Making the invisible visible

Analysing the development of strategies and changes in knowledge production to deal with persistent problems in sustainable development

Barbara J. Regeer
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door
Barbara Johanna Regeer

geboren te Moerkapelle
promotor: prof.dr. J.F.G. Bunders-Aelen
copromotor: dr. J.E.W. Broerse
Members of the thesis committee:

prof.dr. J. Grin, Universiteit van Amsterdam
prof.dr. C.J. Hamelink, Universiteit van Amsterdam, Vrije Universiteit
dr. H. van Latesteijn, TransForum
prof.dr. C. Leeuwis, Wageningen University
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1.1 Aim and scope of thesis

In the 21st century we are confronted with persistent problems: environmental problems as a result of industrialisation, problems of food safety in the food chain, waiting lists in health care, etc. These problems are hard to understand because of their complexity, difficult to deal with in the sense that solutions to these problems are constrained by features embedded in the system, and difficult to manage because they require the actions of different actors with different interests, views and needs. They do not fit into specific disciplines, or into clearly defined policy domains. Thus, persistent problems are by no means easy to resolve.

For a number of decades, appeals for new approaches to such persistent problems have been made by political leaders, business leaders and academics alike. They have argued for a more inclusive and responsive science, government and business culture, in which knowledge production is user driven, policy making is interactive and companies are socially responsible. For example, universities are increasingly organised in institutions that focus on current and often urgent societal themes, as are funding programmes for scientific research. Besides changes in existing structures and institutions, new arrangements (networks, programmes, intermediaries) emerge
in which actors from different domains work together to analyse complex issues and collaboratively implement strategies for change.

However, despite these wide-ranging appeals, despite efforts to put these appeals into practice, and despite the increasingly available practical guidelines and handbooks, critical observers and self-critical practitioners note that too often rhetoric does not match actual practice and aspirations are not lived up to. ‘Interaction with scientists’ is often limited to ‘presentations with room for questions’, mutual learning processes turn out to be regular meetings, sustainable entrepreneurship turns out as green washing, and public consultation becomes gaining support for already made decisions. In short, there is an apparent discrepancy between theory and practice.

This thesis focuses on this apparent discrepancy, particularly in the area of recent efforts to support sustainable development by emerging (temporary) Dutch intermediaries. The conceptual-methodological explorations conveyed in this thesis are grounded in extensive field experience, particularly gained in the role of ‘monitor’ in system innovation projects and programmes for sustainable development. The aim of the research presented in this book is twofold:

• the research aims to contribute to the theoretical clarification of the characteristics of new approaches to persistent problems (e.g. recent effort to support sustainable development), and
• it aims to contribute to understanding and overcoming the intransigence met when putting these approaches into practice.

I start this introduction by exploring the central concepts used in this thesis, in the context of the emergence of new approaches to sustainable development.
1.2 The core concepts of this thesis

Sustainable development is by no means easy to realise. It entails changes at many levels and in different systems (ecological, economic, political, social, scientific) at the same time. Moreover, there is no agreement on the facts or on the values (Douglas & Wildavsky, 1982). And whilst stakes are high and decisions urgent, sustainable development implies making different choices and trade-offs, often outside of the realm of the usual course of action (of individuals and institutions), which causes a considerable amount of resistance. It has therefore been advocated that for these types of intractable (Schön & Rein, 1994), wicked (Rittel & Webber, 1973), unstructured (Hisschemöller & Hoppe, 1996) or persistent (Loorbach, 2007) problems, new types of strategies are needed. In an attempt to raise awareness of the distinct features of these integrated, transdisciplinary, interactive and systemic strategies for supporting sustainable development, I have labelled them ‘mode-2’ approaches.

The distinction between mode-1 and mode-2 has functioned as a heuristic tool in my interactions with practitioners in the (action) research on which this thesis is based. As one of the practitioners in this research recently reflected: “The most significant event at that meeting in 2005 was the introduction of the terms mode-1 and mode-2. Still today it helps me understand what we are trying to do and why it is so difficult.” (reflection workshop, Januari 2009). The term mode-2 seemed to have more interpretive flexibility in the contexts in which I conducted my research, than more specific designations for new approaches to sustainable development (such as transition management, or transdisciplinary research), which has supported the use of the terms mode-1 and mode-2 as heuristic tool. Scholars of science, technology and society
(STS), however, do have ample associations with the terminology, and not always positive. At the same time, the concept of mode-2 knowledge production, as introduced by Gibbons et al. (1994), has been influential, at least as a convenient reference for scholars in the fields of science policy, research policy, management studies and higher education to indicate changes in the relationship between science and society1 (Hessels & van Lente, 2008). So how does my use relate to the discussions in STS? And why and how exactly do I use mode-1 and mode-22? These questions I will explore next, before describing the research approach and formulating the research questions.

Origins of the concepts mode-1 and mode-2

Let us first take a closer look at the original argumentation for a new mode of knowledge production and the associated criticisms. Mode-2 is introduced in ‘The New Production of Knowledge’ by Gibbons et al. (1994) to distinguish a traditional type of knowledge production that occurs in a university context (mode-1) from a new type of knowledge production (mode-2) that occurs outside of traditional university boundaries in the context of application. The thesis of their book is that the nature of the research process is being transformed as a result of such trends as the increased steering of research priorities, the commercialisation of research (e.g. alternative funding for research, but also utilisation of research

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1 A study tracing the citations to this publication reveals that out of 1000 citations until 2007, around 80% refer to the New Production of Knowledge in an approving way, treating it as an accepted account of current transformations (Hessels and Van Lente 2008).

2 In ‘The New Production of Knowledge’, Gibbons et al. 1994 capitalise Mode 1 and Mode 2. In ‘Re-Thinking Science’ Nowotny et al. 2001 hyphenate Mode-1 and Mode-2 when the terms are used as pre-fixes (e.g. Mode-1 knowledge production). In this introduction I consistently hyphenate and do not capitalise mode-1 and mode-2.
results) and the increasingly result-oriented management of research requiring evidence of impact and effectiveness (Gibbons et al., 1994; Nowotny, Scott, & Gibbons, 2003). A new mode of knowledge production is emerging, a mode of knowledge production with the following characteristics.

First, mode-2 knowledge is carried out in the context of application, rather than transferred from science to society. Second, mode-2 knowledge production is trans-disciplinary, where the prefix “trans” indicates that knowledge is not necessarily derived from pre-existing disciplines; it transgresses boundaries. In order to solve problems, a range of theoretical perspectives and practical methodologies is mobilised within the context of application. A third characteristic of mode-2 knowledge is its heterogeneity, which refers to the much greater variety of sites where knowledge is produced (think-tanks, consultancies, NGOs) as well as to the heterogeneity of skills and expertise brought in by the multiple stakeholders involved. A fourth characteristic of mode-2 knowledge is its social accountability and reflexivity. Research is increasingly becoming a dialogical process between research actors and those who have traditionally been outside of the science system.

Problems and the corresponding stakeholders with their interests and needs, are no longer at the ‘outside’ of the research process; they influence topic choice and research design. Hence, social accountability permeates the whole research process. Finally, mode-2 is characterised by novel forms of quality control. Quality is determined by a wider set of criteria (than those used in peer review), reflecting the broadening social composition of the review system. These characteristics are all in contrast with traditional mode-1 science, which is characterised as being homogeneous, autonomous and generated within a disciplinary, primarily
academic, context (Gibbons et al., 1994; Gibbons & Nowotny, 2001; Nowotny, Scott, & Gibbons, 2003).

So far, a summary is given of the account the authors have given of transformations currently taking place in the research system. Whilst influential, the books have also been criticised, particularly by those studying the changing relationship between science and society themselves. It is said to be historically incorrect, not based on empirical evidence and primarily a normative account of a desired mode of knowledge production (e.g. Rip, 2002; Weingart, 1997). What criticisms have they received? Why do STS scholars argue that the presented line of argument is incorrect?

