was important to 'feed' that discourse.

However, the transition discourse was met with skepticism from outsiders, and identified as 'complexity speak'. Many people 'out there' are still engaged in sustainability knowledge systems, Polder-like negotiations and conflicts. It

seems that several interviewees believed that it would be important that such processes would continue, in order to add more people to the transition thinkers – because they would develop similar personal experiences and disappointments. There is also a possibility that this is the intuitive argument, inexpressible in power networks, of those who advocate instruments like impact assessment to make power networks more complex through formal procedures. The formal argument behind such instruments is usually a rather naïve belief in rational decision-making (Nooteboom & Teisman 2002), but in reality the belief could be that if such instruments were abolished, the interdependencies that lead to negotiations and personal relationships between different domains may not be maintained. In 2005, Cabinet still supported the transition discourse, but, since adaptive networks were invisible, other structures would need to ensure continued reproduction of the loose networks that ultimately reach Cabinet, CEOs and Parliament.

On the other hand, the polder culture is also quite robust. It has emerged in the middle ages, and it is still there. The loose networks of the transition discourse 'float' on that culture, and although they are therefore more dynamic than the culture in which they were embedded, they could be robust enough against the abolishment of the procedural basis of many interactions, in particular because the drive to participate depends on personal motives, which need not necessarily be frustration.

In short, the awareness that there is a linkage between processes that only can occur in pockets of trust and the large-scale awareness of the need that such processes are necessary for a sustainable development, inspires to support the transition discourse, and may have numerous implications for sustainable governance.

7.4   *Implications for public management*

The ideas above have implications for sustainable change management. The most central point is perhaps that individual behavior, acknowledging complexity and willingness to act, is key to sustainable change. In the next section I address the individual policy maker, and in this section I first address the public management scientist. How can he analyze and help sustainable change management? The obvious answer would be to design power structures that create adaptive tensions contributing to sustainable development. The next option would be to create power structures that somehow stimulate a process where people can learn to become more adaptive. However, both are too simple. One problem is the management of openness and closedness of processes on the edge of the public world and private world. Another problem is that contribution to sustainable development is only in hindsight observable. The following ideas may inspire further theoretical and empirical study.

Creating power structures to facilitate management of adaptive tensions

It may be possible to acknowledge complexity as a political problem that needs attention in its own right, by institutionalizing the management of tensions. The

Inter-ministerial Energy Transition Program Directorate was set-up with that intention. It was aimed at setting-up societal platforms to advice the government about sustainable transitions, and to ensure that six ministries would coordinate their dialogue with these platforms. The Program had considerable budget, mainly to pay the platform chairs. Their assignment was to create some form of visible market breakthrough within a certain number of years. I use the Program hereafter as example for any formal structure that is set up to manage connections and co-evolution.

The program and the platforms were therefore not power-free. Like in the ETP this may reduce the attainable complexity of the sustainable breakthroughs, and therefore it may lose requisite variety to address larger transitions. On the other hand, the difference between the Program and the ETP was that in the Program six ministries worked together at the highest level. Private parties may trust that in this dialogue the government would be able to make commitments about its own contribution to market breakthroughs. If the game is well played, connections may still be maintained with the implementation power for larger breakthroughs. After all, the type of breakthrough was not specified. First noises in 2006 were that the most difficult part is not to create coopetition between CEOs, but to create an alignment in the government. Will, under the pressure of the Program, adaptive networks emerge in the government? Will dilemmas from the point of view of the whole automotives system be identified and put forward to Cabinet to decide about the next step in the dialogue? Or are their other ways for the government to become a reliable negotiation partner? There is a pitfall that political reality chases the Program to a very small corner of political attention, so that it is forced to deal with the ministries directly. Like many strategy departments, their link to power may easily dissolve.

Managing openness and closedness on the edge of the public and private world

As an adaptive network develops argumentation for general transition paths, outsiders may not think this is relevant to them. However, if a network gets closer to implementation, deals must be made. The government may have to create conditions for these transition paths in the market, that is, adaptive tensions in the market to allow sustainable business investments. Such interventions may be subject to democratic approval; depending on the relationship between Cabinet and Parliament even smaller interventions may need to be openly discussed before they are final. No deal can then be made until Parliament agrees, and the platforms may have to open up to all parties that think that it is in their interest to influence its process. If credible participants are refused in the platform, this in itself may create political resistance against its proposals. And in the case of complex change, it is not unlikely that vested interests will believe that they may be harmed by the proposals, and whether rightful or ill informed, they may try to delay the process or set-up countervailing political power.

To stay confident that an adaptive network will influence development some degree of predictability may therefore be required. The question is how this can be done. Again, cognitive separation could be the answer. External trust in adap-

tive tensions should be maintained, as well as internal trust to not fall in the trap of making premature proposals for specific government interventions. This trust can be built-up by separating the adaptive interactions from the interactions in the platform, whilst the platform, in dialogue with the government, creates the adaptive tensions that drive the adaptive network (i.e. a co-evolutionary approach). The adaptive network may try to attract increasingly influential persons from the relevant sectors, until it has gained enough support to communicate the ideas openly in the platform. Thus, there is a critical phase where the outside world knows something irreversible may be developing, and where new members have to be included in the trust chain of the network.

Accounting sustainable change management

If formal power structures are set-up with the aim to manage tensions to attract a process of co-evolution into a desired direction, their functioning should probably be transparent. Confidentiality may only be allowed in the case of negotiations about purchases by the government, and matters of defense and secret service. If an activity is mentioned on the national budget, Parliament probably will want to be informed about progress. Dutch Cabinet had produced annual progress report about NMP4's transition management since 2001. This had always been rather unspecific, and debates in Parliament about progress normally had not been about strategic choices or social dilemmas created by bifurcations of development, but about the desirability of specific government interventions – precisely the pitfall of sustainable change management. Parliament seemed to lose its interest in transition management.

An important question is therefore how to deal with the paradox of transparency of processes that by nature should be closed to prevent premature exposure and becoming a play ball of power networks. One possible answer is that a Cabinet may bridge this paradox by protecting the process, giving it an unspecific objective and allowing it years of quiet action. Cabinet members then effectively become part of the adaptive networks. However, as budgets increase this may become difficult. Another course of action might be to share the responsibility of protecting the Program and the platforms by theoretical reasoning – thus, by perfecting the transition discourse, looking for more support, possibly by involving Parliamentarians in the adaptive networks, so that it includes a reasoning why such processes need to be allowed time whilst they do cost money. A third option may be opening-up the processes in the platforms, as these are power networks anyway. This would shed light on the agenda and composition of the platforms, the context for adaptive interactions and business deals. However, this could be risky as the edge of order and chaos may easily be crossed. Reporting in public creates the appearance of order, but if in reality the process has not settled yet, is still sensitive because people still act on the basis of trust, the process may collapse.

The monitoring and publicizing about adaptive networks may only be feasible if they do not deal (yet) with interventions that vested interests may see as a threat, as was the case with the IB, or after several years when the dust has set-

tled. It is therefore likely that a tension will remain, and adaptive networks may only survive as long as chains of trust extend into the political domain, and budgets remain limited. Other than that, there may be no distinction possible between governance and the monitoring of governance, in the sense of a direct process of feedback. If cooperation goes well, the monitoring may be assumed to already be an integrated component of governance processes, while adaptive networks are the vehicles for the flow of information.

A quick comparison with what innovation theories and theories of social capital indicate about monitoring suggests that also here the same paradoxes may occur. There, it is suggested that bridges between subsystems and domains that are least connected and most interdependent are most critical and therefore the most informative. In innovation theories this is defined as the innovation system, connecting the academic, private and public worlds (the triple helix). However, such monitoring probably will be mainly in academic interest rather than the political interest, because reporting about these bridges may only be feasible with a considerable delay, or limited to superficial information about the connections.

Power to stimulate individual learning: how to assess the critical values of adaptive systems?

Public management scientists may also assess whether power structures, in particular procedures, may contribute to a learning process at the individual or institutional level, thereby increasing trust, willingness to double think, etc. In other words, whether adaptive tensions could be created as an incentive for learning and perhaps development of loose adaptive networks. In the recent past, several discourses have emerged in The Netherlands carrying such ideas, and have some prescriptive content. Obviously transition management itself is such a discourse, which in my analysis appears to be not only complexity speak. Other such governance discourses are termed 'different government' and 'development planning'. It would be interesting to review their effects, and see if they lead to more connectedness and co-evolution.

Some of such discourses actually lead to interventions at a level of governance processes. A major example is that of impact assessment – procedures to ensure that certain information is presented before formal decisions are made. Geert Teisman and I wrote in 2002 that impact assessment is a lost opportunity. Offering information by force to a power network does not make that knowledge more acceptable or more influential. Knowledge should intertwine, communicate, integrate, and create variety in power networks (Nooteboom & Teisman 2002). That cannot be enforced by procedures: the power networks should be open to it, or it won't happen.

Yet, procedures also may create new interdependencies, which produce tensions in the social system. Basic democratic procedures like elections and the separation of the powers undisputedly have contributed to more balance of power, and therefore adaptive tensions for proposals in the general benefit. It is still my belief that impact assessment, at least for less strategic government de-

cisions, helps to create adaptive tensions in power networks that make them more sensitive to innovative proposals that diminish the impacts on interests that are otherwise relatively weakly represented in the early policy-making processes. Change managers may tap from that energy source to open power networks up for knowledge, gradually and in a positive spiral. On the other hand, by pushing too hard and making impact assessment procedures too complex, the tension exceeds the second critical level of dissipative systems, and chaos results. This seems to have happened around the year 2000 in Western countries, and it was termed an impact 'assessment fatigue' (De Jong & Nooteboom 2002).

Advocates of impact assessment and other incentives for learning to deal with complexity therefore may behave as change managers, and try to assess these critical values. There is a clear need for methods to do that. This seems to be of a different order than the assessment of the impact of direct adaptive tension in a policy process, because some degree of generalization and repetition seems to be possible, as impact assessment will be applied many times.

Trojan horses

Nonetheless even if impact assessment is believed to create adaptive tensions that lead to sustainable development, it is quite possible that affected actors resist against procedures. It will make their reality more complex, and for example it may reduce their competitiveness. Sometimes a lever can be found without enough support in all affected components, by making it serve as a Trojan horse. Such a Trojan horse could be regarded as a third kind of lever. The first kind are the traditional carrot, stick and preach, the second kind is the communication (power behavior) in networks, and the third kind is creating new tensions that encourage adaptive networks. (See also Figure 6 on page 69).

The vested interests may be caught off guard. This may have happened according to some with the European Directives on protection of habitats, or quality of air and water. It was sufficient to build-up influence and co-evolution in partial system components, after which the heads of state and Parliaments approved the proposals, since there was no time for vested interest to resist by organizing countervailing powers, and the Directives were approved. Subsequently, they created enormous pressures on the development of markets. The intensive farming of pigs, which used to be an important branch, is now disappearing from The Netherlands, since no creative solutions have yet been found to merge the different interests. As regards air quality, the pressure is visible in the form of dozens of building projects that are delayed in 2005 and 2006, without perspective yet on creative solutions that will make them go forward. These events take place and no analysis is made of the effects that can be expected from these pressures. One possibility is that polluting activities move to areas with less strict regulations. Another is that urbanization spreads over larger areas, creating more dilution of pollution thereby not exceeding legal limits, but also creating more transport and a reduction of large unspoiled areas. Yet another possibility is a political crisis and disobedience with respect to the EU. The European Commission's general secretariat has put procedures for impact as-

sessment of new legislation in place, which should prevent legislation to have undesirable side effects. It seems helpful to develop a methodology for determining the effect of Trojan horses in terms of adaptive tensions in relation to critical values.

Where impact assessment focuses on binding rules, governance discourses may also be seen as Trojan horse. The transition management discourse itself created momentum for the IB and the ETP for several years. This may also be a thought behind the 'Open Method of Coordination', which is suggested to better articulate the EU's efforts towards sustainable development (CEC 2003). The promise of a large high-level EU meeting where dilemmas would be worded in a way that is meaningful to all countries, adequate to their sense of urgency, and all sectors, seems to have created the expectation that this conference may well become influential. This idea appears to have driven many people to participate in its preparations. There may be another factor yet: some people may have seen that differences between countries are smaller than differences between sectors (transport, environment and energy). Then, an international learning process may generate lessons.

Sustainable development as strange attractor

A theoretical problem is still how to make an independent judgment of whether the collective rationality of an adaptive network contributes to sustainable development. There are still calls for instruments like sustainability impact assessment, but these lack a theoretical basis in a socio-constructivist or memetics worldview. There have been many debates about the meaning of the term sustainable development. Where hardly any interest group will deny that our development should be sustainable, the debate is how that should be interpreted, and that is where controversy begins. On the other hand it is precisely this debate, engendered by the intuitive appeal of the term sustainable, which has created the primary adaptive tension that ultimately led to closer cooperation between the public and private sector in the field of automotives. Any effort to define sustainable development in detail, and using that as an argument to achieve sustainable change in political debates, disturbs that process, and belongs to the class of sustainability research programs or sustainability knowledge systems, that may be expected to meet the same limits as DTO and NIDO did in the Netherlands.

Therefore it may be more advisable from the point of view of sustainable development itself, to keep it an unspecific term. In policy processes, driven by the interdependency in global and local power networks, it may then serve as a strange attractor (Judge 1993) – by avoiding development choices or inertia that are clearly unsustainable and that can be avoided, the goal-seeking process will deliver results that are more sustainable. The strange attractor may attract adaptive networks to engage in that goal-seeking process, ensuring that many groups participate in the co-evolution. An interesting question is, to which extent the establishment of national sustainable development action plans, sustainable development councils, sustainability impact assessment, etcetera, contribute to sustainable adaptive tensions. If the succession of stages I observed for The

Netherlands can be generalized, it may be possible to assess in which stage a specific societal system in a specific country is. The question then becomes, in which degree are adaptive networks emerging and alive? In which degree may the structures that are put in place contribute to the emergence of such networks, given the context that embeds these systems? What is the complexity of their joint vision and implementation potential (i.e. do they have increasing requisite variety?). An analysis framework probably should be derived from a more general theory about the measurement of collective intelligence.

Collective intelligence

There are some wider theoretical considerations about collective intelligence that have implications for studying the sustainability effects of power interventions. Theoretically, as (members of) adaptive networks evolve to become better at what they do, co-evolution speeds-up. Thinking and acting throughout the composed subsystem is then better attuned with the long-term interests of the system – provided the shared vision that adaptive networks continuously verify and reproduce as a selection mechanism for ideas to co-evolve, is accurate. If this shared vision is composed of input from all parts of the subsystem, all having their own perception of possible developments in the real life world, it probably may be assumed to be relatively robust. Whilst not all participants need to oversee all details, they should develop a single language in order to trust that the whole vision really builds-up from these parts, and that others really act according to it. Trust is therefore important to compensate for bounded rationality of each individual (the limited cognitive capacity), it therefore builds up more complex socio-cognitive symbols (i.e. ideas that do not reside in any individual brain, but emerge as the interaction pattern of several brains), but it should be based on realistic expectations.

Then, a more complex collective rationality may emerge. In other words, the whole adaptive network may be said to produce an image of the composed subsystem, as it develops in relation to its environment, and through the adaptive networks, there is some level of coordinated action throughout the composed subsystem. Since all members of adaptive networks hold only part of the required knowledge, the capacity of verifying the coherence of these partial images with each other and with the shared vision becomes critical. The better the adaptive network can do that, 'governancing' trust and coherence, the more the composed subsystem, through its living adaptive networks, develops an implicit self-consciousness based on a self-image that not one member of the adaptive network can reproduce in its completeness – the consciousness only emerges at the level of the system as a whole.

Through self-reference at higher-order level, the composed subsystem visions itself, wired by the adaptive network, in relation to its future environment, and it takes action that is required to become that. The quality of that action depends on the quality of the self-image. If it is one-sided, with a focus on the interests of specific system components, there is little requisite variety, and it will not be able to respond accurately to the complex changes. Its level of com-

plexity will not be maintained as long, that is, its life will be shorter, components may survive in new combinations, but the whole may disintegrate. Precisely like a person might have an inaccurate or schizophrenic self-image, so might a composed subsystem. The accuracy may depend on how its agents generally react to pressures – by inertia ('cup half empty'), by investing in connecting behavior under uncertainty ('cup half full'), or by pushing for simple solutions ('cup half full with poison'). As all three will be present, these components of governance may occur alongside.

Power interventions that are supposed to contribute to sustainable development somehow have to be evaluated against this background. This becomes a question about the existence of adaptive networks and their interconnectivity. Loose networks as well as pockets of trust interact and both should probably be evaluated. A distinction may be helpful between the requisite variety in terms of influence (to which implementing power is a network linked?) and in terms of knowledge (does the network take weaker interests into consideration by developing knowledge about them that is connected to the shared rationality?). The latter may prevent mistakes that easily can be avoided by just mobilizing the right knowledge at an early stage. Then, sustainable development would function as strange attractor for a much larger system, based on responsibility one system takes for the benefit of another.

Adaptive fitness

As adaptive networks are living structures, they have to survive in an ecosystem. The capacity to evaluate their adaptive fitness in that ecosystem becomes important when a change manager considers giving time and resources to that network. It seems to be useless to spend resources in a network that has no influence, or that develops proposals that are not 'intelligent'.

CEOs or ministers may, for example, select proposals made to them by adaptive networks by an inference of the connectedness of these networks: in which degree do they have an overview of the complex problem, and capability of influencing other CEOs or ministers, with the potential of creating co-evolution in the power network? Such formal leaders may also generate creative competition by promising reward to several adaptive networks for the best proposals, and that selective pressure may then drive the evolution of adaptive networks. But on the other hand adaptive networks are internally driven and determine their own success parameters based on their vision, and ultimately based on self-reference. Otherwise, the coherence in the network would quickly be gone, trust would evaporate and requisite variety would be lost. Adaptive networks therefore should become better in seeking opportunities under that pressure, matching both sides.

Table 15. Some structures identified in the literature, which are comparable with adaptive networks

Network organizations and coopetition have been described in business networks (Brandenburger & Nalebuff 1996), which probably may be expected to reach lower complexity levels than adaptive networks that address the sustainable development of total societal systems.

Communities of practice (Wenger 1998) seem to be mainly aimed at learning from the practice of implementation, which perhaps might rather lead to incremental improvement close to current market processes rather than to totally new ways of thinking about progress.

Advocacy coalitions (Sabatier 1993) are perhaps one-sided, just like the sustainability knowledge networks in the Netherlands in the 1990s.

Connecting structures have been described also for globalized societal systems, like Kofi Anan's Global Compact, where Ruggie (2002) applied the term *learning networks*.

Closest to adaptive networks perhaps comes the idea of *viable systems* of Stafford Beer. The Viable Systems Model, as summarized with full bibliography in a web guide by Jon Walker (1991, first version) is based on ideas of cybernetics and focuses on change management in firms, but it also has been applied to world communities. The major difference with the idea of adaptive networks seems to be the conceptual separation of conduct based on power and goal-seeking.

In the Netherlands, Wielinga (2001) has described networks as living tissue, and introduces the term *vital space*, developing in the tension between consensus, autonomy, hierarchy and competition. There may be similarities with Lester & Piore (2005)'s idea of *'public space'*.

Perhaps the most critical double think, for sustainable development, is indeed that of CEOs and ministers to be willing to protect and guide adaptive networks whilst the time is not yet ripe for their proposals. This is for example what energy minister Brinkhorst did in 2004 when he defended transition management in Parliament, and six ministers in 2005. Such a CEO then still needs to evaluate which ideas, from which networks, are the best in terms of producing an adequate self-image of the system with success potential. Whilst keeping some distance to the adaptive network, as CEOs are busy, such a CEO should know enough of it to make an assessment. What kind of information would give indications about the adaptive fitness of a network? A traditional ex ante evaluation is not helpful (e.g. De Bruin and Ten Heuvelhof, 2000). He should assess the competences of a network of creating change before he dedicates his resources to it, and compare this with other possible networks. In other words, the CEO or change manager should assess the (potential) interconnectivity in a network, the degree in which knowledge can be integrated and can be influential. I return to fitness measures in 7.5.

Comparison of adaptive networks with similar concepts

The theoretical framework for adaptive networks I have developed, based on complexity theory and memetics, is closely related to similar structures that have

been described in the change management literature. However, I have not made a systematic comparison. It might be that different concepts actually describe similar phenomena in different words, or that different organisms and species of learning networks should be described. A provisional inventory is presented in Table 15, which emphasizes the differences.

Planning research about adaptive networks

This PhD research was co-financed by one IB member's firm, who created support in a small network in the consultancy where he worked. The aim was to inform the world about emerging adaptive networks (although success was by no means certain at the start). I have tried to be truthful to what I saw, but indirectly I have become a member of the transition discourse and the IB, and I am therefore not objective. The question is whether objective research of adaptive networks is possible at all. The answer may be that social scientists may assist in reflecting from a distance on the self-image of an adaptive network, to identify blind spots. However, when keeping some distance it is theoretically impossible to share the knowledge that most members of the network have, given cognitive limitations of the researcher. There is still no way to determine if the cup is half full or half empty, but the researcher can ask questions that improve the network's self-image. The type of questions he would ask are the same a double thinking CEO would ask before giving support: the questions about adaptive fitness.

7.5   *Sustainable change managers: adaptive fitness*

Complexity theories and the experience under the transition discourse give some idea about how change managers should behave if they want to solve complex problems. If many change managers behave like that, an adaptive network can emerge with a high adaptive fitness, in the sense that the network develops an adequate self-image, from where it can effectively influence development in a desirable direction. I formulate these lessons for individual change managers in a prescriptive way, although the circumstances under which they are valid have not been tested or fully compared with the change management literature (other than what I have used in chapter 2).

Awareness of complexity

In my definition, all members in an adaptive network are change managers, since they need at least to apply double think and act on behalf of the whole rather than the parts that gives them material reward. That should be based on an awareness of complexity, the fact that each person (and each network) has a bounded rationality, and therefore that a process is required to achieve a collective rationality. More in detail I make the following recommendations.

First, all members should think in terms of complex system analysis, in order to develop a shared rationality for action, and as a basis for trust. The 'sharedness' should be based on a joint view about the world, and how that might be influenced, and the most widely acceptable view seems to be complexity think-

ing, since it provides place for different partial rationalities. The IB as well as the ETP made such analysis in terms of a vision (1 or two pages for each network), an overview of transition paths, and individual joint actions.

Second, awareness of non-linear change is needed to give the change managers tools for an agenda as well as for setting action priorities. If the power networks somehow are already destabilized by other factors, it may be easier to give them an extra push. The IB took this explicitly into consideration; it is what they observed in the case of automotives and regional mobility systems. By making this analysis earlier than others, and taking initiative, they became forerunners. For other transition paths, they focused on influencing research agendas or setting up associated networks.

Third, the orientation on becoming a connecting network, with co-evolution as objective, and adaptive to context changes, should be conscious and explicitly shared in the network. It forms their self-image, which allows defining success. At early stages, when there are ad hoc connecting interactions between members of power networks, moderators should take steps toward a more stable adaptive network. The moderators may consciously combine the adequate knowledge and influence, and help the group to develop an interaction method, to create a self-image in relation to the power context, and to learn-by-doing; in a way, taking care of the metabolism of this organism.

**Figure 10. Internal interactions between the members
A, B and C of a network**
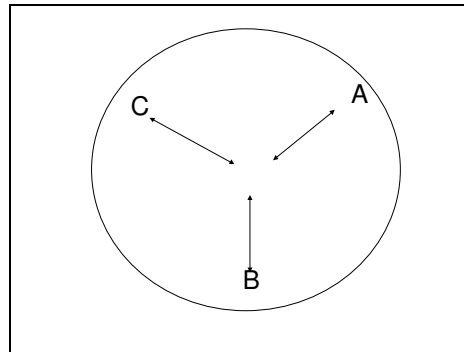
An internal interaction method

An adaptive network needs to interact to achieve its theoretical potential (see Figure 10). Goal-seeking interactions and connecting behavior can be drawn by the tension created by accounting behavior in power networks. It is then unlikely that the shared rationality can be complex; for that purpose, the group probably needs to dedicate more time to reflection.

In the IB, the interaction method was to organize two-monthly meetings that were completely dedicated to goal seeking. It developed a joint system analysis,

and discussed possible futures, transition paths, and aligned action between participating organizations. In the context of these meetings, there were ad hoc smaller meetings of change managers who discussed the terms of success. In the ETP, the working groups and platforms were formally learning networks, but the most effective connecting behavior occurred behind the scenes, in groups that discussed their joint behavior in the working groups and toward the rest of the national government.

The only kind of decision-making required in the group is about the common system analysis and about actions its participants take to gather information needed to make a next step in building a case for interventions by a power network. Theoretically, there needs to be no consensus since no member of the group can forbid others to cooperate on partial issues. They only can exclude themselves from the action, try to delay the process, or try to make opportunistic use of the information they have. To prevent the latter, an adaptive group can explicitly address internal trust, as the IB and ETP did. In addition, the group should discuss its own position with respect to power networks. It should analyze the expected development of the wider societal context on the longer term, the expected development of power networks on the middle term, and the possible effects of their own proposals on the short term, and relate the three two each other to develop their common rationality. Ideas can be piloted in power networks, they may or may not affect the tensions in the power network as feedback will illustrate, and based on that information a next step can be chosen. It is therefore useful to have an overview of transition paths, possible actions for reference, but also to be opportunistic in the precise focus or actions on the short term.

An external interaction method

After imagining interventions and their possible effects, an adaptive network should actually create an impact by communicating with the larger subsystem it tries to influence, i.e. the composed subsystem or the 'whole'. It has no powers, and therefore it has to align thinking based on pure argumentation. This requires an external dialogue. Senge e.a. (2004) term this a 'dialogue with the universe'. Such dialogue can occur in meetings, in larger events or via the media. To be heard, the adaptive network must first influence a power network (via a lever of the second type, see Figure 6 on Page 19). Any individual communicating in public acts as a member of a power network, since his communications have effect on his wider support and legitimacy, and create expectations of reward. If ideas are well received many people reproduce them in their own communications and the ideas resonate throughout the system. If they are not, the communication will be forgotten, or support will diminish.

The idea of dialogue between an adaptive network and the composed subsystem that it intends to influence is schematized in Figure 11. The arrows symbolize the communications between adaptive networks and their composed subsystem (the whole). The whole can also be seen as the total of individuals that are the clients, voters and employees that, through their behavior, reproduce the

structure of the societal system. The adaptive network communicates with the whole via the agents (in this case A, B and C) who act at two levels: through the beliefs of the adaptive network, and in their capacity as power network (this is double think). As they do so, the agenda of the power network has changed, the adaptive tensions have changed, and depending on feedback from the whole a next step can be taken. The adaptive network is in the central circle, the connected organizations are shown in a wider circle and the whole composed subsystem encompasses it all.

Figure 11. External interactions between an adaptive network and the whole it tries to influence, through its members A, B and C
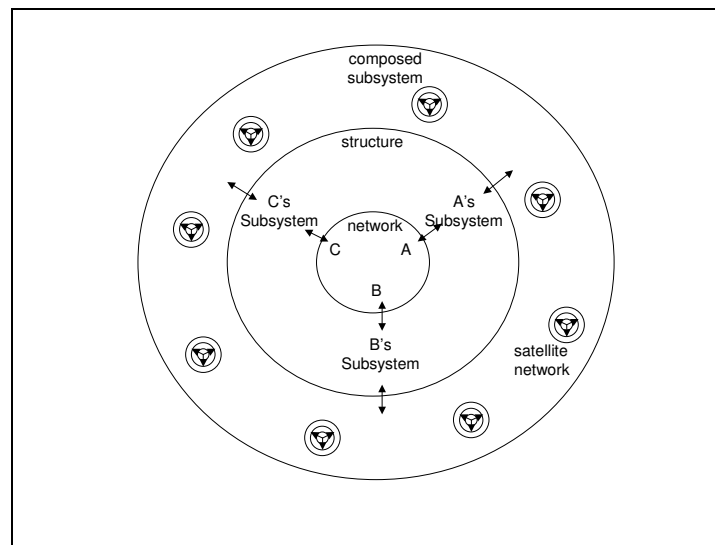
Feedback returns through communications (reactions), and through observed changed conduct. On a larger timescale, an adaptive network may develop in continuous communication with its larger social system. In a larger composed subsystem there may be several active adaptive networks, all competing for the same resources of power networks, and all claiming that they contribute to the same general goal (e.g. sustainable development). The power networks select.

A change manager in the power network who is capable of selecting the best ideas by giving them the resources they need, may evaluate which networks deserve his support by imagining each network 'as the center of the universe' and how it might develop, given its interconnectivity. In this thought experiment, other proposals become part of the one that is evaluated (the satellites in Figure 11). Thus these other networks are simultaneously competitors and co-operators in the larger process of generating and selecting ideas. These ideas about being in dialogue with the whole are closely related with my observations of the external interaction method of the IB.

Identity

An adaptive network needs an identity, a self-image about its position in the world, and that self-image should be balanced in order to create requisite variety to match the complexity of the desired changes. It should have influence in enough system components to influence its development without meeting countervailing power. It needs to create co-opetition between these components, which requires balancing the knowledge about and influence in these different components. As regards the even larger units, which will be influenced by the changes (the world), it may take that up in the vision as conditions. Persons close to formal leaders may add a lot by functioning as 'hyperlinks'. Jeroen Tulp in the IB was such a person. Other parts of the network may only be represented in terms of knowledge about these parts, not influence. As the group has direct influence at high level in more parts of the power networks in the composed subsystem, the interconnectivity of that subsystem is higher, and it can more effectively adapt to circumstances.

Choices may be based on intuition. As issues get complex the group members must trust the competence of the other members to make adequate assessments of their position. Interconnectivity can be assessed through comparing the images different members sketch of the group's position, and agreeing that actions taken contribute to a joint vision. If these images are consistent and coherent, it is more likely that the group acts on shared ideas. This is important because inconsistent or premature outward communication about joint ideas entails a political risk – the credibility of the group in the eyes of enablers may diminish.