**The critical reception of the concepts mode-1 and mode-2**

Whereas ‘The New Production of Knowledge’ describes the emergence of a new type of knowledge production alongside traditional, mode-1 science, scholars in the social study of science and technology have long before deconstructed the very idea of mode-1 science, in the sense of a ‘pure’, fundamental or disinterested knowledge production. Science studiers have studied ‘science in action’, by meticulously describing how scientists systematically disengage their knowledge from any trace of fabrication, construction, place and time (e.g. Latour & Woolgar, 1979). Facts are ‘black-boxed’ and appear (in journals, text books and newspapers) without reference to the actors involved in their construction and the environment in which the research took place. It is a process in which content and context are separated, until the context is dissolved into an invisible history (Latour, 1987). The way this is done differs in each epistemic culture, defined by Knorr-Cetina as “those amalgams of arrangements and mechanisms which […] in a given field, make up how we know what we know” (1999: 1). Not only by studying science from within, do boundaries
between science and society seem blurred and contingent. Studies on the emergence of disciplines (Foucault, 1969), and on knowledge claims in the context of scientific controversies (Wynne, 1996) have also shown the ambiguous nature of scientific knowledge and the strong interwoven nature of processes in science and society.

Thus, science studiers have argued that scientific and societal developments are mutually dependent processes that at the same time constitute each others environment and produce one another. As Jasanoff (2004: 5) states: “Knowledge and its material embodiments are at once products of social work and constitutive of forms of social life. [...] [Scientific knowledge] both embeds and is embedded in social practices, identities, norms, conventions, discourse, instruments and institutions – in short the social.” The social and the scientific are connected like two sides of a coin. The claims made by Gibbons et al. (1994) that mode-2 knowledge production is a relatively new phenomenon emerging alongside the traditional autonomous, disciplinary driven mode-1 science is not supported by empirical evidence. So how then can we understand the distinction between mode-1 and mode-2?

Godin (1998) has argued that the authors of the ‘New Production of Knowledge’ present the idea of mode-1 science as “a true reality” (p. 469) whereas empirical studies in the sociology of science reveal that mode-1 science appears a historically based rhetoric. The processes of disembodying and depersonalising scientific knowledge, as referred to above, and of demarcating science from non-science (Gieryn, 1983; Star & Griesemer, 1989), have been made into an ethos by scientists themselves. An ethos which proclaimed the scientist’s moral virtues and autonomy of science from the political, social and economic spheres (Godin, 1998 referring to Merton, 1973,
Weber, 1949 and Polanyi, 1962). But the rhetoric of the autonomous production of knowledge and the by intellectual curiosity driven scientist, should not be confused with a factual account of science as it used to be and still is.

This prompts an analogy with Latour’s account of blurring boundaries between nature and culture. The book is appropriately titled ‘We have never been modern’ (Latour, 1993), where ‘modern’ stands for the separation of the scientific and social realm, and the associated processes of scientific specialisation and social progress, which have been labeled mode-1 in the ‘The New Production of Knowledge’. Latour argues that modernity shows two sets of practices: the practice of ‘purification’ results in a separation of nature and culture, and the practice of ‘translation’ results in hybrid networks of nature-culture (e.g. continuous chains linking the ‘chemistry of the upper atmosphere, scientific and industrial strategies, the preoccupations of the heads of state, the anxieties of ecologists’ p. 11). One may argue that the practice of ‘purification’ gives rise to the rhetoric of mode-1, and that it is the ‘image’ of science, rather than the actual practice of science that may be labeled mode-1. I will illustrate with some examples how public representation of science reinforces the mode-1 ethos.

Research on science coverage in the press revealed that “very little appeared in the press about the actual nature of the research” (Nelkin, 1987, p. 6), and that it “ignored how science was really done” (LaFolette, 1991, p. 16). The myth of scientists as white-coated, male, caucasian, intelligent and authoritative, and science as producing objective knowledge, creating certainties and solving problems, is found not only in newspapers, but also in comics, school books, television programmes, museum exhibitions and films (Collins, 1987; Lewenstein, 1995). Thus,
mode-1 is not a ‘mode’ in the sense that it is an actual mode of operation of science, but an expected mode of operation, which has subsequently affected knowledge production itself. A similar argument has been made about the process of policy making. Even though policy scientists have shown that policy making does not happen in orderly steps of problem definition, solution proposition, decision making, implementation and evaluation (e.g. Teisman, 2000), this ‘image’ of policy making has affected actual practice. Furthermore, the mode-1 rhetoric is also manifest in the way (science) policy constructs expectations of science (and scientists) and induces corresponding behaviour (Douglas & Ney, 1998).

From the above, I hypothesise that the use of the distinctive concepts mode-1 and mode-2 may act as a heuristic tool that helps developing strategies that accommodate emerging tensions between mode-1 and mode-2. I will come back to this use of mode-1 and mode-2 shortly, but now turn to another criticism of The New Production of Knowledge, namely that it is primarily a normative appeal for another mode of knowledge production.

The normative stance

‘The New Production of Knowledge’ has not only been critisised for being empirically and historically incorrect, but also for their normative stance: “it is first and foremost a political plea, mixing descriptive and normative perspectives” (Godin 1998, p. 467). Indeed, the book, as well as the follow up (Nowotny, Scott, & Gibbons, 2001) et al., 2001) and other manifestations (Gibbons & Nowotny, 2001; Nowotny, Scott, & Gibbons, 2003) suggest a normative stance: mode-2 knowledge production will lead to better science; a mode of knowledge production where people have a place, not only as end users, but at the core of knowledge production; where
diverse values are not added to science but integrated into its practice. The co-evolution of science and society provide the basis for the construction of a new social contract between science and society, giving people a stronger voice in the _agora_ in which science and society meet.

Humanist philosopher Kunneman (2005) has argued that Gibbons _et al._ (1994) and Nowotny _et al._ (2001) constructed two very different lines of arguments; one arguing that in a knowledge economy, through globalisation, knowledge production takes place in a greater diversity of places, which according to Kunneman leads to a more commercialised and strategically utilised form of knowledge production (see also Blume & Geesink, 2000). The second line encompasses the democratisation of knowledge production through incorporating values at its core. It is this line of argument that Kunneman proposes to endeavour on (which he does by introducing it as a third mode of knowledge production), and it is this line of argument that I have taken to be central to the understanding of mode-2 knowledge production, and my aspiration to contribute to the resolution of contemporary persistent problems.

Although both books (Gibbons _et al._ 1994 and Nowotny _et al._ 2001) provide a somewhat confusing reading experience, by the mix of discourses employed of description and appeals (the authors themselves say that they were intended as reflective essays written for a policy audience, rather than as empirical analyses, Nowotny _et al._ 2003: 186), making a connection between _descriptive_ accounts of science and society and _prescriptive_ appeals is by no means uncommon nor particularly recent. The social study of science and technology has from the outset had a clear political agenda (Callon, 1995; Van Lente, 1994). Whilst positivistic notions of science to many STS
scholars are an obstacle to the democratisation of science and technology, the notion of science and technology as contingent to the social provide alternative constituencies of decision making about science and technology. Different scholars have advocated a more inclusive and responsive science; a type of knowledge production that starts from real-life problems and aims to devise solutions in collaborations between multiple stakeholders. Funtowicz and Ravetz (1993) for instance express the need for ‘post-normal science’ in cases characterised by high uncertainties and conflicting values. Bijker (1995) relates the conceptual shift in the relationship between technology and society (from technology as autonomous to technology as socially constructed) to the possibility of democratising our technological culture. This is congruent with other voices in the science studies discourse to move from descriptive studies to prescriptive work in which science studiers contribute their expertise in the field of ‘knowledge science’ to real life science-society interactions (Collins & Evans, 2002). More generally, there are wide calls for revising the contract between science and society by developing new interfaces that encompass attempts at ‘reflexive co-evolution’ (e.g. Rip, 2005).

Not only from the perspective of STS have calls been made for rethinking the relationships between science and society, also policy scientists have argued that in our present society relationships between citizens and government as well as between policy scientists and practice need revising. Schön and Rein (1994) argue that traditional approaches to policy analysis are not appropriate for understanding persistent problems (or intractable controversies as they call them), and, more importantly, they do not aid in their resolution. The dichotomy between reflection by academic scholars and the practice of policy making should be resolved by collaboration between policy academics and policy practitioners. Laws and Hajer (2006)
too have moderated the claim that knowledge can by itself guide policy making, and have also argued for cooperation. The corresponding idea that the units within which policy has to be made coincide ever less with the constitutionally defined settings (Hajer & Versteeg, 2005) has given rise to a new role for citizens in our deliberative democracy (e.g. Fischer, 2000; 2003).

Thus, the normative stance that the relationship between science and society needs re-thinking is shared beyond the criticisms of mode-2, and a variety of strategies are developed from different (disciplinary) perspectives to give people a stronger place in the agora where science and society meet, as the examples in table 1.1 illustrate. The table lists a selection of approaches for more inclusive and responsive science and policy that have been developed largely in the 1990s of the last century. The left hand column shows the title of the proposed approach with the primary sources in brackets. The next two columns summarise the main issue that the approach intends to address (2nd column) and the way in which it proposes to do so (3rd column). In the right hand column finally, core features of the proposed methodology are listed.

A few notes of precaution; table 1.1 should not be interpreted as providing an exhaustive overview of approaches or arguments. It for instance does not include accounts of reflexive modernization (Beck, Giddens, & Lash, 1994), or the network society (Castells, 1996), nor does it include arguments for bringing together theory and practice as posed by action researchers (e.g. Kemmis & McTaggert, 1988; Reason & Bradbury, 1990). It also does not explicitly mention the many participative approaches as developed in the context of development work, such as participatory rural appraisal (PTA) (e.g. Chambers, 1992), and public engagement mechanisms as
developed in various policy, business and science contexts (see Rowe & Frewer, 2005 for an overview). Moreover, the approaches are not as distinct from each other as the table suggests. For instance, the Interactive Learning and Action approach (Bundred, 1990, Bundred & Broerse, 1991) was included as an example in ‘Technology Assessment through Interaction’ (Grin, van der Graaf & Hoppe, 1997) and the recent Handbook for Transdisciplinary Research (Hirsch Hadorn et al. 2008) includes contributions on post-normal science (Funtowicz & Ravetz, 2008). Due to the context of the present thesis, examples from the Dutch context predominate; but, as shown, revising the relationships between science and society in order to deal with persistent problems is not merely a Dutch endeavour. Table 1.1 thus provides a selection of arguments and approaches that primarily serves to illustrate the similarities of arguments from different perspectives.

It is striking that some calls listed in table 1.1 take as a starting point the increasingly problematic relation between science, government and society in a fundamental sense (e.g. by referring to the process of reflexive modernisation), whereas others start by stating that science (natural and social) insufficiently makes use of its potential to contribute to complex problems solving. We see two related hypotheses: 1) science needs rethinking, and 2) our democracy needs rethinking. More recently, the approaches (table 1.1) based on these hypotheses have started to convergence to new types of problem solving strategies that take neither science nor policy as a starting point. Rather, they take the systemic properties of the problems as starting point and as such focus on all systems that are affected by, and conversely affect, the problems at hand, whether science or policy. Hence, the third hypothesis: 3) persistent problems need new types of problem-solving strategies (see fig. 1.1). The need for new types of problem-solving
<table>
<thead>
<tr>
<th>Approach</th>
<th>Addresses</th>
<th>Proposition</th>
<th>Methodology</th>
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| Transdisciplinary research     | the fact that contemporary societal and environmental problems are in need of new type of knowledge production | Design research processes in a transdisciplinary way | • Grasp the relevant complexity of a problem;  
  • take into account the diversity of life-world and scientific perceptions of problems;  
  • link abstract and case-specific knowledge  
  • develop knowledge and practices that promote what is perceived to be the common good |
| Interactive Learning and Action approach | the need to broaden decision making about science and technology         | Enhance the development of science-based innovations by involving groups and aspects that are usually only marginally considered | • Give end-users prominent role in decision making throughout process  
  • Develop a shared vision  
  • Enable trust-building and capacity-building  
  • Support knowledge integration (of explicit and tacit, of scientists knowledge and end-users knowledge) |
| Deliberative democracy         | the need for more democratic institutional arrangements                  | Create new models of citizen engagement through deliberation | Participative inquiry:  
  • Develop a narrative understanding of social problems  
  • Build capacity  
  • Promote reflexive discourse |
| Post-normal science            | the fundamental uncertainties in policy issues of risk and the environment | Employ post-normal science when facts are uncertain, values in dispute, stakes high and decisions urgent | Develop a genuine and effective democratic element in science by:  
  • setting and evaluating problems and solutions by the criteria of broader communities (the extended peer communities) |
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>Suggested Approaches</th>
</tr>
</thead>
</table>
| **Mode-2 Knowledge Production**              | the increasing need for institutions, scientists and people to accommodate complexity and uncertainties of contemporary society | Make science more context-sensitive by bringing in people. Call to continue to re-think science. Suggestions:  
• coping strategies for dealing with uncertainties  
• democracy of knowledge (embracing the implications)  
• adaptable, comprehensive universities |
| **Frame Reflection**                         | the need to resolve intractable policy controversies                        | Develop new approach to policy analysis: frame-critical approach.                     |  
• Collaborative frame-reflection  
• Design rationality as co-design  
• Resolve dichotomy between science and practice through reflection-in-action |
| **Constructive and Interactive Technology Assessment** | the need to deal better with the impacts of technology in society          | New paradigm of managing technology in society.                                      |  
• Broadening design, development and implementation processes of new technologies by  
  • Facilitating societal learning processes  
  • Organise dialogue among and early interaction with actors involved in and actors affected by the technology.  
  • Sociotechnical criticism |

Strategies have been elaborated in the direction of system innovation, transition management and reflexive governance. As figure 1.1 depicts, many of the above suggestions for new approaches to complex problems are (being) incorporated in these current strands of research. They focus particularly on the challenges associated with realising sustainable development.
Based on historical studies of structural societal transformation processes (e.g. Schot 1998), characteristics of so called ‘transitions’ were used to formulate features of transition management; a process oriented steering philosophy based on multi-level coordination (Loorbach, 2007; Rotmans, Kemp, & Asselt, 2001). Some of the core concepts at the roots of transition studies are ‘system innovation’, ‘regime shifts’, ‘socio-technological transformations’ and ‘evolutionary theories’ (see Elzen & Wieczorek, 2005; J. Grin, 2004b). Reflexive governance refers to an alternative orientation for governance, needed to shape the course of societal directions in more sustainable directions. It is a response to the unintended side-effects of modernisation that are inherently generated by the practices of modernisation (hence, reflexive modernisation), and it proposes strategies that incorporate rather than eliminate uncertainty, ignorance, heterogeneity, ambiguity and unintended effects (see Voß, Bauknecht, & Kemp, 2006). Again this overview
of more recent strategies for sustainable development is not complete; it does not include writings on network governance (Koppenjan & Klijn, 2004), on social-ecological transformations (Becker et al. 1997), on the triple-helix of university-industry-government relations (Leydesdorff & Etzkowitz, 1996) or on complex adaptive systems (Dooley, 1996; Holland, 1992).

So, why are the concepts mode-1 and mode-2 used in this study?

To summarise, scholars of STS have argued that seemingly intractable types of problems, such as those associated with sustainable development, require new ways of knowledge development and a new type of relationship between science and society. They have advocated an inclusive and responsive science; a type of knowledge production that starts from real-life problems and aims to devise solutions in collaboration with multiple stakeholders. Similarly, scholars of policy processes have emphasised that managing for sustainability requires new ways of governance: it is not an exclusive activity of governmental bodies, but rather reflects principles of network steering. Traditional intervention modes and policy instruments are supplemented by notions of reflexive governance (Voß et al. 2006) and deliberative democracy (Fischer, 2003; Hajer & Wagenaar, 2003). Moreover, system innovation (Grin, 2004a) and transition management (Kemp, Parto, & Gibson, 2005; Loorbach, 2007) emphasise the multi-level nature of approaches. In the context of this thesis, where I take mode-2 to be a central concept, I choose to consider these different approaches as examples of mode-2 approaches, just like they could be (and have been) used as examples of Reflexive Governance (e.g. see Voß et al. 2006), or as examples of Transdisciplinary Research (e.g. see Hirsch Hadron et al. 2008). There are several reasons for this choice, which are related to the three ways in which I use the concept of mode-2: namely normatively, analytically and heuristically.
First, the normative stance says that science should aim to contribute to the resolution of the persistent problems related to sustainable development by incorporating people and values in the process of knowledge development. As science studiers have argued, the actual practice of scientific knowledge production (in which facts are difficult to distinguish from values, content from context, and the act of research from the researched) provides ample potential to do this. When this potential is made productive through deliberate development and implementation of new strategies, I call these approaches ‘mode-2’. Rather than specifying the differences, I want to emphasise the shared endeavour of these different strategies: the efforts to design, in practice, new ways of handling problems, through a close interaction and reciprocal relations between different actors, domains and sectors in society, in order to contribute to sustainable development.