In summary, in raising consciousness about identity the following factors are important:

- How is the composed system wherein the group wants to achieve impact delineated?
- Which are the relevant components of the composed subsystem (how is it structured)?
- About which components does the group have (inside) knowledge?
- In which components does the group have influence?
- How is this influence related to the power network where possible interventions need to be accepted?

These questions can be answered with the help of in Figure 12, which I call the interconnectivity triangle. In my view the IB consciously discussed the type of knowledge and influence that was needed to make a next step, and implicitly applied the interconnectivity triangle. In this way it became more adaptive to its own perceptions. In the triangle, the adaptive network is shown on top, overlooking the structure of and behavior in the composed subsystem. The structure is formed of power networks, and determines the components, leading organizations and agents, their mutual relations, interdependencies, and therefore the adaptive tensions. This adaptive tension is the 'target' of the adaptive network.

The interconnectivity triangle connects the adaptive network with the whole via the political leaders that they influence. The triangle is composed of three main processes, which are connected through influence and leadership:

The first process is the *evolution of behavior* in the economic and political markets, where agents (lower governments, companies, consumers, citizens, voters, employees) make their daily decisions. This leads to the development of market systems and patterns of production and consumption. For market actors, leaders in the structure formed by the components of the composed subsystem, are highly visible. If these leaders change their agenda, a new adaptive tension emerges, and the market is rewarded in a different way. The adaptive network, on the other hand is invisible for the market at large, but the market may still be influenced by it indirectly, via the power network. The adaptive network can make its own direct observations of the market, for example by inviting academics.

Figure 12. The interconnectivity triangle, three processes and their links
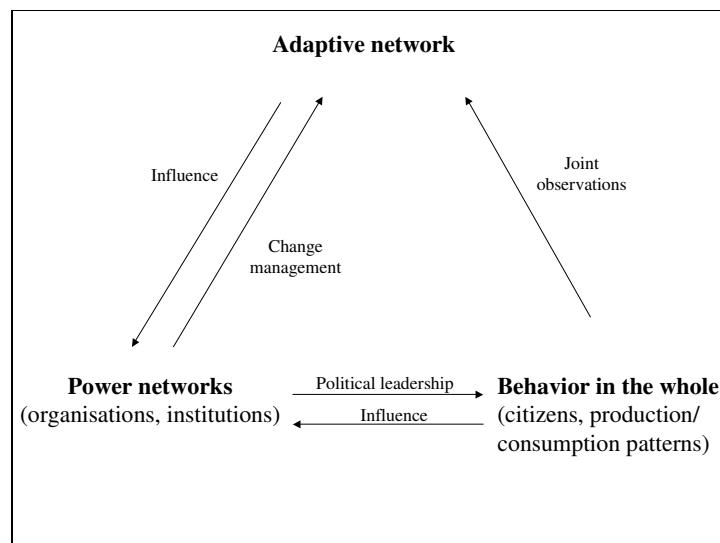
The second process is the *evolution of the adaptive tensions in the structure*, which determines how agents in the market are rewarded for their behavior (or will be rewarded in the future if certain interventions are announced). Structure is composed of institutions, organizations and dominant rules of engagement. It is represented by the communications of its political leaders. Agents in the whole do what they are rewarded for, thereby reinforcing the structure time and again. Political leaders are rewarded for acting in the interest of continuity of their organization, which is why the whole influences them, but they may also take the initiative for change, awaiting the feedback from the whole.

The third process is the *development of adaptive networks*. Here, change managers try to influence the power networks that form the adaptive tensions from behind the scenes. Agents with power can engage in adaptive behavior, becoming change managers. The adaptive networks develop an image of their position. By definition they cannot have direct influence on the market, but by influencing the adaptive tensions they can have indirect influence.

Balance of knowledge

The interconnectivity triangle also may help to create balance in the process by identifying the type of knowledge required for progress and balance. Goal seeking obviously requires a lot of knowledge about the market and about developments in the power networks. The interconnectivity triangle may help to identify gaps in knowledge. Making the interconnectivity triangle for a particular societal system explicit requires three types of knowledge:

Knowledge is needed to *create a variety of perceptions* about the societal system. Here, experts from components of the system indicate how people in their component think about the system and about changes and innovations. These experts may work in influential organizations in the political process, in particular in the government, NGOs and enterprises, but also in the academic world.

Knowledge is needed to *intertwine between separate views about the whole* from the general point of view of possible futures. How are consumers likely to respond to structural changes? How are citizens going to evaluate the implications of these changes? The availability of such knowledge is not automatic. Structural organizations and their experts are by nature shortsighted.

The third type of knowledge, or perhaps more adequately 'skill', is knowing how to *communicate and integrate thinking of people*, developing the group's competency to undertake a goal-seeking process. These people may assemble the group, give structure to its thinking, and find words to describe the importance of this process and its chances of success.

Political opportunities

As an adaptive network achieves progress and balance, it depends on political opportunities for applying levers. The word 'adaptive' applies perhaps more to the required political opportunism than it applies to making use of societal trends. To be effective, a learning network must reach those who influence the formal, political agenda. For such persons, any communication in public is a political action. It is a political risk to do that, since even if the idea has been well thought out and is in the potential interest of the whole, opponents may respond opportunistically before a public that doesn't oversee the depth of the issue. This is a political risk that may be reduced by creating adaptive connections with opponents (co-opetition). It may also be a risk to allocate resources for doing research or doing pilots in the market, if such is not yet accepted as a formal objective. Thus, the members of a learning network should always be keen on political opportunities, so-called windows of opportunity (Kingdon

1995). They should be masters of double think, where the tension between joint long-term objective and the short-term political objectives is used to create new matches. It may be so, that a learning network has identified a number of actions for which the time is not yet ripe, and these may be waiting 'on the boiler plate', until an opportunity arises. Such joint actions are to serve the common goal, which only can be achieved at the long term. These actions should match with the short-term goals of political leaders. Because of the chaotic and unpredictable political process (leaders may be replaced), a learning group should always discuss the political developments and be alert for opportunities.

Power networks rarely explicitly indicate the types of proposals they will accept. Sometimes there simply may be room for such proposals in the wide and abstract statements politicians and CEOs have made. The IB has showed this by making use of the public declarations of the need for sustainable corporate governance by some CEOs, but also by many of its smaller actions.

One step at a time

As described above, adaptive networks may become impatient and try to push power networks into a certain course of action (e.g. the example of DTO). In that way, the adaptive network has lost its adaptability and has become a force like any other. In order to keep progress to more interconnectivity until the power network really is ripe for change, the adaptive network should propose the power network to change its conduct one step at a time, and only push further if connectivity, i.e. the influence of the adaptive network, proceeds accordingly ('those man can best lead who follow the same road a little ahead'). Pushing it may blow up the process of building trust and foresight, and the ideas may become unacceptable for a long time, since vested interests build their counter-discourses.

Opportunities for the discourse itself

The six ministers cooperating in the Inter-Ministerial Transition Program (whilst being political competitors!) had never given any indications that they were interested in such a Program, but they were open for it; there was an opportunity. The IB, the ETP and the five DGs had needed four years to achieve this level of complexity, and in these four years, political support for transition management had not been withdrawn. As the next elections are nearing, momentum outside the government has been built-up, the government itself has re-organized itself to form a context for counter-acting adaptive networks in the government, and the two keep each other in balance. The implication is that the transition discourse, its effect on power networks and therefore its adaptive networks may have become less vulnerable for elections.

8 Glossary

Accounting
: The type of behavior where an agent rewards another agent for contributing to his agenda.

Adaptability
: The capacity of a subsystem to adjust to changing circumstances. Because of interdependency with other subsystems in a composed subsystem, this capacity depends on the interconnectivity in the composed subsystem.

Adaptive network
: Groups of policy makers having influence and knowledge in different parts of society, aiming for co-evolution of ideas.

Agenda
: The (public) agenda is the set of objectives for which agents says to strive, and promises to reward agents who contribute to these objectives. This includes priorities. Agents may promise more than they can do, and may not be open about their true priorities.

Agent
: A person, unit in a social subsystem, who makes independent decisions about its own conducts, and takes the mutual relations of the other agents in the subsystem into consideration.

Change manager
: An agent who tries to make a subsystem more adaptable through connecting behavior. In the transition discourse, such a person is called a transition manager.

Co-evolution
: The mutual influence of ideas, structure, process, conduct and reward in different, interdependent subsystems through mutual selective pressures at market level or at social level. In the latter case an awareness of possible selective pressures through the market can help align development of ideas and subsequent alignment of market actions. Co-evolution of thinking is hypothesized to make the higher order subsystem more adaptive to changing circumstances.

Complexity speak
: A normative discourse about the themes of this book: content, structure, process, behavior and reward. The term complexity speak is used to suggest that those who express this discourse are not willing or capable to follow its suggestions.

Composed subsystem
: The social subsystems that are all related to the same market system, and therefore they are interdependent.

Conduct	Observable behavior of agents; in either specific situations or in general. Patterns of behavior form a strategy that may or may not be intentional.
Connecting behavior	Conduct that initiates or constitutes an adaptive network. Same as adaptive behavior and change management.
Content	What is, or could be, expressed in language: ideas, views, perceptions, memes, theories, discourses and knowledge.
Context	The context of an adaptive network is the power network that generates an adaptive tension. The context of the power network is the composed subsystem they govern (the 'whole').
Cooperation	An agent's conduct in the interest of a subsystem, for which the agent expects reward.
Coopetition	Conduct that is based on, and leads to, trust and shared foresight between agents who compete for the same resources.
Development	The process, the whole of interactions that lead to change of structure, which may have visible effects at market level and therefore in the life world.
Dialogue	A form of communication where two agents try to understand the other in order to identify a common perception or rationality.
Double think	To think and act in the interest of different levels of nested subsystems, with different delay times and probabilities for material reward.
Enabler	A change manager at a high position in a hierarchy, who spends only little time on activities of change management, and allows another change manager to spend significant amounts of time.
Foresight	A type of rationality that explicitly tries to make adequate assessments of the effects of own conduct in networks and ultimately on societal systems; the adequacy is not directly observable but it is assumed that systems thinking (complexity thinking) is the most universal language to develop joint foresight.
Goal-seeking	The type of behavior that leads to ideas that is expected to be acceptable for a power network, and to relieve a tension in that network. A form of learning where a number of agents link their resources and interact with their larger subsystems to create lessons for a mutual benefit.
Governance	The interactions patterns, or the generalized interactions, in a network. There may be an emphasis on accounting or goal-seeking behavior. For optimal adaptability the two need to be in balance, since then mental flexibility is combined with the capability to physically implement.
Higher order	Subsystem X is one order higher than subsystem Y if Y (perhaps represented by one of its agents) is one of the agents in X. The ideas formed in X are meta-ideas of the ideas formed in Y.
Innovation	The impact of goal-seeking interactions in adaptive networks, aimed at a different kind of development.

Institutionalized	An emerging structure that many agents perceive who determine their rationality to a significant extent on it and its ideas.
Interconnectivity	The degree in which content is passed around in a social subsystem, influencing conduct through co-evolution. Depends on the quantity and quality of connections between agents.
Interdependent	Two or more agents are defined to be interdependent if they compete for the same limited resources they need to exist, as expressed in their routine behavior.
Lever	An intervention a power network can make into either the market or in the social processes about possible market interventions.
Market	The exchange of goods and services that shapes the development of the real, visible world.
Mutual relations	The perception two agents have about the behavior of the other; this perception may develop in interaction.
Nested subsystems	A general term for subsystems that are composed of smaller subsystems. In the context of sustainable development, the term composed subsystems is used, which are linked to societal systems.
Network	A (governance) network is group of agents who have mutual relations based on interdependencies; it is a kind of subsystem whose agents are representatives of other subsystems. These agents are, in their own perceptions, more or less equal in their degree of dependency.
Organization	A hierarchical organization, an institutionalized subsystem
Process	The whole of interactions in a subsystem, which is based on and lead to conduct.
Proposal	An idea that an adaptive network proposes to a power network, to adjust its agenda.
Rationality	The relationship between ideas and behavior
Reward	Recognition an agent gets from other agents for his behavior, that may or may not be material
Societal system	A market system and the social subsystems that depend on it, like the mobility system; the energy system.
Structure	An idea about the pattern of a subsystem as observed by many agents in the subsystem. Adaptive networks are volatile structures that are only observable for its members. Power networks are institutionalized and visible.
Subsystem	A (social) subsystem is a group of agents with mutual relations. The prefix 'sub' is often added to emphasize that each system is an agent of a higher-order system and therefore dependent.
System innovation	Changes of societal systems, and related changes of composed subsystems.

Systems thinking	Thinking according to the principles of cybernetics and complexity theories, based on an evolutionary worldview.
Trust	A bet on the future conduct of other agents.
Wicked problems	Conflicting agendas; the same as complex problems.

9   Abbreviations

ANWB	An NGO for mobility, outdoor recreation and tourism
CEO	Chief Executive Officer
DG	Director General / Directorate General
DTO	Sustainable Technological Development
EC	European Commission
ETP	Energy Transition Process
EU	European Union
EZ	Ministry of Economic Affairs (responsible for the energy sector)
IB	Innovation Board Sustainable Mobility (which had no formal status)
IPE	Program Directorate Energy Transition (a cooperation of six ministries)
IUCN	The World Conservation Union
LNV	Ministry of Agriculture Nature and Food Quality
LTVE	Long Term Energy Outlook
NGO	Non Governmental Organization
NIDO	National Initiative Sustainable Development
NMP4	Fourth National Environmental Policy Paper
R&D	Research and development
SER	Socio-Economic Council
SG	Secretary General
SNM	Netherlands Society for Nature and Environment
V&W	Ministry of Transport, Public Works and Water management
VROM	Ministry of Housing, Spatial Planning and the Environment
WBCSD	World Business Council for Sustainable Development
WWF	World Wide Fund for Nature

10 Tables

11 Figures

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14 Summary

The governance for sustainable development

In this book, I reconstruct how policy makers, working together in what I term adaptive networks, have enabled a breakthrough in thinking about sustainable mobility in certain policy circles. I define the conduct of leading actors in these adaptive networks as sustainable change management. Sustainable development is conceptualized as a complex problem. No single person or organization can 'manage' sustainable change autonomously. It is a joint concern and therefore a matter of effective governance – a joint effort of several domains. Adaptive networks are self-organizing groups of policy makers who enable joint fact-finding and visualizing a direction towards improvements, in this case sustainable transport. These policy makers combine two capabilities. First they are influential in, and have knowledge about, different power networks. Secondly they try to break away from the existing policies in those power networks and develop a joint understanding about new, more effective policies. They try to align the evolution of this process of rethinking with the behavior in their power networks. In this perspective, breakthroughs stem from the co-evolution of partly conflicting ideas and interests. Change managers in adaptive networks act on their personal initiative. Power networks are not able to reward their initiatives, unless the new ideas they create have been accepted to a considerable degree.

Adaptive networks develop in the context of power networks – the existing hierarchical leadership that has power over the short-term use of resources, which includes making public statements about (un)desirable developments, creating new expectations of their own conduct and reward. Interactions in adaptive networks are not primarily based on the use of power and much more on the development and spreading of ideas. To become effective, adaptive networks should develop ideas in contrast with the ones in existing power networks and at the same time infect the power networks with these ideas.

The distinction between adaptive networks and power networks is conceptually useful. In practice, there is (and there should be) some overlap between the two, to link innovative ideas with power. People in high (power) positions, who also participate in the learning process, are important linking pins. Adaptive networks become highly influential if they are able to use the existing tensions

in and between power networks. Such tensions are continuously available, because in Western democracies environmental, social and economic interests are separately organized and tend to apply their power in different directions.

The theory about adaptive networks is applied to the Dutch policy making process about sustainable transport. In The Netherlands the intended policy approach has been termed 'transition management'. The concept of transition has been adopted in government policies through the 4th National Environmental Policy (NMP4) in 2001. The existing physical and social complexity creates wicked problems. Setting targets cannot solve these problems, since the problems cannot be fixed and solutions have not been found yet. Political leaders and business leaders oriented towards existing targets will not look for solutions for wicked problems. If they seek new solutions and targets in a governance network, they reduce the chances of short-term accountable progress.

The tension between the accounting component of governance and the goal-seeking component can, however, also be used constructively. If policy makers develop proposals that actors take up in their power networks, the power network may be changed. The changed power network may create new tensions, forming opportunities for new types of proposals. *The iteration between adaptive (reflexive, learning) interactions and power interactions leads to different, more sustainable outcomes, since the justification of policies is based on more complex ideas.*

However, this conduct places high demands on its participants; they must believe they can make a difference. Adaptive networks can be temporary manifestations of individuals willing to think 'out of the box' and define new objectives for the common good, initially not fitting their individual good. I postulate that their emergence and impact depends on internal trust – trust in the other members of an adaptive network – as well as external trust – trust in the relative stability of the power context and its susceptibility for a certain kind of proposals. Internal trust resembles the idea of coopetition – the cooperation between competitors based on common interests that only can be served after a long search process. A third factor is foresight (or trust in an adequate self-image) – the collective capacity of making adequate assessments of the effects of own conduct in power networks.

Research question

I have postulated the existence of adaptive networks. In terms of complexity theory, these are networks that develop trust and can connect different parts of society, so that they can help their system become adaptable to change of circumstances that forms a joint threat, alias a joint opportunity. They do that by trying to contribute to an alternative, more sustainable development. In such a way, the capacity of humans to anticipate also becomes a conduct of the social system as a whole. However, complexity impedes reward of this individual behavior, due to uncertainty and a long feedback cycle. The key question for this book goes one step back: *How can new ideas about sustainable development be*

widely adopted, and how can this be evaluated in the case of transition management? This question is answered through the following sub-questions:

- How can the idea of adaptive networks be related to existing theories of complexity and change? This question is answered in chapter 2, which includes the philosophical question related to the evaluation of the sustainability of ideas
- How can these theories be operationalized to observe adaptive networks, their interaction with power networks, and the spreading of sustainable ideas in the real world? This is elaborated in chapter 3.
- In the case of transition management, how did:
  - Power networks evolve, and where can adaptive networks be hypothesized as an explanation of that evolution? (answered in chapter 4)
  - Adaptive networks evolve, and where can change managers be hypothesized as an explanation for that evolution? (answered in chapter 5)
  - Change managers influence development? (answered in chapter 6)
- Which lessons for sustainable change management, contributing to sustainable governance, can be drawn? This is answered in chapter 7, which deals with issues like coopetition and trust, which, as conduct in adaptive networks, may contribute to a more adaptable society.

Chapter 2: Theoretical notions of complexity

In complexity theory, social systems are conceptualized as an embedded hierarchy (a nested structure) that is closely related to historical, geographical and market factors. Individuals are rewarded for behavior that fits preset hierarchical objectives, which necessarily do not fit complex problems. The result is that social systems develop through their internal driving forces. A social system is a dissipative structure – using some form of energy that can be converted to other forms and passed on in the social system through its reward system, eventually converting to order and disorder. As the agents in the system are replaced and may evolve, a social system can resemble a living organism – with its own metabolism. In the case of social systems, the energy source is material reward by the market system in the real life world, but cultures can also emerge that reward types of behavior that are less clearly linked with material reward for the person or community. This is caused by the long feedback time between behavior and effect in the market system. The agents that determine the reward system and that are replaced and may evolve, are ideas. This is the epistemological view of memetics, which builds on social constructivism. The common rationalities develop as discourses, which still present either overly simple or overly abstract solutions to complex problems. Persons and social groups, which also reproduce and evolve, carry ideas. The capacities of persons and groups therefore may coevolve with the evolution of the ideas that motivate them. This may lead to institutionalized discourses and practices like the democratic system, which may create a shorter feedback cycle for impact of conduct. A division of powers

Diagram 1: Family tree of networks

Greenpolder

Research system
Sustainable development

2000

NMP4-team

Innovation Board
Sustainable
Mobility

EZ team

5DG
deliberation

2006

Platform
Automotives

Inter-ministerial
Transition
program

produces checks and balances, new interdependencies, and therefore social tensions, which may encourage cooperation and learning.

If a social system increases its adaptability to changing circum-stances (i.e. its sustainability), it must create requisite variety: its ensemble of evolving discourses must lead to a pattern of thinking and behavior that meets the complexity of the changes in the environment. The conduct that 'works' sur-vives through in a process of selection. This depends on individual capacities (bounded rationality; cognitive limitations) and on collective capacities (social capital; trust; connectivity). It helps to acknowledge complexity and to apply systems thinking in governance networks. The capacity and willingness of double think is important (meeting requirements for short-term survival in a hierarchical system, whilst trying to bridge the tensions with interdependent other hierarchies). There is a theoretic possibility of management instruments that stimulate such behavior, in innovation sciences termed systemic instruments or public spaces, but this has not yet been well elaborated.

Several authors see as key to such instruments that they create tensions that

Diagram 2: Analysis

Sustainable change management

Power networks

Naked eye

Ideas

Networks

Rounds

Adaptive networks

Magnifying glass

Ext. trust

Intern. trust

Foresight

Change managers

Microscope

Individual
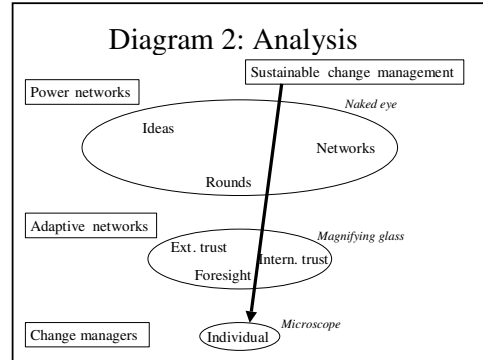
may attract adaptive interactions. Whether that happens depends on the charac-teristics of the social system under tension. If the pressure is too high, it will collapse; if it is too low, it will not change. Survival then may depend on the availability of enough policy makers in different parts of the system, capable and willing to engage in reflexive interactions, and linking to power networks, creating a next order selection mechanism for ideas. This may create more alignment between conduct in different subsystems, and a more effective re-sponse to common challenges. Trust is an important variable to allow reflexive interactions, and whilst it may develop in a positive or negative feedback cycle, it is also embedded in the more stable culture in a social system.

Chapter 3: A method of complexity research

To observe and explain social change under complex conditions, I have chosen a case study based approach. The case study is formed by the sustainable devel-

opment and transition management discourses in The Netherlands, with a focus on specific networks in the context of NMP4, in the period 2001 – 2006. Diagram 1 gives an idea of the main networks I have identified and studied. The period before 2000 is described in some detail to explain the state of mind of the NMP4 team in 2000. After that, several networks emerged of which the main ones are indicated. For the NMP4 team in 2000 and later networks that took over its ideas, I structure the analysis in development rounds until 2006 in terms of content (ideas)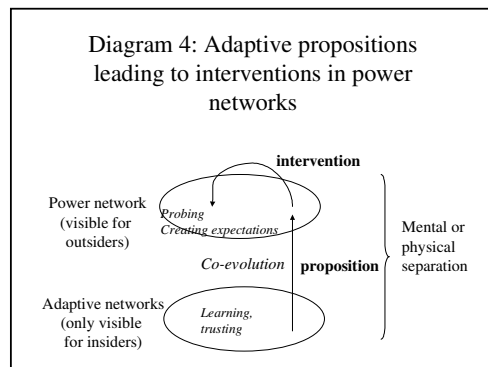, structure (networks), tensions (compensated by trust and foresight shown in conduct), at three levels of scale or detail (see Diagram 2). Trust is closely related to expected reward.
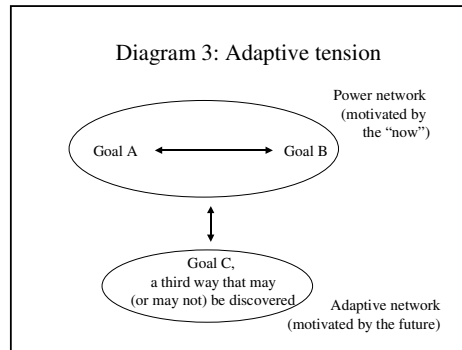
Diagram 3: Adaptive tension

Power network
(motivated by
the "now")

Goal A ←——→ Goal B

Goal C,
a third way that may
(or may not) be discovered
Adaptive network
(motivated by the future)

The interaction between power networks and adaptive networks is described in terms of adaptive tensions that attract adaptive interactions, which generate a proposition, as in Diagram 3. When successful, the adaptive network develops a proposition that is accepted by members of the power network with whom they are linked. This acceptance means that they change their visible power interactions; e.g. by probing (testing) new ideas. By doing that, they create expectations about their own future behavior, and therefore social tensions that may provoke a reaction throughout the power system. Where Diagram 3 structures the adaptive tension to which individuals and networks can respond, Diagram 4 shows how that response is structured. Adaptive networks develop ideas that lead to propositions to power. If power accepts the proposition, a visible intervention occurs in the power networks, which then may respond by an adjustment of tensions.

Diagram 4: Adaptive propositions leading to interventions in power networks

intervention

Power network
(visible for
outsiders)

Probing
Creating expectations

Mental or
physical
separation

Co-evolution   proposition

Adaptive networks
(only visible
for insiders)

Learning,
trusting

In the period 2000 - 2005, I have indirectly observed the development of content, structure, process, conduct and reward. The power context is interpreted from these interviews, supplemented with documents. Large-scale change represented in power networks can assist in hypothesizing the existence of adaptive networks where actions are aligned by emerging next-order ideas (i.e. shared vision). The adaptive groups, interactions and their impact are then interpreted from interviews, making use of triangulation (cross-checks), identifying common perceptions of the

relevant parameters. By monitoring the process, a first hand account has become possible. This material then should create an overview perception of the development of power networks, adaptive networks, the tensions that drove them, as well as the impact of change managers, and it should provide insights of effective conduct in terms of sustainable change management.

Since sustainable development is my research object, I have to define a boundary for research that is meaningful in that sense. I assume that a natural boundary is the composed subsystem – a set of social systems that all depend on, or are affected by, the same market system. This is why the link between large-scale and small-scale processes, i.e. the whole system versus individual conduct, is important. A composed subsystem has market components (like in the mobility system infrastructure managers, commuters, manufacturers), as well as domains with a different type of internal reward system (government, business, academic, civil society). Sustainable development is in that context defined as a development that enables long-term continuation of the composed subsystem, through adaptation to changes in its environment (i.e. other composed subsystems with which it has relations, or the physical environment on which the market depends). Sustainable development is by no means secure, because market interactions may lead to depletion of critical resources or other undesirable side effects that may destabilize the composed system. Yet, the conduct in the composed subsystem may not reflect the concerns for the future some of its members may have.

Chapter 4: power networks; adaptive tensions attracting adaptive networks

The outcome of the historical description of the power networks related to transition management can be summarized as a series of visible interventions about novel ideas, which may have emerged in adaptive networks. Several interventions were visible as well as successful, in the sense that the interventions received positive reactions. The central idea that has emerged was that sustainable automotives are feasible, The Netherlands is a good place for experimentation, and the government should organize a platform that can serve as a power context where the different private stakeholders and public stakeholders can develop widely acceptable ideas about concrete implementation. Direct involvement of top management and Cabinet at crucial moments would ensure implementation of proposals. The most compelling interventions and the associated adaptive networks were:

- The NMP4 team (the first hypothesized adaptive network), with civil servants from several ministries, proposed transition management to the principals of the ministry of economic affairs EZ, responsible for energy policies, and the environment minister and proposing that non-environment ministries were to 'manage sustainable transitions'; and Parliament supported this unusually vague approach;
- The members of the innovation board sustainable mobility IB (the second hypothesized adaptive network), from governments, industries, academics
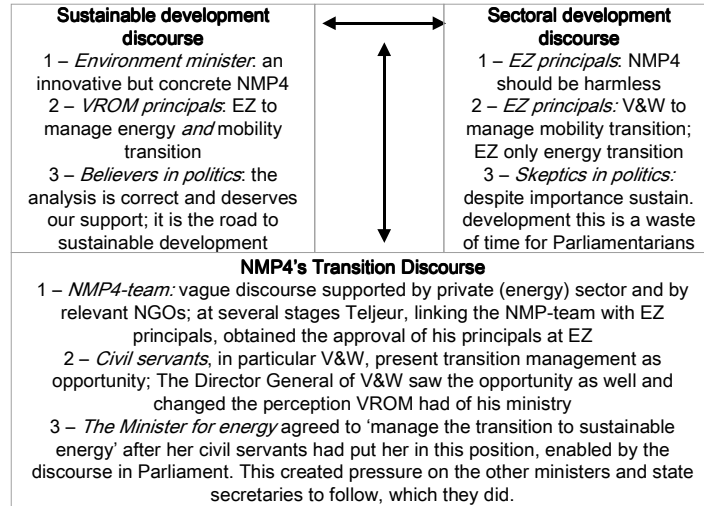
and NGOs, communicated differently in their organizations about automotives; the car as such became more accepted in the environment movement;

- Speakers and voters at the EU conference Energy in Motion, influenced by the IB, took clear positions about sustainable automotives;
- The energy transition process, a team in EZ (the third hypothesized adaptive network), developed transition experiments and more focus in R&D for sustainable energy;
- The Director Generals of several ministries (the fourth hypothesized adaptive network) proposed to establish an Inter-ministerial Energy Transition Program Directorate (IPE), which created an adaptive tension for more coordination between six ministries in order to engage in a constructive dialogue with the automotives sector and other sectors.

This evolution toward bridging the gap public – private in the case of automotives was taken as an example for other paths to sustainable transitions under the IPE. The driving force was the tension between the sustainable development discourse and sectoral growth and competitiveness discourses, which was strongly felt in Parliament. This potential energy has now been focused on the gap public – private through a chain of interventions and tensions. The series of power interventions may be compared with waves of tension that propagate in power networks until, in events like the EU conference, a widely shared new problem definition emerges that gives focus (alignment).

These large-scale waves were built-up through smaller-scale waves. For illustration, I summarize the propositions and interventions in three rounds, during the development of NMP4 in Diagram 5. Here, the adaptive tensions were large scale (as large as the tension between the sustainable development discourse and the economic growth discourse), and the emerging transition management discourse was vague. At later stages, discourses about more specific scenarios emerged (sustainable automotives). This also illustrates that adaptive propositions emerged from different groups at different stages – whereas simultaneously, these groups were linked and the ideas could be shared through adaptive interactions between the groups. Each innovative power intervention can therefore be hypothesized as a manifestation of co-evolution that has occurred before in adaptive networks and has built momentum for the intervention behind scenes. Whilst these adaptive networks as such were not visible due to their sensitivity, politicians communicated about the need of adaptive networks, and the need to give them time. For example, state secretary for environment Van Geel used the metaphor of a 'peat fire'. Minister Brinkhorst of economic affairs also made several statements. The state of affairs early 2006 was that the transition discourse was still alive, and institutionalized through a Directorate. Its profile had been raised, despite a lack of clear outcomes and, related, substantial criticism.