Second, I make an analytical distinction between mode-1 and mode-2. Even though the new strategies are developed against the background of a mode-2 understanding of knowledge production (science-in-the-making) the impact of the mode-1 rhetoric (science-ready-made) on the effectiveness of mode-2 strategies is significant and deserves serious attention. This is not only the case for our understanding of knowledge production, but also for our understanding of the strategies that lead to progress (e.g. to a more sustainable world); the (mode-1) ideals of planning and control, certain knowledge and unambiguous evaluations that have become embedded in the cognitive and institutional structures of society, at times seriously hamper the development and implementation of (mode-2) strategies that embrace uncertainty, ambiguity and dispersed governance activity. By making an analytical distinction between mode-1 and mode-2, the tensions can be positioned theoretically and consistent options for solutions can be defined and tested.
Third, the heuristical stance invites the stakeholders in the agora to explore the persistent problems in a more inclusive framing, avoiding premature closure. This reframing solicits the development of strategies to deal with the tensions between mode-2 strategies and mode-1 expectations, routines, ideals and institutions. The concept of mode-2 is used as a heuristic tool to give interpretation and meaning to emerging stagnations in sustainability projects. This study has started with the assumption that the concept of mode-2, whilst inspired by the various accounts described above, has a high degree of interpretive flexibility, which is necessary for it to fulfill the function of a heuristic tool. It can be further shaped as a result of the interactions between theory and practice. Hence, the power of mode-2 as a heuristic tool is its potential for enhancing theoretical understanding of new strategies for sustainable development and at the same time enabling the practical development of these strategies.

In this way, the conceptual-methodological explorations presented in this thesis respond to an as yet underexposed issue in the context of new approaches for sustainable development. Scholarship on mode-2 strategies for sustainable development (under banners ranging from transdisciplinary research and reflexive governance to system innovation and transition management) provides many propositions for requirements that are believed to lead to desired new types of knowledge production and related problem solving strategies. However, insights on how to realise these conditions in practice are rare, and insights in ways to address the tensions between mode-1 and mode-2 are scarce. At the same time, with the increasing number of projects and programmes on system innovation for sustainable development that are conducted in real life, there is an abundance of experiences with mode-2 approaches to sustainable development in practice. These
experiences confirm that successful implementation of strategies that are characterised by uncertainties and ambiguities is tough. So, if mode-2 approaches to persistent problems are so difficult, and if scholars of participative approaches, system innovation, and mode-2 knowledge production have indeed acquired relevant knowledge about these processes, then how can we contribute to accommodating these difficulties through our research? Where does theory meet practice? With the development and conduct of the research presented in this thesis, I hope to contribute to this underdeveloped aspect of the aspired new approaches to sustainable development. I will next elaborate on the approach employed in the conduct of my research.

1.3 Research approach: where theory meets practice

My research is situated where theory (on mode-2 strategies for sustainable development) and practice (bringing multiple stakeholders together in processes of knowledge cocreation and problem resolution) meet. It is part of a longer line of research that goes back to the development of the Interactive Learning and Action (ILA) approach (Formerly called the 'Interactive Bottom-Up approach') to broaden decision making about science and technology. The ILA is a transdisciplinary innovation strategy that has been developed during the 80s and 90s of the last century by Bunders (1990) and Bunders and Broerse (1991). Its original aim was to increase the sustainability of agricultural innovations in developing countries by making them adjusted towards the needs and interests of small-scale farmers. Since its first introduction in 1987, it has been applied among others in Zimbabwe, South Africa, Bangladesh and The Netherlands. The approach is structured around a number of principles stating the importance of involving end-users from the start, striving for knowledge
cocreation, organising a network of support and facilitation by an interdisciplinary team. The intervention strategy is cyclical whereby tailor made interventions follow observation of and reflection on previous interventions. Broerse (1998), on the basis of her research in Zimbabwe, formulated the importance of recognising that conditions for a mode-2 strategy are never in place and that, as a consequence, the strategy itself should focus on creating or dealing with these conditions. Thus, the ILA approach does not only act at project level, but also on the institutional setting and the individual competences of people.

The effective interaction at the interface between science and society, is not only advanced by conducting more ILA projects in different fields (e.g. in biomedical innovation trajectories, Caron-Flinterman, 2005; or innovation processes in eogenomics, Roelofsen, Broerse, Cock Buning, & Bunders, 2008), but also by training others through dedicated training programmes or through close collaboration in practice. The institutionalisation process of an interactive approach at the Grameen Krishi Foundation in Bangladesh can be seen as the starting point of this ambition. In this case, an interdisciplinary ILA team endeavoured to transform (mode-1) working routines of the foundation to more interactive approaches by training members of a dedicated unit within the organisation and organising a broader network of support around it during a period of seven years (see Zweekhorst, 2004).

The present research takes the anchoring of interactive approaches further and into the Dutch context of system innovation programmes. Rather than initiating in-depth single case studies, it aims to advance the anchoring of mode-2 strategies to sustainable development by facilitating in processes that are initiated by others. Through taking up the additional role of ‘monitor’ besides project leaders and project
participants in system innovation projects, we were able to support capacity building of transition professionals and hence have a broader impact on furthering and anchoring mode-2 approaches to sustainable development. As developing the methodology to do this is part of the present research itself, I will not elaborate on it extensively in this introductory chapter: I will describe the rationale and application of, what we now call, the ILA monitoring approach in a separate chapter (see Chapter 3). Nevertheless, here I will sketch the methodological framework that enabled me on the one hand to support learning in practice and on the other hand to draw generic, theoretical lessons. The former forms the basis of my research and is inseparably linked to the latter, which forms the primary focus of this thesis.

**Methodological framework**

I start my research from the presupposition that an inquiry into the meaning and working of mode-2 strategies for sustainable development can only be rooted in practice. Separating action from reflection, and research from practice feels unnatural in the world of mode-2. However, an *analytical* distinction can be made between the action-reflection loops that take place in the practice of our cases (practice loops) and the action-reflection loops that take place in the context of generating the more theoretical insights (theory loops) that are laid down in this thesis. These loops interact with each other through the chosen research approach. This is visualised in figure 1.2 below.

The practice loop represents the developments of cases in which the field work was conducted. The different cases in the practice loop (see for a description section 1.4) form the laboratory for the methodological-conceptual explorations that take place in the theory loop. Depending on the orientation of research (deductive or inductive) and the aim of the research
(theory-building, applied research), the interactions between the theory loop and the practice loop are more or less intensive and more or less frequent. In my research, I (initially) put more emphasis on the inductive than the deductive orientation and aimed for a mutual enrichment of theory and practice. As a result, the methodology is characterised by frequent and intensive interactions between practice and theory (the dotted arrows in fig. 1.1). Combining (through multiple iterations) observations and analyses of new practices with theoretical explorations of the core issues that emerge as a result of our research, enables us to make these new insights productive in practice and as such become supportive to the development and implementation of mode-2 strategies for sustainable development.

**Figure 1.2 Methodological framework**

The *practice loop* features intermediaries with mode-2 aspirations, which develop and conduct mode-2 strategies to address problems associated with sustainable development. More generally I define intermediaries as actors (or actants) that explicitly or implicitly shape relationships between different domains of society (with an emphasis on the relationship between science and society). These may include
knowledge centres, hybrid platforms, policy programmes, research funding, interactive methodologies, project leaders, network managers, action researchers, exhibitions, or websites; that is any institution, structure, procedure, person or object that operates at boundaries, on the one hand reinforcing the boundaries by performing acts of purification, and on the other hand supporting cocreation by performing acts of translation.

The research hinges on the essential distinction between mode-1 intermediaries, that operate against the background of a mode-1 understanding of the relationship between science and society, and mode-2 intermediaries, that operate against the background of a mode-2 understanding of the relationship between science and society (see Table 1.2, based on Vasbinder in Fonk, 2002; Regeer & Bunders, 2007). These different backgrounds have implications for the role perception of the intermediary; from transferring knowledge in mode-1 to creating forums for knowledge cocreation in mode-2. The distinction between mode-1 and mode-2 intermediaries also becomes evident in other aspects than role perception; namely with regard to their ideas about the structure of the problems they are dealing with, ideas about appropriate intervention strategies, assumptions about epistemology, and ideas about communication. The differences between co-operation and co-production and between coordination and cocreation can be subtle from a distance (e.g. when intermediaries are studied through desk research or single interviews) but become evident when played out and observed in practice. Moreover, espoused ideas and actual practice may differ considerably.

In my research I have addressed both the question of:
• how do intermediaries develop and conduct mode-2 approaches to sustainable development, and
• how can the concept of mode-2 approaches be used to (collectively) reflect upon the actions of the intermediary.
I thus deliberately employ a recursive use of the concept ‘mode-2’; the process of developing theoretical understanding of mode-2 intermediaries functions on the basis of the products of its own working (by employing the distinction between mode-1 and mode-2 heuristically in practice). These two questions encompass the entire research project as sketched in figure 1.2: they link both loops. This thesis does not comprise the results of the entire research project, but focuses instead on the methodology connecting the loops and the conceptual explorations in the theory loop.

Table 1.2 A heuristic tool for developing and understanding intermediaries

<table>
<thead>
<tr>
<th>Relationship between science and society</th>
<th>Presumed role of intermediary</th>
</tr>
</thead>
<tbody>
<tr>
<td>mode-1</td>
<td></td>
</tr>
<tr>
<td>CO-OPERATION</td>
<td>COORDINATION</td>
</tr>
<tr>
<td>Co-operation between science and society. Societal actors are not involved in designing the research and scientists are not involved in the utilisation of knowledge. No change in working methods of either.</td>
<td>Matching knowledge supply to knowledge demand and vice versa</td>
</tr>
<tr>
<td>mode-2</td>
<td>COCREATION</td>
</tr>
<tr>
<td>CO-PRODUCTION</td>
<td></td>
</tr>
<tr>
<td>Society and science both actively seek the best way to structure and manage complex change processes. Responsibilities differ, but modus operandi start to converge.</td>
<td>Articulating knowledge demand, facilitating knowledge co-creation as integral part of joint solution process</td>
</tr>
</tbody>
</table>

The theory loop features the conceptual-methodological explorations of the core characteristics of mode-2 approaches to persistent problems as employed by mode-2 intermediaries. The systemic character of persistent problems require new ways of approaching them – that is why I pay particular attention to intervention strategies as developed and conducted by mode-2 intermediaries. These strategies involve
the integration of knowledge of the variety of actors involved, which induces questions of epistemology. Thus, by engaging with the practice of mode-2 intermediaries, I aim to theoretically clarify the mode-2 characteristics of intervention strategies and epistemology. Moreover, as mode-2 intervention strategies imply the initiation of learning processes beyond the boundaries of the initial project, both at the level of personal competence and at system level, the characteristics of mode-2 communication strategies require special attention. Finally, the interactive research approach (ILA monitoring) is further developed, by reflecting upon the rationale and actual conduct. Associated research questions that have guided the theoretical clarification of these mode-2 concepts are described below.

**Intervention strategies**

Central to the study are the intermediaries and the intervention strategies they conduct. Research in the practice loop is focused on intermediaries with mode-2 aspirations; they have expressed the intention to address problems associated with sustainable development from a systemic perspective.

- What are essential characteristics of intervention strategies developed and employed by intermediaries to aid the resolution of persistent problems?
- What common blind spots can be formulated on the basis of our research and how can they be accommodated?

**Monitoring & Evaluation**

If mode-2 approaches to persistent problems are so difficult, and if scholars of participative approaches, system innovation, and mode-2 knowledge production have indeed acquired relevant knowledge about these processes, then how can research contribute to accommodating these difficulties?
What type of research may contribute to enhancing the reflexivity required by mode-2 approaches to persistent problems?

What monitoring & evaluation approach may shed light on blind spots and make them productive?

Epistemology
As argued above, new approaches to persistent problems require the integration of perspectives and knowledge from different stakeholders. This raises epistemological questions.

• What type of knowledge is gained in the process of mode-2 knowledge production?
• How can the (scientific) quality of this knowledge be guaranteed?
• What are the implications for intervention strategies that aim for knowledge cocreation between multiple actors?

Communication
Mode-2 intermediaries’ efforts to contribute to sustainable development imply involving different stakeholders, developing the necessary capacities and intervention strategies and stimulating learning through interaction between various actors. The question arises how learning between projects and from projects can be encouraged. A relevant question that arises is:

• How can we capture lessons learned in such a way that it enables learning by a growing network of people (and institutions) involved in efforts to stimulate sustainable development?

Thus, core issues focus on the rationale and workings of mode-2 strategies for sustainable development, rather than on a comparative analysis of different (mode-2) approaches or on a comparative analysis of sustainable development in different
sectors of society (e.g. urban development, agriculture, retail, etc.). The motivation is to contribute to the clarification and revision of the characteristics of mode-2 approaches to persistent problems as they are developed and conducted by mode-2 intermediaries, and with these insights to contribute to the understanding and accommodating of the intransigence met when putting these approaches into practice. In the next section I will describe the cases in which my research is grounded.

1.4 Experiencing the field

In order to develop an enhanced understanding of salient characteristics of mode-2 strategies for supporting sustainable development, the conceptual-methodological explorations in this thesis are grounded in practice. As ‘monitor’ I was able to work together with practitioners in the context of two system innovation programmes that will be described in this section. To emphasise the role of the cases in my research once more, I paraphrase Schön: Rather than asking how intermediaries (programme managers, project teams, project leaders) might make better use of mode-2 theories, or how mode-2 scholars might make their research results more palatable to intermediaries, I have approached these intermediaries as competent inquirers in their own right and asked how a different kind of research might enhance the kinds of inquiry they conduct in their efforts to support sustainable development (1995: 96, cited in Laws and Hajer 2006). The conceptual (what salient characteristics of mode-2 approaches emerge?) and methodological (how can we enhance inquiry through our research?) explorations laid down in this thesis are developed through an intensive experiencing of the field in a process of mutual inquiry, rather than by descriptive research or by validating theoretical hypotheses in the field.
The research in the practice loop took place in two ICES/KIS programmes (NIDO and TransForum) and underlying projects (see Table 1.3 and Table 1.4). ICES/KIS is a national programme to invest in the Dutch Knowledge Infrastructure by strengthening the country’s research and development capacity in five important thematic areas, ranging from information & communication technology (ICT) to sustainable system innovation. It addresses the need to improve matching of knowledge supply to knowledge demand by bringing together science and society (see also Klerkx & Leeuwis, 2007).

Intermediaries such as NIDO (National Initiative on Sustainable Development, an ICES/KIS-2 programme) and TransForum (innovation programme that aims to provide a more sustainable perspective for the Dutch agro-sector and green spaces, an ICES/KIS-3 programme, see also Leeuwis et al., 2006; Veldkamp et al., 2008) can be historically positioned in a growing field of programming efforts to shape relations between science and society. During the 1980s, missions of scientific research funding agencies were extended from fundamental science to science responding to societal needs. The requirement to judge programmes and proposals on societal merits was extended from selected research programmes to all research, and funding agencies were expected to initiate programmes responding to the concerns of society at large. At the same time, national states narrowed their previous science policies to technology policy and made cuts in university budgets (Kwa, 2006, p. 458). Kwa describes the position of funding agencies as dramatically changing from articulating the needs of science for national

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3 In 1994 the ‘Inter-departmental Commission on Economic Structure’ (ICES) was founded to strengthen the economic structure of the Netherlands. The working group ICES/KIS was founded to invest in the Knowledge Infrastructure (KIS). In 1994 and 1998 the respective programmes ICES/KIS-1 and ICES/KIS-2 were executed.
states before the 1980s, to urging reforms and increased interdisciplinary cooperation among scientists after the 1980s.