Diagram 5: NMP4 process 2000 -2001

Sustainable development discourse		Sectoral development discourse
1 – *Environment minister*: an innovative but concrete NMP4 2 – *VROM principals*: EZ to manage energy *and* mobility transition 3 – *Believers in politics*: the analysis is correct and deserves our support; it is the road to sustainable development	↕	1 – *EZ principals*: NMP4 should be harmless 2 – *EZ principals:* V&W to manage mobility transition; EZ only energy transition 3 – *Skeptics in politics:* despite importance sustain. development this is a waste of time for Parliamentarians

NMP4's Transition Discourse

1 – *NMP4-team:* vague discourse supported by private (energy) sector and by relevant NGOs; at several stages Teljeur, linking the NMP-team with EZ principals, obtained the approval of his principals at EZ

2 – *Civil servants*, in particular V&W, present transition management as opportunity; The Director General of V&W saw the opportunity as well and changed the perception VROM had of his ministry

3 – *The Minister for energy* agreed to 'manage the transition to sustainable energy' after her civil servants had put her in this position, enabled by the discourse in Parliament. This created pressure on the other ministers and state secretaries to follow, which they did.
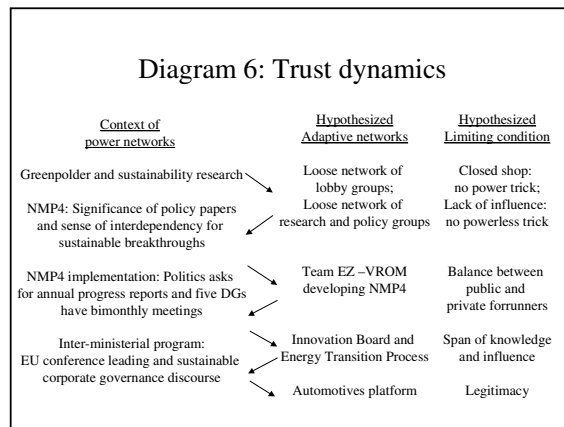
Chapter 5: adaptive networks; trust and foresight

I have analyzed interviews with policy makers who have been closely involved in the interventions above, to identify how and why they acted. I focused on external trust, internal trust and shared foresight. External trust is seen as conduct based on the assumption that adaptive tensions in power networks are stable, creating lasting opportunities for interventions toward more sustainable power contexts. Internal trust is trusting that partners in adaptive networks share in the joint enterprise. Shared foresight might be expressed as a common idea about a sustainable future and a limiting factor for further build-up of adaptive tension in what is believed to be the right direction. A term frequently used in the IB and ETP was 'credible'. Whenever some proposals were not seen as credible, there were

Diagram 6: Trust dynamics

Context of power networks	Hypothesized Adaptive networks	Hypothesized Limiting condition
Greenpolder and sustainability research	Loose network of lobby groups;	Closed shop: no power trick;
NMP4: Significance of policy papers and sense of interdependency for sustainable breakthroughs	Loose network of research and policy groups	Lack of influence: no powerless trick
NMP4 implementation: Politics asks for annual progress reports and five DGs have bimonthly meetings	Team EZ –VROM developing NMP4	Balance between public and private forrunners
Inter-ministerial program: EU conference leading and sustainable corporate governance discourse	Innovation Board and Energy Transition Process	Span of knowledge and influence
	Automotives platform	Legitimacy

different views about limiting factors.

These three factors have been interpreted, and the overview is shown Diagram 6. The arrows from left to right indicate that an adaptive tension exerted by a power network, and trusted by adaptive networks. The arrows from right to left indicate power interventions after co-evolution in adaptive networks; the power interventions may create a new power network with a new adaptive tension. The development of trust was a spiral of positive feedback, leading to more trust. Successful adaptive networks enabled this, and common understanding of their situation drove them. As the networks (apparently) influenced their context to create a new stage of adaptive tension, it trusted that the power context would consolidate for a while, and the adaptive networks had a period to adjust to the new situation, and had to build up new trust to make a next step.

The question emerges in which degree collective behavior in adaptive networks was intentional. It is my observation that specific policy makers were capable of seeing the opportunities for innovative network building. These trailblazers were able to make others enthusiastic. These others were susceptible to this enthusiasm because they had shared the general desire to support sustainable development, and an intuition about large-scale adaptive tensions. They acknowledged complexity, and by getting closer to implementation power they became increasingly committed to the adaptive interactions. They explicitly discussed motives and trusted that the others had no hidden agenda (i.e. the interactions were power free).

This intuition was formed by collective disappointments the 1990s with the greenpolder model and the sustainability research programs. An ironic (in the sense: not discouraged by the seemingly impossible task) and trusting attitude was enough to create some level of shared foresight by contributing knowledge to the common overview. This trust enabled, for example, the members of the IB to take the opportunity of the EU conference, and it connected the involved domains to allow the three ministries to develop a widely accepted problem definition at the EU conference, which was why it was well visited and enthusiasm for addressing sustainable automotives grew again. It is my observation, and that of several members of these networks, that wide acceptance of the transition discourse facilitated these connections. In terms of trust theories, the socio-cognitive understanding of trust (making trust itself an object of policies and conduct aimed at a positive spiral) enabled trust. Trust was explicitly discussed and the process could therefore focus on an agreed limiting factor, and ideas could at times be passed on from one power network to another, if that would enable a focus on the weakest link.

As the trust in intentions of others in the network grew, the limiting factor seems to have become the belief in the competences of others to create increasingly more complex shared foresight as basis for action; i.e. competence trust. Insiders see this development as a breakthrough in policy culture in the Dutch mobility, energy and environmental subsystems, since it takes away the cynicism caused by distrust in intentions. However, outsiders don't see this at all, as they form no part of it. With this perspective, shared foresight itself becomes a

component of trust – it is the resource needed to believe that a group can change the power context by interventions that create co-evolution in the larger system. It may also be termed the self-confidence of a network, or the complexity of co-evolution, and therefore conduct, that is reachable. It builds up through co-evolution between change managers in the adaptive network.

Chapter 6: change managers; enthusiasm, uncertainty and reward

In the transition discourse, dozens of people have participated in loose networks that supported it without often being able to explain the idea to direct colleagues. It is a personal disposition that has been triggered by the participation in the greenpolder model and sustainable development research programs. The emergence of such loose networks probably also has been a latent possibility in the general 'polder' culture of The Netherlands. The irony of the situation was that sustainable development was imaginable but due to lock-in the resistance seemed unsurpassable. These policy makers dealt with this situation by looking for constructive, development-oriented propositions. They had a real concern for sustainable development, as they were easily mobilized for the IB and the ETP, or to support the transition discourse. As interviews show, all participants had skills of systems thinking, which formed the basis of the cooperation. Different roles, often combined by one individual, can be observed in the adaptive networks:

- *Enablers* could connect ideas with power, had the capacity to enable others to interact behind the scenes, and to intervene in power networks when others were skeptical;
- *Initiators* inspired others to focus on complex, long-term options;
- *Networkers* formed the particle around which a crystal was formed, because they could mobilize individuals from throughout the composed subsystem with the appropriate attitude for networks with adaptive capacities;
- *Moderators* (or connectors) helped others to perceive joint opportunities and to develop trust and foresight; they helped separating the adaptive interactions from visible power actions (playing with openness to visibly manage tensions and closedness to create internal trust);
- *Systems thinkers* could inspire into joint visioning, making new combinations and identifying possible joint action;
- *Letting goers* did not mind that others were allowed to further develop their idea, without getting personal credit for it. (With major example: non-environmental ministries implemented the NMP4.);
- *Experts* contributed by showing possible developments at market level, as well as the impacts of these developments.

Most participants actually may have been driven by intuitions rather than explicit system analyses and foresight. However, a limited number of people played key roles in the management of tensions in a localized way; these were exceptionally skilled in moderation and systems thinking, and appeared not to be interested in widely visible personal success.

In the government and in larger corporations and NGOs, civil servants and employees sometimes have time to 'develop a hobby' – to spend time on a cause they personally believe to be important. In the transition discourse, several 'hobbyists' actually created impact in power networks. This was not only a result of enthusiasm, but also of competence. There could be a trend toward an increasing number of the more competent policy makers spending some of their time in hobbies. Jeroen Tulp is perhaps the clearest example; he was one of the most influential civil servants in the mobility sector and felt the tension between the need to bridge the gap public – private, whilst not being able to do that in his 'power' role. He was prepared to 'double think' for at least a year in the IB, until the EU conference made the short term and the long term coincide. His behavior, and that of others, could also have been contagious to other civil servants who saw them operating. Some said it was a conscious strategy to try to serve as role model. Policy makers who had been involved in the IB and the automotives platform, seem to have tried to transfer the competencies of adaptive interaction to other platforms.

Several organizations engaged in the platforms have assigned persons who participated in several related platforms as a kind of 'proactive diplomats'. As someone said, 'the IB members have been looking for wind in their sails, and they have gotten good at it'. Their management has recognized their skills and added value after the success of the IB. The transition discourse is actively applied to create an understanding and trust in these relationships. It seems that the language of transitions has become alive and creates a measure for rewarding change management in adaptive networks. On the other hand, this competence still seems to be personal.

It seems important that these change managers be embedded in loose networks that understand their transition language. The loose networks surfaced regularly in several events where prominent Dutch policy makers and (ex) politicians made a case for transition thinking. Other examples were dozens of publications in ArenA, the magazine of the Netherlands Association of Environmental Professionals. In the academic world there was increasing attention for transition management, with significant support of the government. Governmental knowledge organizations gave support to all interested in transition management (www.transitiemanagement.nl). The Environment and Nature Planning Bureau (www.mnp.nl), an independent think tank responsible for producing sustainability outlooks, took up the progress monitoring of transition management. It is difficult to imagine that all these efforts are not rooted on strong and lasting loose networks, and that they will not actually create better understanding of sustainable change management.

Chapter 7: sustainable change management

It helps to compare networks with living organisms. The first main lesson for sustainable change management is that sustainable change managers may be aware that they form part of a loose network that can be compared with a living organism. It then becomes easier for them to make the link between individual

and collective complexity-acknowledging behavior. It becomes easier to be ironic rather than cynical or skeptical, and this development-oriented drive can lead to more complex conduct and more complex and flexible collective policies. Being development-oriented rather than oriented toward reducing unsustainable options for others (what I have termed accounting behavior), implies having faith in a similar understanding and attitude in other parts of the composed subsystem, so that loose networks can emerge. These loose networks have the capability of self-organizing into adaptive networks, and by doing so, they improve their skill of self-organizing and developing propositions that can influence power. If they are successful, trust and foresight increase, and the loose network has increased its collective competence.

The metabolism of this organism is based on making propositions to power that actually influence adaptive tensions in a direction it considers desirable. The power networks should respond favorably, and it should create stronger expectations that it will reward more detailed propositions for alternative development challenges as opposed to business-as-usual. Such success can give the loose network renewed energy and more hope for a sustainable future. An outsider can evaluate the degree of sustainability of these successful propositions by assessing the complexity of the emerging ideas in adaptive networks, which have developed the proposition. If knowledge about weaker groups, like future generations, is represented in the adaptive network, by definition it has become more complex and more sustainable. Although this is still an imperfect measure, it is clear that the adaptive networks evaluated in this book were more sustainable than previous adaptive networks. They achieved considerable complexity, because for the first time there was some agreement between all domains of the significantly complex automotives system, including environmental NGOs.

The conceptual distinction between power networks and adaptive networks helps to understand the conduct of policy makers, and how at times policy makers self-organized into networks, with a varying degree of separation of adaptive interactions and power interactions. This conceptual separation offers the possibility of making the separation explicit and physical, so that power-free groups can emerge, which intentionally can facilitate a co-evolution of ideas. This co-evolution leads to propositions to power, which can lead to power interventions and waves of change in the larger social system if the time is right for that. New adaptive tensions emerge and the cycle repeats, one step closer to sustainable development. Action in the whole social system becomes more aligned and geared toward dealing with the common problems on the long term.

The fact that adaptive networks develop complex ideas that cannot be generated in power networks may suggest that they know better, but that may not be always the case. As any distinctive social group they suffer from self-reference and groupthink. Adaptive networks can only make proposals that compete with the proposals of other adaptive networks, and power networks select, like always. Power networks, e.g. the primacy of politics over civil servants and societal platforms, therefore remain fully intact, but they are better informed. Adap-

tive networks can only survive if power networks are open for the inspiration they offer; if their ideas are convincing.

The individual role to bridge gaps. The second main lesson is that adaptive networks depend on policy makers who are prepared to make the link between the short term and the long term by investing personally in making social and conceptual connections with policy makers in other parts. They found their personal motivation in the tension between current unsustainable practices and the desire for a sustainable development in the societal system they depended on. This capacity may be defined as double think, which for example may allow a CEO to act in an adaptive network, developing ideas that undermine his formal corporate policies, and which may not be understood (yet) by most other policy makers in his corporation who do not share his (capacity of) double think. Outsiders asking for sustainable development, seeing only the visible actions may then remain critical about that CEO. Even if power networks accept a breakthrough proposal, the CEO may hardly be rewarded in a material sense, since his contribution occurred behind the scenes. Only the loose networks that had seen his actions may reward him. What makes reward even more unlikely is that solutions for complex problems like sustainable development are difficult to find, and take long series of interventions in power networks, creating a much wider social learning process in waves, before an adaptive tension emerges that is open for visible market interventions. A major obstacle is the cultural gap between public and private sector, and leaders on both sides may have to invest for a long time before the process culminates in a context that enables a non-fragmented dialogue across that gap.

This was in the mind of public and private leaders involved in transition management, and their right hands, since they had developed such competencies to some extent, individually and collectively. This enabled knowledge to flow more between parts. Each time a power network accepted a proposal, the social system was one step further in its thinking about sustainable development. One adaptive network, the Innovation Board Sustainable Mobility (IB), perfected these skills and made them explicit. They found success in developing new problem definitions in power networks, which created adaptive tensions for further steps. Because this process did not yet lead to visible market changes, the paradox emerged that they were successful in their own eyes but not in the eyes of the outside world.

The idea that adaptive interactions must be power free, and that they therefore depend on individual willingness to manage sustainable change, is therefore key. Before adaptive networks can offer their complex ideas to power networks, there is no way to give their efforts legitimacy or resources. It is fundamentally unknowable if they are going to develop useful ideas, the ideas are too sensitive to be widely understood since they require double think, and creating expectations of results by allocating resources already disturbs the required closedness. Just the fact that they are adaptive networks does not create legitimacy in the eyes of outsiders, which is why they depend on their own rationality. They must

be willing to accept the idea that the larger social system may not appreciate their ideas, power networks may develop in a (to them) undesirable direction, and the loose network may not be able to self-organize for a while into active adaptive networks. To keep the loose networks alive, it helps to cultivate a common language of management of tensions through adaptive networks, where success is determined by increasing the complexity of conduct in power networks.