The currently running ICES/KIS (now often referred to as BSIK4) programme ‘sustainable system innovation’, of which TransForum is a part, stimulates new ways to approach pertaining problems, such as those in mobility, energy supply and agriculture. It starts from at least three basic assumptions. First, new approaches must be sustainable, for future generations not to suffer from choices we make today. Second, approaches must involve different types of knowledge (scientific, technological, societal, competences). And third, it is important that all parties (corporations, knowledge institutions, societal organisations and governments) participate, to ensure that all relevant aspects (administrative, organisational and technological) are included (BSIK, 2005). The BSIK approach to sustainable development thus reflects the scholarly literature on governing sustainable development through knowledge cocreation, as described in this introduction. Some more details on the specific cases are given in the chronological account of the conducted research below (see also Table 1.3 and Table 1.4).

First period (2002 - 2004): Preliminary explorations
The preliminary explorations that form the basis of this thesis were conducted in the context of the ICES/KIS-2 programme NIDO. One of its programmes (Sustainable Urban Development) requested monitoring assistance, particularly with respect to transdisciplinary knowledge production. The

4 A third ICES/KIS programme commenced in 2004, based on the 2002 ‘Resolution on Subsidies for Investments in Knowledge Infrastructure’ (Besluit Subsidies Investeringen Kennisinfrastructuur, or BSIK).
development of the programme itself was monitored by attending programme meetings, regularly interviewing the process and project manager and organising and participating in workshops and conferences. Moreover, I interviewed and conducted desk research concerning other intermediaries in the Dutch field of sustainable urban development. In this process I first developed and explored the idea of the distinction between mode-1 and mode-2 intermediaries as a heuristic tool (Regeer, 2004), which I elaborated on in the present Introduction. This idea was presented in several contexts (e.g. STS conference in Milano 2003, Transdisciplinarity conference RMNO 2004) and further explored in a study for the RMNO, in which several other cases were analysed to illustrate the workings of our framework (Regeer and Bunders, 2007).

In addition to the programme, I also acted as ‘monitor’ in one of NIDO’s underlying projects, aimed at enhanced collaboration between different units within the Public Works organisation of the municipality of Rotterdam (Regeer, 2003b). The role of monitor was then primarily one of observing and reflection, and was only later fully developed into the ILA monitoring approach. First suggestions for a mode-2 monitoring approach, on the basis of these experiences, were done in the RMNO study mentioned above (Regeer & Bunders, 2007).

I also analysed a supplementary case that was not part of the NIDO programme, but gave us the opportunity to further explore core theoretical issues related to the epistemology of transdisciplinary research in the area of sustainable urban development. These issues are reflected in Chapter 2 of this thesis. A brief description of these cases and my involvement can be found in Table 1.3 below.
Table 1.3: Involvement in ICES/KIS-2 programme NIDO (National Initiative Sustainable Development)

<table>
<thead>
<tr>
<th>Programme</th>
<th>Involvement</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Dutch National Initiative for Sustainable Development (NIDO) had the objective to achieve leaps forward in durable development based on, and in co-operation with, existing programmes to that extent. Sustainable Development means creating a link between prosperity and well being, a link between economic growth and improvement of the living environment. The programme Sustainable Urban Development focused on post-war housing areas and created an action oriented agenda for sustainable urban development; an approach with future value, attention for social aspects and chances for economical and ecological development of areas.</td>
<td>• Participant observation programme team</td>
<td>van Twillert, N., Joustra, D.J., Regeer, B.J. and De Ruiter, A.N. (2004) 'Eindrapportage Nido-programma Duurzame Stedelijke Vernieuwing'. Leeuwarden: NIDO.</td>
</tr>
<tr>
<td></td>
<td>• Frequent sparring sessions process manager (bi-weekly to monthly)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Five interviews with programme manager and directors of other intermediary organisations in the field and additional desk research</td>
<td>Regeer, B. J. (2003). Knowledge and values in Transdisciplinary Research. Paper presented at the International workshop Interfaces between science and society, Milano, Italy.</td>
</tr>
<tr>
<td></td>
<td>• (Co)organised 3 workshops and participated in 3 conferences in the context of the programme</td>
<td>See also: Regeer, B.J. and Bunders, J.F.G. (2007)</td>
</tr>
<tr>
<td></td>
<td>• Knowledge dissemination through presentations and reports</td>
<td></td>
</tr>
</tbody>
</table>
### Projects studied in context of Programme

**Osrdorp Complex 50**
- In 1992 six housing associations and the local council started the urban renewal plans for the area Osrdorp in Amsterdam. While other parts of the area are being demolished and rebuilt, in the case of Osrdorp Complex 50 it was decided to renovate the 250 houses. The approach was experimental in many aspects; in terms of sustainable regeneration the project resulted in several innovations and in terms of the renewal process new organisational models were introduced, serving as an example for the rest of the area. The project was given the status of Example Project Sustainable and Energy-saving Building by the Steering Group Experimental Housing.

**Involvement**
- **Period 2002 - 2003**
  - In-depth interviews with 8 main actors and additional desk research
  - Retrospective case-study
  - Organised panel discussion with main actors on issues of transdisciplinary research at international scientific conference

**More information**

**Development teams Public Works Rotterdam**
- New organisational model within Public Works in which civil servants of three different units are brought together to develop new opportunities for Public Works and to bring in sustainability aspects into urban developments.

**Involvement**
- **Period 2003**
  - Participant observation project team
  - Three reflection sessions with project leader Rotterdam, NIDO process manager and coach
  - Presentation to all members of the Public Works department

**More information**
- See also: Regeer, B.J. (2004) and van Twillert et al. (2004)

From 2005 onwards we (see footnotes in this section) were given the opportunity to further explore the notions of mode-2 intermediaries and mode-2 approaches for sustainable development in the context of the ICES/KIS-3 programme TransForum (see Table 1.4 for a description). We started with an advisory trajectory\(^5\) based on the experiences with the NIDO programme, aimed at supporting the TransForum programme to be a mode-2 intermediary. Soon, it was felt both by us and the contractor that working with the projects in the field should form the basis for further developing the TransForum programme. This was done both through being subcontracted by TransForum projects\(^6\) and within the context of a PhD project\(^7\). Our initiatives and approach appeared to be quite fruitful and the number of subcontracts with TransForum projects grew, as did the ILA monitoring team. Other system innovation projects and programmes in the area of the sustainable development of agriculture, not related to TransForum, also requested the assistance of the ILA monitoring team, extending it further\(^8\). As a result of our intensive involvement in a range of innovation projects as monitors, I was able, in collaboration with colleagues, to further develop the suggestions we had made with respect to

\(^{5}\) Prof.dr. Bunders and Regeer M.Sc. assisted by Hoes M.Sc.

\(^{6}\) The first set of subcontracted monitoring projects was executed by Regeer M.Sc. Prof.dr. Bunders was involved as supervisor of all monitoring activities throughout.

\(^{7}\) Hoes M.Sc. started here PhD project, in which she monitors TransForum projects, in October 2006.

\(^{8}\) In the course of the project, the monitoring team was extended with junior researcher Liesveld M.Sc., post docs Dr. Beekman, Dr. Caron-Flinterman and Dr. Van Amstel and senior researcher Prof.dr. Tj. De Cock Buning. Sharing of knowledge, experiences and methodological challenges between the members of the ILA monitoring team was initiated and organised by Regeer M.Sc. with contributions by Prof.dr. Bunders. Supplementary research has been or is done by junior researchers Den Hertog M.Sc, De Braauw M.Sc and Van der Ham M.Sc.
monitoring in our exploratory study (Regeer & Bunders, 2007). The development and rationale of the ILA monitoring approach is explicated in **Chapter 3** of this thesis.

As a consequence of increased understanding of and experience with the types of innovation projects TransForum supported, questions concerning the role of TransForum in guiding or facilitating these projects, and the consequences for its own identity as an intermediary became more prominent. The monitoring approach was then also extended to the programme development of TransForum, the results of which are presented in **Chapter 4** of this thesis.