It helps to link time scales and social scale. Certain adaptive networks only can make a difference in power networks with little power and therefore little internal complexity. For example, adaptive behavior can help to create relatively small changes in R&D policies or investments in somewhat more sustainable products. Such initiatives may be successful even without major government market interventions, but they may still require adaptive behavior. At the same time, these successes may not lead to a chain of events that creates a sustainable transition. Sustainable transitions may actually depend on breakthroughs in thinking about government policies to facilitate market changes, and, there, a different kind of sustainable change management is needed. It is this second kind of sustainable change management that has mainly been addressed in this book. Yet, different levels of complexity can be linked. Small changes may be designed to fit, or not contradict, desirable larger changes. Processes aimed at major transitions can aim at facilitation of adaptive tensions at a scale of smaller complexity, contributing to the larger scale social change.

Like scales of social complexity, also time scales can be linked. On a time scale of decades, I have observed that in several waves loose networks emerged of individuals who had the competence to develop trust across societal domains and to develop a common way of thinking about sustainable development. These people had a shared history of unsatisfactory experiences, which made them apply systems thinking and postpone their judgment in dialogues based on mutual respect of the person and his interests. This was a process of cultural evolution. On a time scale of months, however, people from these networks could self-organize into adaptive networks that connected several societal domains. These then would develop a working method that, if they were successful in their self-defined terms, subsequently evolved on a time scale of years. Self-organization was induced by opportunities like the 4th National Environmental Policy (NMP4), and evolution was induced by the capacity of adaptive networks to 'jump' from one such opportunity to another, under different names and compositions, adapting to the changing power environment of the adaptive networks – i.e. the large scale evolution and the sudden political opportunities of adaptive tensions in power networks.

Finally, my messages should not be overrated. I have deliberately tried to develop a development-oriented view of sustainable development. To that end, sustainable development should be linked to personal behavior, linking all scales of time and space. To that end, I singled out the goal-seeking component of governance. I have depicted society as a whole as connected and adaptive. The

focus on the IB, an adaptive network that was successful in self-defined terms, and its successors, suggests that this is a trend. However, that may not be the case and the influence of loose networks may be local, temporary or even not in the interest of future generations. On the other hand, these networks depended on people who were personally willing to engage in sustainable change management, who developed double think, and clearly were not only driven by material reward. These groups have grown in the past ten years in the mobility and energy systems, but they may still be small compared to groups who focus on the accounting component of governance.

15 Samenvatting

Besturing voor duurzame ontwikkeling

In dit boek reconstrueer ik hoe beleidsmakers, die samenwerkten in wat ik noem adaptieve netwerken, een doorbraak hebben mogelijk gemaakt in het denken over duurzame mobiliteit in bepaalde beleidskringen. Ik definieer het gedrag van vooroplopende actoren in adaptieve netwerken als duurzaam verander management. Duurzame ontwikkeling wordt gezien als een complex probleem. Geen enkele persoon of organisatie kan zelfstandig duurzame veranderingen 'managen'. Dat vergt een gezamenlijke inspanning van verschillende domeinen. Adaptieve netwerken zijn zelforganiserende groepen beleidsmakers die gezamenlijk onderzoek en gezamenlijke visievorming mogelijk maken, in dit geval voor duurzame mobiliteit. Deze beleidsmakers hebben twee vaardigheden. Ten eerste hebben ze invloed en kennis over verschillende machtsnetwerken. Ten tweede proberen ze los te komen van bestaand beleid in die machtsnetwerken en ontwikkelen een gezamenlijk beeld van nieuwe, effectievere beleidsopties. Ze proberen de evolutie van hun denken op een lijn te krijgen met het gedrag in hun machtsnetwerken. Vanuit dit gezichtspunt ontstaan doorbraken door co-evolutie van deels strijdige ideeën en belangen. Verandermanagers in adaptieve netwerken handelen op eigen initiatief. Machtsnetwerken zijn niet in staat om hun initiatieven te belonen, tenzij de ideeën die ze ontwikkelen in enige mate door de machtsnetwerken worden geaccepteerd.

Adaptieve netwerken ontwikkelen in de context van machtsnetwerken - de bestaande hiërarchische structuren die kunnen besluiten over de inzet van middelen op de korte termijn, wat ook het maken van openbare verklaringen over (on)gewenste ontwikkelingen omvat, omdat daarmee verwachtingen ontstaan over hun eigen gedrag en beloning. Interacties in adaptieve netwerken zijn niet primair gebaseerd op het gebruik van formele macht maar op het ontwikkelen en verspreiden van ideeën. Om effectief te worden, moeten adaptieve netwerken ideeën ontwikkelen die contrasteren met de ideeën in bestaande machtsnetwerken maar meteen ook die machtsnetwerken daarmee infecteren.

Het theoretisch onderscheid tussen machtsnetwerken en adaptieve netwerken is zinvol. In de praktijk is er een zekere overlap tussen beide nodig, om nieuwe ideeën met uitvoeringsmacht te verbinden. Personen op hoge (machts)posities, die ook deelnemen in het leerproces, zijn belangrijke verbinders tussen de twee.

Adaptieve netwerken worden invloedrijk als ze gebruik weten te maken van de spanningen binnen en tussen machtsnetwerken. Dergelijke spanningen zijn beschikbaar omdat in Westerse democratieën milieubelangen, sociale belangen en economische belangen apart georganiseerd zijn en de neiging hebben om tegengestelde invloed uit te oefenen.

De theorie over adaptieve netwerken wordt in dit boek toegepast op een Nederlands proces gericht op duurzame mobiliteit, genaamd transitiemanagement. Het idee van transities is opgenomen in het vierde Nationaal Milieubeleidsplan (NMP4) in 2001. De bestaande fysieke en sociale complexiteit leiden tot hardnekkige problemen (*wicked problems*). Deze kunnen niet worden opgelost door kwantitatieve doelen te stellen, omdat de beleidsmakers geen greep krijgen op de problemen en daardoor geen oplossingen worden gevonden. Publieke leiders en leiders in de marktsector richten zich op bestaande afrekenbare doelen lossen geen complexe problemen op. Als ze nieuwe oplossingen en targets zoeken in een besturingsnetwerk verminderen ze de kansen op beloonbare doorbraken op korte termijn.

De spanning tussen de afrekencomponent van besturing en de doelzoekende component kan ook constructief worden benut. Als beleidsmakers voorstellen ontwikkelen die machtsnetwerken accepteren, heeft er een verandering plaatsgevonden. Het veranderde machtsnetwerk creëert nieuwe spanningen die nieuwe kansen bieden voor nieuwe voorstellen van adaptieve netwerken. *Deze iteratie tussen adaptieve (lerende, reflexieve) interacties en machtsinteracties leidt tot andere, meer duurzame uitkomsten, omdat de onderbouwing berust op complexere ideeën.*

Dit soort gedrag stelt hoge eisen aan de deelnemers, die moeten geloven dat ze invloedrijke ideeën kunnen ontwikkelen. Adaptieve netwerken kunnen tijdelijke manifestaties zijn van individuen die buiten gebaande paden willen denken en nieuwe doelen willen stellen voor hun gezamenlijke belang, ook al lijken die doelen in strijd met hun individuele belang. Ik postuleer dat het verschijnen en de invloed van adaptieve netwerken afhangt van intern vertrouwen – het vertrouwen van in de leden van een adaptief netwerk in elkaar – en in extern vertrouwen – het vertrouwen van een adaptief netwerk in een blijvend ontvankelijke machtscontext. Intern vertrouwen lijkt op het idee van coöpetitie, samenwerking tussen concurrenten gericht op een gezamenlijk belang op lange termijn. Een derde factor is vooruitzicht (of het vertrouwen in een adequaat zelfbeeld); de gezamenlijke capaciteit om correct in te schatten welke invloed de groep heeft in machtsnetwerken.

Onderzoeksvraag

Ik heb het bestaan van adaptieve netwerken gepostuleerd. Vanuit de complexiteitstheorie kunnen deze worden gezien als netwerken die vertrouwen ontwikkelen en verschillende delen van de samenleving zo met elkaar kunnen verbinden dat ze het systeem als geheel helpen om zich aan te passen aan veranderende omstandigheden die zowel een bedreiging als een kans zijn. Dit doen ze door te pogen bij te dragen aan een andere, duurzamere ontwikkeling. Zo wordt de mo-

gelijkheid van mensen om te anticiperen ook een mogelijkheid voor een sociaal systeem als geheel. Aan de andere kant verhindert complexiteit dat dit gedrag beloond wordt. Dit komt door onzekerheid en een lange terugkoppelingstijd. De centrale vraag in dit boek gaat daarom een stap terug: *Hoe kunnen nieuwe idee-en over duurzame ontwikkeling in brede kring worden overgenomen en hoe kan dit worden geëvalueerd in het geval van transitiemanagement?* Deze vraag wordt beantwoord met de volgende deelvragen:

- Hoe past het idee van adaptieve netwerken in bestaande theorieën over complexiteit en verandering? Deze vraag wordt beantwoord in hoofdstuk 2, dat ook ingaat op de filosofische vraag hoe we de duurzaamheid van een idee kunnen evalueren;
- Hoe kunnen deze theorieën worden geoperationaliseerd om adaptieve netwerken te kunnen waarnemen, hun interactie met machtsnetwerken, en de spreiding van duurzame ideeën in de wijdere wereld? Dit wordt uitgewerkt in hoofdstuk 3.
- How can these theories be operationalized to observe adaptive networks, their interaction with power networks, and the spreading of sustainable ideas in the real world? This is elaborated in chapter 3.
- Hoe ontwikkelde zich in het geval van transitiemanagement:
    - o Machtsnetwerken, en welke adaptieve netwerken kunnen worden verondersteld als verklaring van deze ontwikkeling? (hoofdstuk 4);
    - o Adaptieve netwerken, en welke verandermanagers kunnen worden verondersteld als verklaring van het ontstaan van deze adaptieve netwerken? (hoofdstuk 5);
    - o Het gedrag van verandermanagers die de ontwikkeling beïnvloed hebben? (hoofdstuk 6).
- Welke lessen voor duurzaam verandermanagement, als bijdrage aan duurzame besturing, kunnen hieruit worden afgeleid? Hierop gaat hoofdstuk 7 in, dat ingaat op samenwerking en vertrouwen die, als gedrag in adaptieve netwerken, kunnen bijdragen aan een zich aanpassende samenleving.

Hoofdstuk 2: theoretische noties van complexiteit

De complexiteitstheorie conceptualiseert sociale systemen als een ingebedde hiërarchie (een geneste structuur) die sterk is gerelateerd aan historische, geografische en marktfactoren. Individuen worden beloond voor gedrag dat bij vooraf bekende doelen past, die niet noodzakelijk leiden tot oplossing van complexe problemen. Het resultaat is dat sociale systemen zich door interne drijvende krachten ontwikkelen. Een sociaal systeem is een structuur die energie van buiten omzet in andere vormen en intern doorgeeft in het systeem door middel van een beloningsysteem, wat leidt tot ofwel nieuwe orde ofwel wanorde. Als de agenten, onderdelen, van een systeem vervangen worden kan gedrag ook evolueren als een levend organisme, met zijn eigen metabolisme. In het geval van sociale systemen is de energiebron de beloning in de markt en in de zichtbare wereld, maar er kunnen zich ook culturen ontwikkelen die gedrag belonen dat minder herkenbaar gelinkt is aan materiele beloning. Dit komt door de lange

terugkoppelingstijd tussen gedrag en effect in de markt. De agenten die het be-loningssysteem bepalen en die regelmatig worden vervangen en daardoor kun-nen evolueren, zijn ideeën. Dit is de wetenschapsfilosofie van memetica, voort-bouwend op het sociaalconstructivisme. Gezamenlijke rationaliteit ontwikkelen zich als discoursen die gesimplificeerde en geabstraheerde oplossingen voor-stellen voor complexe problemen. Personen en groepen, die zich vernieuwen en daarbij kunnen evolueren, dragen deze ideeën of memen. Het gedragsrepertoire van personen en groepen kan daarom co-evolueren met het discours dat hen motiveert. Dit kan leiden tot geïnstitutionaliseerde discoursen en praktijken zoals het democratisch systeem, dat een kortere terugkoppelingstijd schept voor het effect van eigen handelen op de samenleving. Een scheiding der machten produceert nieuwe afhankelijkheden en daardoor sociale spanningen, die sa-menwerken en leren kunnen bevorderen.

Als een sociaal systeem zijn aanpassingsvermogen vergroot (en daarmee zijn duurzaamheid), moet het de vereiste diversiteit (*requisite variety*) aan responsen kunnen creëren. Het geheel aan zich ontwikkelende discoursen moet leiden tot een patroon van ideeën en gedragstypen dat overeenkomst met de diversiteit van veranderingen n de omgeving. Het gedrag dat 'werkt' zal dan vanzelf overleven in een proces van selectie. De diversiteit hangt af van individuele competenties (*bounded rationality*, cognitieve beperkingen) en collectieve competenties (soci-aal kapitaal, verbondenheid). Het helpt om complexiteit te accepteren en sys-teemdenken toe te passen in adaptieve netwerken. De capaciteit en bereidheid tot dubbeldenken is belangrijk (overleven in een hiërarchisch systeem en tegelijk ook de spanning met andere hiërarchieën proberen te overbruggen). Er is een theoretische mogelijkheid van managementinstrumenten die dit soort gedrag stimuleren, die systeeminstrumenten worden genoemd, of publieke ruimten, maar dit is niet goed uitgewerkt.

Verschillende auteurs zien als sleutel dat deze instrumenten creatieve span-ningen moeten voortbrengen die adaptieve interacties aantrekken. Of dat gebeurt hangt af van de kenmerken van het sociale systeem dat onder spanning staat. Als de druk te groot is zal het instorten, als de druk te laag is verandert het niet (ont-staan er geen adaptieve interacties). Overleving hangt dan af van de beschik-baarheid van genoeg beleidsmakers in verschillende delen van het systeem die in staat en bereid zijn om met elkaar in adaptieve (reflexieve) interactie te gaan, en daarmee invloed uit te oefenen op machtsnetwerken. Dit schept een hogere orde systeem voor selectie van ideeën. Dit kan meer samenhang opleveren in het gedrag in verschillende subsystemen, en een effectiever antwoord op gemeen-schappelijke problemen. Vertrouwen is een belangrijke variabele om reflexieve interacties mogelijk te maken, en terwijl het zich in een cyclus van positieve of negatieve feedback kan ontwikkelen is het ook ingebed in de meer stabiele cul-tuur van het sociale systeem.

Hoofdstuk 3: Een methode voor complexiteitsonderzoek

Om sociale veranderingen in complexe omstandigheden te kunnen waarnemen en verklaren heb ik gekozen voor een case studiebenadering. De case studie

bestaat uit de duurzame ontwikkelings- en transitiemanagement discoursen in Nederland, met een focus op specifieke beleidsnetwerken in de context van het NMP4, in de periode 2001 – 2006. De periode voor 2000 is ook in enig detail beschreven om de situatie te kunnen verklaren rond het jaar 2000. Na 2000 verschenen verscheidene netwerken waarvan de belangrijkste zijn aangegeven. Voor het NMP4-team en latere netwerken die ideeën overnamen, structureer i de analyse in ontwikkelronden tot 2006, aan de hand van inhoud (ideeën), structuur (netwerken), spanningen (gecompenseerd door vertrouwen en vooruitzicht voor zover waarneembaar in gedrag), en dit op drie schaalniveaus. Vertrouwen ligt dicht aan tegen verwachte beloning.