Table 1.4 lists all TransForum projects in which I had a direct involvement and that started in the period 2005–2008 (projects that have started in 2009 are not included). On average, ILA monitoring encompasses the participation in team meetings (monthly or bi-monthly), frequent updates with the project leader (bi-weekly or monthly), design and execution of reflection sessions, in-depth interviews with project team members and actors in the wider network, participation in Communities of Practice, and presentations at board meetings, network meetings and conferences. All interviews and reflection sessions, and some team meetings, were recorded (digital audio files) and transcribed. In each project, on average two student projects (internships) contributed to the monitoring by focusing on specific issues, and added valuable data in the form of interview transcripts and observations. Details on the specific studies, data collection, analysis and results, can be found in the additional documentation as listed in the right hand column. The total number of projects monitored by the ILA monitoring team is higher than shown in table 1.4, at present (May 2009) comprising 13 system innovation projects in the field of the sustainable development of agriculture and
### Table 1.4 Involvement in ICES/KIS-3 programme TransForum

<table>
<thead>
<tr>
<th>Programme</th>
<th>Involvement</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TransForum programme</strong></td>
<td><strong>Period 2005 - present</strong></td>
<td>ILA monitoring, interviews, advice, working sessions, with respect to developing the learning programme and becoming a mode-2 intermediary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional focal points:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- competences network managers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- mode-2 publication strategy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- mode-2 communication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- shared value development</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Projects studied in context of Programme</th>
<th>Involvement</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streamlining Greenport Venlo experiments with new ways of ‘steering’ complex societal processes by organising a learning process between the variety of actors involved in Greenport Venlo. Greenport Venlo is one of the five ‘Greenports’ designated by the Dutch government as growing regions for greenhouse agriculture and horticulture. In Venlo ‘Greenport’ has become a regional ‘brandname’ that encompasses ‘Cradle to Cradle’ (C2C) developments. The TransForum project facilitates the co-development of the many local initiatives: hence the project name Streamlining Greenport Venlo.</td>
<td><strong>ILA monitoring</strong> Additional focal points: • network competences • mode-2 communication • mode-2 monitoring &amp; evaluation</td>
<td></td>
</tr>
</tbody>
</table>

**Involvement**

**Period 2005 - present**

**ILA monitoring**

Additional focal points:
- network competences
- mode-2 communication
- mode-2 monitoring & evaluation
<table>
<thead>
<tr>
<th><strong>Green Care Amsterdam</strong></th>
<th><strong>Biopark Terneuzen</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers around Amsterdam are providing care and shelter to people with psychological problems and to recovering addicts, together with health organisations and insurers in the 'Green Care' TransForum project. They also make their farms available for special education needs through a learning programme. Such a combination of care and agriculture can not be put in place easily. Many (small-scale) experiments are therefore combined to learn from each other in Green Care.</td>
<td>Agroparks offer great opportunities for substantial sustainability gain due to their spatial clustering, the closing of energy and matter cycles and the reduction of transport. To innovate in practice and make a substantial sustainability gain, cross-sector cooperation is necessary. This opportunity has been taken in the docklands of Terneuzen where greenhouse farming and agro-processing (ethanol and fertiliser production and manure processing) work together.</td>
</tr>
<tr>
<td><strong>Period 2005 - present</strong></td>
<td><strong>Period 2006 - 2007</strong></td>
</tr>
<tr>
<td>ILA monitoring</td>
<td>ILA monitoring (with Anne-Charlotte Hoes)</td>
</tr>
<tr>
<td>Additional focal point: • Intermediaries in care farming</td>
<td>Additional focal point: • Format for knowledge dissemination</td>
</tr>
</tbody>
</table>
**Synergy and New Mixed Farm**

Dutch greenhouse horticulture is responsible for approximately 10% of total natural gas consumption in the Netherlands. The future of this sector depends on the possibility of realising sustainable energy supply. Growers share experiences and work together to further the concept of 'Closed Greenhouses' in Synergy.

New Mixed Farm is an envisioned agro-park on an agricultural development site in the south of the Netherlands. Four entrepreneurs aim to develop a new farming system in which innovative technologies are used to generate energy from agricultural by-products. The niche experiment New Mixed Farm received support from the national government, because it has the potential to change several unsustainable features in agriculture.

<table>
<thead>
<tr>
<th>Period 2005 - 2009</th>
<th>Supervisor internship and research partner</th>
<th>PhD student (Anne-Charlotte Hoes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Several meetings with project team</td>
<td>Presentation at board meeting</td>
</tr>
<tr>
<td></td>
<td>Co-designed reflection sessions</td>
<td></td>
</tr>
</tbody>
</table>


2 ICES/KIS-3 programmes (that is TransForum and Transumo, a system innovation programme aimed at stimulating sustainable mobility). This broader work has of course influenced the work reflected in this thesis.

**Third period (2008 – 2009): Emerging generic questions**

From the monitoring & evaluation work in the practice of mode-2 approaches to sustainable development, new generic issues emerge. Some are methodological: how does our approach to monitoring system innovation projects compare to other similar approaches? How do projects experience and benefit from the monitoring? And what do donors expect of the results? These questions are taken up in a collaborative project with the Communication and Innovation Studies group of Wageningen University and have lead to many inspiring and insightful discussions about the scope, role and practice of monitoring mode-2 approaches to sustainable development, which have advanced the development of the ILA monitoring approach as described in Chapter 3.

Other new questions are related to formulating generic lessons about successful approaches to supporting sustainable development. With TransForum for instance we are formulating the Shared Value Development approach, which is seen as a generic approach to realising sustainable development of agriculture through new value propositions, as it has emerged from the projects (see also Boon, Beekman, Regeer, Mager, & Budders, 2009). Based on our monitoring experiences and on additional mutual meaning making sessions, the features, experiences and tools of the Shared Value Development approach will be described and made available to others. Other issues that have emerged in several projects are indicated in Table 1.4 as additional focal points; for instance questions dealing with competences of network managers (e.g.
Streamlining Greenport Venlo, TransForum, Green Care Amsterdam), features and strategies of mode-2 intermediaries (all projects), and the need for new modes of communicating results of innovation projects (e.g. Streamlining Greenport Venlo, Biopark Terneuzen, TransForum). The last question, on finding ways to share learning experiences beyond the time span of the project and beyond the actual interactions in and around the project, is addressed in Chapter 5.

1.5 Outline of thesis

In this Introduction I have set the aim and scope of this thesis, explored the core theoretical concepts and explicated my research approach. Perceptions of science, knowledge and knowledge production have appeared essential to the understanding of mode-2 strategies for sustainable development. In Chapter 2 the epistemological issues that are at the foundation of collaborative endeavours of knowledge production and problem resolution (mode-2 approaches or transdisciplinary research) are explored. It leads to the outlines of a view on knowledge cocreation that uses the full potential of knowledge in different forms, through a process of mutual engagement, which is highly relevant in the context of system innovations for sustainable development. The question how this full potential of knowledge and problem solving capacity can be accessed, with a research approach that is based on engagement with running system innovation projects, is explored in Chapter 3. The challenges that programmes for

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9 The ILA monitoring (& communication) team grew further with Athena communication specialists Dr. Broerse, Dr. Hellsten and Kupper M.Sc., and for the project described in chapter 5 was supplemented with external experts J. de Bruin M.Sc., M. Murtaugh M.Sc. and Dr. J.M. Bradburne. The project was initially developed by Regeer, in collaboration with De Bruin and Murtaugh.
system innovation (as opposed to projects) face as a result of tensions between mode-1 and mode-2 are described and interpreted in Chapter 4. Monitoring the process of developing and conducting mode-2 approaches to sustainable development, gives us many insights into the workings and challenges of mode-2 intermediaries, some of which are described in the Chapters 3 and 4. However, if the aim would be to help other practitioners learn from the experiences we articulated and registered in our research, one would probably not write academic articles. The question what mode of communication is suitable to this end is explored in Chapter 5, by means of a design research process. In the Conclusions, I revisit the research questions as presented above. The research approach developed and conducted in the context of this thesis thus aims to support the internalisation of learning experiences by participants and their institutions and to capture learning experiences in such a way that vicarious experience is induced in others. It is also the aim of this book to contribute to the understanding as well as the practice of efforts to realise sustainable development, by meticulously articulating and exposing the intransigence met when putting new strategies into practice.
Account

The foundations for the current **introduction**, the core theoretical concepts and the conceptual-methodological approach, were laid in:


Chapters 2 to 5 are based on co-authored articles that are published or submitted to peer reviewed journals. In this thesis, I have chosen to maintain the we-form in which the articles were originally written.