De interacties tussen machtsnetwerken en adaptieve netwerken wordt beschreven aan de hand van adaptieve spanningen die adaptieve interacties aantrekken, die dan weer een voorstel genereren. Indien succesvol ontwikkelt het adaptieve netwerk een voorstel dat wordt geaccepteerd door leden van machtswerken met wie ze verbonden zijn. Deze acceptatie betekent dat de zichtbare (machts)interacties veranderen; er worden bijvoorbeeld proefballonnetjes opgelaten. Individuen in machtsnetwerken scheppen daarmee andere verwachtingen binnen het netwerk en bij de achterban van hun toekomstige gedrag. Dit leidt tot sociale spanningen die een reactie in het systeem oproepen. Adaptieve netwerken ontwikkelen ideeën die leiden tot voorstellen aan de macht. Als machthebbers deze voorstellen accepteren doen ze een zichtbare interventie in een machtsnetwerk, dat kan reageren met een aanpassing van spanningen.

In de periode 2000 – 2005 heb ik indirect de ontwikkeling van structuur, proces, gedrag en beloning bestudeerd. De machtscontext interpreteer ik uit interviews, aangevuld met documenten. Grootschalige verandering in machtsnetwerken kan helpen om hypotheses te stellen over adaptieve netwerken die aan het werk moeten zijn geweest, als acties meer op elkaar afgestemd zijn door emergente hogere orde ideeën (zeg maar gedeelde visie). De adaptieve netwerken, interacties en hun effect worden vervolgens geïnterpreteerd uit interviews, gebruik makend van triangulatie (vergelijking van bronnen), het identificeren van gedeelde percepties van relevante parameters. Door dit proces te volgen is een eerstehands verslag mogelijk geworden. Dit materiaal zou dan een overzicht moeten opleveren van de ontwikkeling van machtsnetwerken, adaptieve netwerken, de spanningen die hen dreven, maar ook de invloed van verandermanagers. En het zou inzicht moeten geven in effectief gedrag met het oog op duurzaam verandermanagement.

Omdat duurzame ontwikkeling mijn studieobject is, moet ik ook een onderzoeksafbakening kiezen die daar bij past. Ik ga ervan uit dat een natuurlijke grens is het samengestelde subsysteem – een set van sociale systemen die allemaal afhangen, of onder invloed staan, van hetzelfde marktsysteem. Daarom is het verband tussen grootschalige en kleinschalige processen, het hele systeem versus het individu, belangrijk. Een samengesteld subsysteem heeft marktcomponenten (zoals in het mobiliteitssysteem infrastructuurmanagers, forensen, goederenproducenten), maar ook domeinen met verschillende typen beloningssysteem (overheid, bedrijven, wetenschap, belangenorganisaties). Duurzame

ontwikkeling is in die context gedefinieerd als een ontwikkeling die het moge-lijk maakt dat het systeem nog lang blijft bestaan door aanpassing aan een ver-anderende omgeving (andere samengestelde subsystemen waar het relaties mee heeft, of het fysieke systeem waar de markt afhankelijk van is). Duurzame ont-wikkeling is niet gegarandeerd omdat martkinteracties kunnen leiden tot uitput-ting van kritische hulpbronnen of ongewenste neveneffecten kunnen hebben die het samengestelde systeem destabiliseren. Tegelijkertijd hoeft het gedrag in het samengestelde systeem niet de toekomstzorgen van sommige individuen in het systeem te reflecteren.

Hoofdstuk 4: machtsnetwerken, adaptieve spanningen die adaptieve netwerkingen aantrekken

De uitkomst van de historische beschrijving van machtsnetwerken die betrokken waren bij transitiemanagement kan worden samengevat als een serie zichtbare interventies met het oog op nieuwe ideeën die zouden kunnen zijn ontstaan in adaptieve netwerken. Verschillende interventies waren zichtbaar en ook succes-vol omdat er positieve feedback kwam. Het centrale idee dat ontstond was dat er een duurzame co-evolutie in de markt tussen automotoren en autobrandstoffen (samen genaamd *automotives*) mogelijk was, dat Nederland een goede plaats is voor experimenten met die systemen en dat de overheid een platform zou moe-ten organiseren dat als machtscontext kan dienen waar de verschillende private en publieke partijen gedeelde ideeën en handelsstrategieën kunnen ontwikkelen. Directe betrokkenheid van het topmanagement en Kabinet op bepaalde mo-menten zou implementatie verzekeren. De meest opvallende interventies en de geassocieerde adaptieve netwerken waren:

Het NMP4 team (het eerste veronderstelde adaptieve netwerk), met ambtena-ren van verschillende ministeries, stelde transitiemanagement voor aan de be-stuursraad van het Ministerie van Economische Zaken, dat verantwoordelijk was voor energiebeleid, en de milieuminister. Het voorstel was dat niet-milieuministeries 'duurzame transities zouden managen'. De Tweede Kamer steunde dit vage idee;

De leden van het innovatieberaad duurzame mobiliteit (IB) (het tweede ver-onderstelde adaptieve netwerk), van overheden, industrieën, universiteiten en belangenorganisaties, communiceerden anders naar hun eigen organisaties toe over *automotives*. De auto als zodanig werd geaccepteerd door de milieubewe-ging;

Sprekers en stemmers op de EU conferentie Energy in Motion, beïnvloed door het IB, namen duidelijk positie in voor duurzame *automotives*;

Het energietransitieproces, initiatief van een team in EZ (het derde veronder-stelde adaptieve netwerk), ontwikkelde transitie experimenten en meer focus in het R&D beleid voor duurzame energie;

De Directeuren Generaal van verschillende ministeries (het vierde veronderstel-de adaptieve netwerk) stelde voor om een Interdepartementaal Programma Energietransitie (IPE) te starten. Dit schiep een adaptieve spanning voor meer

coördinatie tussen zes ministeries om samen een constructieve dialoog aan te gaan met de *automotives* sector en andere sectoren.

Deze evolutie naar een brug over de kloof publiek – privaat in het geval van *automotives* werd als voorbeeld gebruikt voor andere paden naar duurzame transities onder het IPE/. De drijvende kracht was de spanning tussen het duurzame-ontwikkelingdiscours en de sectorale groei en concurrentiekracht-discoursen. Deze spanning werd sterk gevoeld in de Tweede Kamer. Deze potentiële energy is nu gefocust op de kloof publiek – privaat door een keten van interventies en spanningen. De serie machtsinterventies kan worden vergeleken met golven van spanning die zich voortplanten in machtsnetwerken totdat, in het geval van de EU conferentie, een breed gedeelde nieuwe probleemdefinitie verscheen die focus geeft aan verdere stappen. Deze grootschalige golven bouwden zich op uit kleinere golven. De adaptieve spanningen waren tijdens het ontwikkelen van NMP4 grootschalig (zo groot als past bij de spanning tussen het duurzame-ontwikkelingdiscourse en het economische groei discours), en het emergente transitiediscours was vaag. In latere fasen verschenen discoursen over meer specifieke scenario's (duurzame *automotives*). Dit illustreert ook dat adaptieve voorstellen opdoken in verschillende groepen op verschillende momenten – terwijl deze groepen ook weer met elkaar waren verbonden en de ideeën werden gedeeld in adaptieve interacties tussen de groepen. Iedere innovatieve machtsinterventie kan daarom worden verondersteld een manifestatie te zijn van co-evolutie die eerder heeft plaatsgevonden in adaptieve netwerken, waar achter de schermen steun werd opgebouwd. Hoewel deze adaptieve netwerken niet zichtbaar waren vanwege hun gevoeligheid, communiceerden politici over de noodzaak van adaptieve netwerken, en de noodzaak om ze tijd te gunnen. Staatssecretaris Van Geel bijvoorbeeld gebruikte de metafoor van een veenbrand. Minister Brinkhorst van EZ deed verschillende vergelijkbare uitspraken. Begin 2006 was het transitiediscours nog springlevend en werd geïnstitutionaliseerd met een directoraat. Het aanzien van transitiemanagement werd hiermee verhoogd ondanks een gebrek aan duidelijk zichtbare resultaten en daaraan gerelateerde kritiek.

Hoofdstuk 5: adaptieve netwerken; vertrouwen en vooruitzicht

Ik heb interviews geanalyseerd met beleidsmakers die nauw betrokken waren bij de genoemde interventies, om te zien hoe en waarom ze acteerden. Ik concentreerde me daarbij op extern vertrouwen, intern vertrouwen en vooruitzicht. Extern vertrouwen wordt gezien als gedrag dat is gebaseerd op de veronderstelling dat adaptieve spanningen in machtsnetwerken stabiel zijn, en daarom betrouwbare kansen scheppen voor interventies naar meer duurzame machtsnetwerken. Intern vertrouwen is het vertrouwen dat partners in adaptieve netwerken delen in hun gezamenlijke onderneming. Gedeeld vooruitzicht kan worden gezien als een gemeenschappelijk idee van mogelijke duurzame toekomsten en van een beperkende factor in het opbouwen van adaptieve spanning in de 'juiste' richting. Een term die vaak gebruikt werd was 'geloofwaardig'. Als voorstellen

bestempeld werden als niet geloofwaardig, dan waren er binnen de groep verschillende ideeën over beperkende factoren.

De vraag ontstaat in welke mate collectief gedrag in adaptieve netwerken ook echt zo bedoeld was. In mijn observatie waren er specifieke beleidsmakers in staat om te zien welke kansen er waren om nieuwe netwerken te bouwen. Deze koplopers konden anderen enthousiast maken. Die anderen stonden open voor dit enthousiasme omdat ze de algemene wens met elkaar deelden om duurzame ontwikkeling te steunen, en ook een intuïtie over grootschalige adaptieve spanningen. Ze ontkenden complexiteit niet, en door zich te verbinden met implementatiemacht werden ze steeds meer gecommitteerd aan de adaptieve interacties. Ze bespraken expliciet elkaars motieven en vertrouwden erop dat de anderen geen verborgen agenda hadden (de interacties waren machtsvrij).

Deze intuïtie werd gevormd door gemeenschappelijke teleurstellingen in de jaren 90 met het groenpoldermodel en met het kennissysteem duurzame ontwikkeling (bijvoorbeeld de DTO en NIDO programma's). Een ironische (in de zin van niet ontmoedigd door een schijnbaar onmogelijke taak) en vertrouwende houding was nodig om een zeker gezamenlijk vooruitzicht te kunnen ontwikkelen door kennis in te brengen voor het gezamenlijke overzicht. Dit vertrouwen maakte bijvoorbeeld mogelijk dat de leden van het IB om gebruik te maken van de EU conferentie als kans, en zo kon het IB de betrokken domeinen met elkaar verbinden zodat de drie ministeries een breed geaccepteerde probleemstelling konden ontwikkelen voor de EU conferentie. Die werd goed bezocht en het enthousiasme om duurzame *automotives* aan te pakken groeide. In mijn waarneming, en die van verschillende leden van deze netwerken, werden deze verbindingen makkelijker door de brede erkenning van het transitiediscours. In de termen van theorieën over vertrouwen, werd het vertrouwen groter omdat er bewust aan werd gewerkt – er was een socio-cognitief discours over en er werd gestuurd op een positieve spiraal. Vertrouwen werd expliciet besproken en het proces kon daarom focussen op een gedeelde beperkende factor, en ideeën konden soms worden doorgeven van het ene machtsnetwerk naar het andere, als dat een focus gaf op de zwakste schakel.

Naarmate het vertrouwen in de bedoeling van anderen in het netwerk groeide leek het erop alsof de beperkende factor werd het geloof in de competenties van anderen om steeds complexere ideeën te delen als basis voor actie; vertrouwen in competentie dus. Insiders zien deze ontwikkeling als een doorbraak in de beleidscultuur in overlap van de de Nederlandse mobiliteits, energie en milieusystemen omdat het cynisme er mee weggenomen wordt dat ontstaat door wantrouwen van elkaars bedoelingen. Aan de andere kant zien buitenstaanders dit vaak niet zo, want die zijn geen lid van de netwerken. Vanuit dit perspectief is gedeeld vooruitzicht zelf een component van vertrouwen. Het is de hulpbron die nodig is om te geloven dat een groep de machtscontext kan beïnvloeden en co-evolutie in het grotere systeem op gang kan brengen. Het zou ook het zelfvertrouwen van een netwerk genoemd kunnen worden, of het haalbare ambitieniveau voor co-evolutie. Dit bouwt zich op door co-evolutie tussen verandermanagers in een adaptief netwerk.

Hoofdstuk 6: verandermanagers, enthousiasme, onzekerheid en beloning

Tientallen mensen in het transitiediscours hebben deelgenomen in lossen netwerken die het discours steunden, vaak zonder het idee te kunnen uitleggen, zelfs aan directe collega's. Het lijkt een persoonlijke dispositie die werd getriggerd door de deelname in het groenpoldermodel of het duurzame kennissysteem. Het verschijnen van losse netwerken was waarschijnlijk ook een latente mogelijkheid van de algemene poldercultuur in Nederland. De ironie van de situatie was dat duurzame ontwikkeling voorstelbaar was maar dat er onneembare barrières leken te zijn. De beleidsmakers gingen hiermee om door constructieve, ontwikkelgerichte voorstellen te maken. Ze waren echt betrokken bij duurzame ontwikkeling, ze waren immers snel bereid deel te nemen aan netwerken zoals het IB en het ETP, of om het vage transitiediscours op andere manieren actief te steunen. De interviews wijzen uit dat alle deelnemers systeemdenken toepasten, en dat dit de basis van hun 'actiegerichte' samenwerking vormde. Verschillende rollen, vaak samenlopend in individuen, zijn waarneembaar:

- *Sponsors* konden ideeën met macht verbinden, hadden de capaciteit om anderen ruimte te geven om achter de schermen te interacteren, en interventies te plegen in machtsnetwerken waar anderen sceptisch waren;
- *Initiatiefnemers* inspireerden anderen om te focussen op complexe, langetermijnveranderingen;
- *Netwerkers* vormden de kern waaromheen een kristal ontstond, omdat ze de juiste mensen konden mobiliseren uit het hele samengestelde systeem;
- *Verbinders* hielpen anderen om gezamenlijke kansen in beeld te brengen en vertrouwen en vooruitzicht te ontwikkelen. Ze hielpen om adaptieve interacties te scheiden van zichtbare machtsinteracties (het spelen met openheid om zichtbaar spanningen te managen en met geslotenheid om intern vertrouwen te krijgen);
- *Systeemdenkers* die anderen konden inspireren om een gezamenlijke systeemanalyse en scenarioanalyse te maken, gericht op nieuwe kenniscombinaties en kansen voor gezamenlijke actie;
- *Loslaters* vonden het niet erg dat anderen hun eigen idee verder brachten zonder dat zij daar zelf nog veel credits voor kregen. (Groot voorbeeld: niet-milieuministeries implementeerden het NMP4);
- *Experts* droegen bij door mogelijke ontwikkelingen op marktniveau te schetsen, maar ook de effecten van die ontwikkelingen.

De meeste deelnemers werden misschien echt gedreven door intuïties meer dan expliciete systeemanalyses en vooruitzicht. Maar toch speelde een beperkt aantal mensen een sleutelrol bij het managen van spanningen en systeemdenken op lokaal niveau; deze waren bijzonder vaardig in modereren en systeemdenken, en schenen niet geïnteresseerd in zichtbaar persoonlijk succes.

Bij de overheid en in grote bedrijven en belangenorganisaties, krijgen ambtenaren en werknemers soms ruimte om een hobby te ontwikkelen – tijd besteden voor een doel dat ze persoonlijk belangrijk vinden. In het transitiediscours

creëerden verschillende hobbyisten daadwerkelijk impact in machtsnetwerken. Dit was niet alleen maar het resultaat van enthousiasme, maar ook van competentie. Er zou een toename kunnen Jeroen Tulp is misschien het duidelijkste voorbeeld; hij was één van de meest invloedrijke ambtenaren in het mobiliteitssysteem en voelde de noodzaak om de kloof publiek – privaat te overbruggen maar ook de onmogelijkheid om dat te doen in de bestaande machtscontext. Hij was bereid om een jaar lang te dubbeldenken in het IB totdat de EU conferentie een kans bood om de korte termijn en de lange termijn te laten samenvallen. Dit gedrag en dat van anderen zou ook besmettelijk kunnen zijn voor andere ambtenaren die hem hebben zien opereren. Sommigen zeiden dat het hun bewuste strategie was om als rolmodel te functioneren. Beleidsmakers die in het IB en in het platform *automotives* acteerden, schijnen te hebben geprobeerd om adaptieve competenties 'mee te nemen' naar andere platforms.

Verschillende organisaties die actief waren in platforms hebben werknemers aangewezen die als een soort 'proactieve diplomaat' konden deelnemen aan die platforms. Iemand zei 'de IB leden zochten wind in hun zeilen, en zijn daar goed in geworden'. Hun management nam deel aan Energy in Motion en had gezien welke vaardigheden ontstonden op de grens van organisaties en zagen de toegevoegde waarde op termijn. Het transitiediscours wordt actief gebruikt om een sfeer van vertrouwen en begrip te krijgen in deze relaties. Het lijkt alsof de transitietaal levend is geworden en een mate van beloning voor verandermanagement in adaptieve netwerken schept. Aan de andere kant is de positieve waardering voor deze taal nog zeer persoonlijk.

Het lijkt belangrijk dat deze verandermanagers onderdeel uitmaken van losse netwerken die dezelfde transitietaal spreken. De losse netwerken kwamen aan de oppervlakte op verschillende momenten waar prominente Nederlandse beleidsmakers en (ex) politici pleitten voor transitiedenken. Andere voorbeelden zijn de tientallen publicaties in het blad ArenA, het magazine van de Vereniging voor Milieukundigen. In de academische wereld nam de belangstelling voor het transitiediscours verder toe, met belangrijke steun van de overheid. Kennisinstituten van de overheid gaven steun aan alle geïnteresseerden in transitiemanagement (www.transitiemanagement.nl). Het milieu- en natuurplanbureau (www.mnp.nl), een onafhankelijke denktank die onder andere milieuverkenningen maakt, begon transitiemanagement te monitoren. Het is moeilijk voorstelbaar dat deze inspanningen niet geworteld zijn in sterke en blijvende losse netwerken, en dat deze niet bijdragen aan een beter begrip van duurzaam verandermanagement.

Hoofdstuk 7: duurzaam verandermanagement

Vergelijk netwerken met levende organismen. De eerste les voor duurzaam verandermanagement is dat het helpt als verandermanagers zich ervan bewust zijn dat ze onderdeel vormen van een los netwerk dat kan worden vergeleken met een levend organisme. Het wordt dan makkelijker om het verband te leggen tussen individueel en collectief complexiteitserkennend gedrag. Het wordt ook makkelijker om ironisch te zijn in plaats van cynisch of sceptisch, en deze ontwikkelgerichte drijfveer kan leiden tot complexer gedrag en complexere en

flexibeler gezamenlijk beleid. Ontwikkelgericht zijn, in plaats van een exclusie-ve oriëntatie op het verhinderen van onduurzaam gedrag bij anderen (afrekenge-drag), impliceert vertrouwen hebben dat een vergelijkbaar begrip van de situatie en houding in andere delen van het samengestelde systeem bestaan, zodat losse netwerken kunnen ontstaan.Deze losse netwerken hebben de mogelijkheid om door zelforganisatie adaptieve netwerken te vormen en door dat te doen de vaar-digheid van zelforganisatie en het ontwikkelen van invloedrijke voorstellen ook te verbeteren. Als ze succes hebben nemen vertrouwen en vooruitzicht toe, en het losse netwerk heeft zijn collectieve competentie vergroot.

Het metabolisme van dit organisme is gebaseerd op voorstellen aan de macht die ook echt invloed hebben op adaptieve spanningen in een richting die past bij hun visie. De machtsnetwerken zouden instemmend moeten reageren, en dit zou sterkere verwachtingen moeten creëren dat de voorstellers beloond worden met een nieuwe kans om voorstellen te leveren die afwijken van de bestaande prak-tijk. Dit succes kan het netwerk nieuwe energie geven en meer hoop op een duurzame toekomst. Een buitenstaander kan de mate van duurzaamheid van deze voorstellen evalueren aan de hand van de complexiteit van de ideeën die ontstaan in adaptieve netwerken. Als kennis over zwakkere groepen, zoals toe-komstige generaties, wordt gerepresenteerd in het adaptieve netwerk zijn de ideeën per definitie complexer geworden en dus meer duurzaam – een ander operationeel criterium is er niet. Ook al is dit geen perfecte maat, is het duidelijk dat adaptieve netwerken die in dit boek zijn onderzocht duurzamer zijn dan voorgaande adaptieve netwerken, die minder complex en vluchtiger waren. Voor de eerste keer was er overeenstemming tussen alle domeinen in het com-plexe *automotives* systeem, inclusief milieuorganisaties.

Het conceptuele onderscheid tussen machtsnetwerken en adaptieve netwer-ken helpt om het gedrag van beleidsmakers te begrijpen, en hoe deze af en toe zelforganiseerden in netwerken met een variërende mate van scheiding van adaptieve interacties en machtsinteracties. Deze conceptuele scheiding biedt de mogelijkheid om de scheiding expliciet en fysiek te maken zo dat machtsvrije groepen kunnen ontstaan die bewust co-evolutie kunnen nastreven. Dit leidt tot machtsinterventies en golven van verandering in het grotere sociale systeem als de tijd daar rijp voor is. Nieuwe adaptieve spanningen verschijnen en de cyclus herhaalt zich, één stap dichter bij duurzame ontwikkeling. Actie in het totale systeem wordt meer coherent en afgestemd op gemeenschappelijke problemen op de lange termijn.

Het feit dat adaptieve netwerken complexe ideeën ontwikkelen die niet in machtsnetwerken kunnen ontstaan zou kunnen suggereren dat ze het beter we-ten, maar dat hoeft niet altijd. Zoals iedere herkenbare sociale groep kennen ze zelfreferentie en groepsdenken. Adaptieve netwerken kunnen alleen voorstellen doen die concurreren met de voorstellen van andere adaptieve netwerken en machtsnetwerken selecteren dan. Machtsnetwerken, bijvoorbeeld het primaat van de politiek over de ambtenarij blijven intact, maar worden alleen beter geïn-formeerd over hun opties. Adaptieve netwerken kunnen alleen overleven als

machtsnetwerken openstaan voor de inspiratie die zij bieden; als hun ideeën overtuigend zijn.

De individuele rol om kloven te overbruggen. De tweede les is dat adaptieve netwerken afhankelijk zijn van beleidsmakers die bereid zijn om het verband te leggen tussen de korte termijn en de lange termijn door persoonlijk te investeren in sociale en conceptuele verbindingen met beleidsmakers in andere delen. Ze vonden hun persoonlijke motivatie in de spanning tussen bestaande onduurzame praktijken en de wens van duurzame ontwikkeling van het maatschappelijk systeem waarvan ze afhankelijk zijn. Deze capaciteit mag orden gedefinieerd als dubbeldenken, wat bijvoorbeeld een CEO in staat kan stellen om op te treden in een adaptief netwerk en ideeën te ontwikkelen die zijn formele beleid ondermijnen, wat misschien (nog) niet wordt begrepen door een meerderheid van andere beleidsmakers in zin bedrijf die zijn competentie van dubbeldenken niet hebben. Buitenstaanders die vragen om duurzame ontwikkeling zien alleen maar de zichtbare acties en blijven kritisch over deze CEO. Ook al machtsnetwerken een doorbraakvoorstel accepteren wordt de CEO misschien niet materieel beloond, omdat zijn bijdrage achter de schermen plaatsvond. Alleen de losse netwerken hebben dat optreden kunnen waarnemen en kunnen hem belonen. Beloning wordt nog onwaarschijnlijker omdat oplossingen voor complexe problemen zoals duurzaam ontwikkeling moeilijk te vinden zijn, en lange series interventies in machtsnetwerken vereisen, waarmee veel meer mensen bij het golvende leerproces betrokken worden alvorens een adaptieve spanning ontstaat die leidt tot marktdoorbraken. Een groot obstakel is de cultuurkloof tussen de publieke en private sectoren, leiders aan beide zijden moeten langdurig investeren voordat een context ontstaat die een niet-verbrokkelde dialoog over de kloof heen mogelijk maakt.

Publieke en private leiders die deelnamen aan transitiemanagement deelnamen of het steunden waren zich hier waarschijnlijk ten volle van bewust. Dit geldt ook voor hun rechterhanden die individueel en gezamenlijk deze competenties ontwikkelden. Hierdoor kon kennis makkelijker stromen tussen de delen. Iedere keer als een machtsnetwerk een voorstel accepteerde was het sociale systeem een stap verder in het denken over duurzame ontwikkeling. Eén adaptief netwerk, het IB, verbeterde deze vaardigheden heel gericht en maakte ze ook expliciet. Succes ontstond door nieuwe probleemdefinities in machtsnetwerken die nieuwe adaptieve spanningen creëerden. Omdat dit nog niet tot zichtbare veranderingen in de markt leidde ontstond de paradox dat ze succesvol waren in hun eigen ogen maar nog niet in de ogen van de buitenwereld.

Het idee dat adaptieve netwerken machtsvrij moeten zijn en dus afhankelijk zijn van individuele bereidheid tot duurzaam verandermanagement, is daarom de sleutel. Voordat adaptieve netwerken hun complexe problemen kunnen aanbieden hebben ze geen bron van legitimiteit of hulpbronnen. Het is principieel niet kenbaar of ze bruikbare ideeën zullen ontwikkelen; de ideeën zijn te gevoelig om breed correct begrepen te worden omdat ze dubbeldenken vereisen. Verwachtingen creëren door allocatie van geld verstoort de geslotenheid al. Alleen

het feit dat het adaptieve netwerken zijn is voor de buitenwereld geen legitimatie, en hierom zijn ze volledig afhankelijk van hun eigen rationaliteit. Ze moeten bereid zijn om te accepteren dat het grotere systeem hun ideeën niet op prijs stelt, hun ideeën misschien niet op prijs stelt dat machtsnetwerken zich anders ontwikkelen dan ze hopen, en het losse netwerk moet dan even afwachten. Om de losse netwerken toch levend te houden helpt het om een gezamenlijke taal voor het managen van spanningen te cultiveren in adaptieve netwerken, waar het succes bepaald blijft worden toenemend complex gedrag in machtsnetwerken.

Het helpt om tijd- en ruimteschalen met elkaar te verbinden. Sommige adaptieve netwerken kunnen alleen verschil maken in machtsnetwerken met weinig macht, en daardoor beperkte interne complexiteit. Adaptief gedrag kan bijvoorbeeld helpen om relatief kleine veranderingen in R&D-beleid te krijgen of investeringen in iets duurzamere producten. Dit soort initiatieven kan succesvol zijn zelfs zonder belangrijke ingrepen van de overheid in de markt, maar kunnen toch adaptief gedrag vereisen. Toch hoeven deze kleine successen niet te leiden tot een keten van gebeurtenissen die uiteindelijk leidt tot een duurzame transitie. Duurzame transities kunnen in werkelijkheid afhangen van doorbraken in het denken over overheidsbeleid om marktverandering te faciliteren, en daar is een ander soort verandermanagement nodig. Juist dit tweede soort verandermanagement is behandeld in dit boek. Maar deze complexiteitsniveaus kunnen ook worden verbonden. Kleine veranderingen kunnen worden ontwikkeld om te passen binnen gewenste grote veranderingen, zodat de kleine veranderingen daar in ieder geval aan bijdragen.

Zoals de schalen van sociale complexiteit kunnen ook tijdschalen verbonden worden. Op een schaal van decennia heb ik verschillende golven zien verschijnen waarin losse netwerken ontstonden die de vaardigheid hadden om vertrouwen te bevorderen over domeingrenzen heen en die een gezamenlijk manier van denken over duurzame ontwikkeling evolueerden. Deze mensen hadden een gezamenlijke geschiedenis van onbevredigende ervaringen, die hen ertoe aanzette systeemdenken te hanteren en hun oordeel uit te stellen in dialogen gebaseerd op onderling respect van een persoon en zijn belangen. Dit was een proces van culturele evolutie. Op een tijdschaal van maanden, daarentegen, leden van deze netwerken konden zich zelforganiseren in adaptieve netwerken die verschillende domeinen konden verbinden. Deze konden dan een werkwijze ontwikkelen die als de groep in eigen ogen genoeg succes had om door te blijven gaan, geleidelijk kon verbeteren in de loop van enkele jaren. Zelforganisatie werd opgeroepen door kansen zoals het NMP4, en evolutie werd mogelijk doordat het adaptieve netwerk kon schotsspringen van het ene machtsnetwerk naar het andere, onder verschillende namen en in verschillende samenstellingen, zich steeds aanpassend aan een veranderende machtscontext, zowel de grootschalige evolutie als de politieke kansen in machtsnetwerken op korte termijn.

Tenslotte moeten deze waarnemingen niet worden overgewaardeerd. Ik heb bewust gestreefd naar een ontwikkelgerichte oriëntatie op duurzame ontwikkeling. Daartoe moet duurzame ontwikkeling worden verbonden aan het gedrag

van een enkel persoon, alle schalen van tijd en ruimte verbindend. Ik heb de samenleving beschreven als verbonden en adaptief. De focus van het IB, een adaptief netwerk dat in eigen ogen succesvol was, en zijn opvolgers, suggereren dat dit een trend is. Maar daar staat tegenover dat deze netwerken afhangen van mensen die persoonlijk bereid waren om aan de slag te gaan met duurzaam verandermanagement, die dubbeldenken ontwikkelden, en duidelijk niet uit waren op materiële beloning. Deze groepen zijn in de afgelopen tien jaar gegroeid in het mobiliteits en energiesysteem, maar zijn nog beperkt vergeleken met de groepen die zich uitsluitend richten op de afrekenende component van besturen.