**Chapter 2**


**Chapter 3**

Chapter 4
Regeer B.J., S. Mager, V. Beekman, J.F.G. Bunders (subm.)
‘New approaches to sustainable development.
TransForum – the case of a mode-2 intermediary’.
Considered for publication by: Environment and Planning C: Government and Policy

Chapter 5

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CHAPTER I


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Chapter 2
The epistemology of mode-2 knowledge production in strategies for sustainable development

As we argued in the introduction, many calls for new approaches to sustainable development are rooted in considerations of the role of scientific knowledge production in societal problem solving. Particularly in the case of persistent problems, such as those associated with sustainable development, scientific knowledge is not directly applicable to the issue at hand; there is no consensus about the problem definition, about relevant knowledge, or about relevant stakeholders.

Scholars and practitioners in the field of transdisciplinary research have argued that “transdisciplinarity is a new form of learning and problem solving involving cooperation among different parts of society and academia in order to meet complex challenge of society” (Klein 2001: 7). Thus problems are structured, knowledge is developed and solutions are devised in collaboration with multiple stakeholders. Scientific knowledge development and solution development for unstructured problems become part of the same mode-2 process leading to new socio-technical innovations.

In order to enhance our understanding of these complex, collaborative processes of problem resolution, we need to take
a closer look at the way in which these take place, especially with respect to the (co)creation of knowledge. By defining and (re)shaping theoretical concepts about knowledge, knowledge creation and knowledge integration, this chapter aims to contribute to the epistemological basis of mode-2 approaches to sustainable development\(^\text{10}\). Because the theoretical exploration was done in the context of a larger project on transdisciplinary research\(^\text{11}\), in this chapter mode-2 knowledge production is referred to as ‘transdisciplinary research’.

### 2.1 Introduction

In a recent interview with the German veterinarian Ilse Köhler-Rollefson on her research on putting the decline of the camel population in India to a halt, she states that pastoralists such as the Raika are the world’s “real experts in livestock management” and that the international scientific community has much to learn from them. “Their knowledge”, she says, “is especially vital for the sustainable use of marginal environments.” (Doogue et al. 2002: 86) The same day, an article on the use of IT in knowledge conversion in corporations appears. A case study on the supermarket chain Seven-Eleven Japan shows that local knowledge of the shop manager is used by the system in order to adequately respond to local developments. “[According to Seven-Eleven Japan it is] important for shop managers and staff to use their own insights

\(^{10}\) This chapter has been published before as: Regeer B.J., J.F.G. Bunders (2003) ‘The epistemology of transdisciplinary research: from knowledge integration to communities of practice’ In: Interdisciplinary Environmental Review 5 (2): 98-118.

\(^{11}\) The RMNO (Advisory council for research on spatial planning, nature and the environment) project Transdisciplinary Research was funded by the Coordination Fund of the Dutch Consultative Committee of Sector Councils for Research and Development (COS) and executed by Prof.dr. J.F.G Bunders and B.J. Regeer M.Sc.. A further contribution was made by the Sustainable Urban Development programme of the National Initiative for Sustainable Development (NIDO).
when they place an order. An informal conservation with a client, who tells him about a festival at a local school, is a good example. The staff member uses his experience and insight when he orders extra packed lunches.”¹² (Reinmoeller et. al. 2002).

These are but two examples that show that local knowledge is increasingly considered to be beneficial for the development of new and more adequate solutions to problems. They show moreover that the ‘local knowledge’ perspective is employed in a great variety of contexts, from rural agriculture to corporate information strategies. Transdisciplinary research, in which knowledge from different social and academic actors is integrated, is an expanding field of research, inspiring scholars from a great range of backgrounds (Flinterman et. al. 2001). In the first example “veterinarian Ilse Kóhler-Rollefson, Indian experts and Raika camel breeders learn from one another in order to halt the decline of the region’s camel population. They combine traditional remedies with modern veterinary practices and work to restore grazing rights.” (Doogue et. al. 2002: 84) Transdisciplinary research goes beyond multi- or interdisciplinary research by crossing the borders (if any) between science and society, hence the prefix trans-.

Thus, the term transdisciplinary research is used to label a range of research practices in which knowledge from different social and academic actors is integrated. It can be seen as a new form of learning and problem solving, which helps to meet the complex challenges of society, such as sustainable development. In practice, the benefits of this way of problem solving are widely acknowledged and the range of examples is broad;

¹² Original text in Dutch.
participation of the poor in development projects, citizen participation in environmental assessment, local residents’ input in landscape planning and patient involvement in public health. Our concern in this paper however, is theoretical rather than practical. First a note on the demarcation of our problem. In this paper, we approach these kinds of participative projects from the perspective of broadening the base of relevant knowledge, rather than from the perspective of democratizing decision making. We are therefore not directly interested in the role of interests, power relations and stakeholder opinions, but rather in knowledge integration and knowledge creation. Now, from a scientific research perspective, broadening the base of relevant knowledge raises so called ‘epistemological’ questions, such as ‘what kind of knowledge is gained in transdisciplinary research’ and ‘how can that knowledge be regarded as objective and justified’ (Burger 2000: 104). For participation workers in real practice, these questions are not necessarily at stake, but for scholars in the field of transdisciplinary research they are.

In this chapter we address the epistemological questions of transdisciplinary research as follows. First we have a closer look at the reasons why these questions arise. Within the ‘field’ of transdisciplinary research, the temptation exists to envisage the process of knowledge integration as bringing together different ‘parcels’ of knowledge to create new knowledge. Now, if some of these ‘bits’ of knowledge are scientifically justified, and others aren’t, do we then end up with scientifically valid knowledge or not? We will go beyond this image of knowledge integration by focussing on the nature of knowledge and knowledge creation instead. We argue that from this perspective, which we call the perspective of knowledge creation, these epistemological issues do not arise. To do this, we draw on insights and examples from Wittgenstein’s later
philosophy and from the field of the social studies of science. Moreover, we bring in an example from the field of sustainable urban development (see box 2.1) and refer to a well-known case from the social studies of science (see box 2.2) to illustrate our line of thinking. Finally, we introduce Wenger’s (1998) ‘communities of practice’ as a particular adequate concept for understanding issues concerning the epistemology of transdisciplinary research.

**Box 2.1: The case of Osdorp Complex 50**

Like the majority of social housing stock built after the Second World War, the urban area in the West part of Amsterdam (Osdorp), is in need of improvement and modernisation. While other parts of the area are being demolished and rebuilt, in the case of Complex 50 it was decided to renovate the 250 houses. Built in the sixties, the uniformity of the dwellings did no longer meet the needs of the diversity of households living in Complex 50 in the nineties; large families, elderly people and starters. The energy and technical quality of the six housing blocks had deteriorated; flats were noisy, badly isolated and not equipped with central heating. The blocks were 5 storeys high, without elevator. Research from 1993 shows that 40% of the tenants wanted to move out. A large renewal and renovation project had to improve the quality and attractiveness of the complex.

The housing association decided from the start to raise the quality of the housing substantially while keeping it affordable for low-income households, giving tenants the opportunity to stay in their houses. Diversity was created by building light prefabricated wooden frame dwellings of two storeys high on top and enlarging existing houses at the ground floor level by combining them with first floor flats. Elevators to the new houses on top made the apartments in the middle layers accessible to elderly people. In order to solve social conflicts in collective stairwells, entrances to the different types of houses were separated.

Before we start we would like to emphasise which purpose the first example (box 2.1) is meant to serve. This paper is not an analysis of the specific process used to develop the knowledge base for a particular urban development project. We merely
include this example to give life to the theoretical development of an epistemology of transdisciplinary research, and will refer to Osdorp Complex 50 to illustrate points in case. Osdorp Complex 50 is a transdisciplinary project in the sense that it is a multi-actor process, it involves academic and non-academic knowledge, the process has yielded innovative results, mutual learning took place, and its focus was on problem solving. From a scientific research perspective, some may be critical about the lacking of clear research objectives. One may therefore define the Osdorp Complex 50 case as transprofessional problem solving rather than transdisciplinary research. Even so, it would still help us illustrate certain aspects of multi-actor, complex, problem-solving processes, for the benefit of transdisciplinary research.

### 2.2 Knowledge integration

We start by clarifying the context in which the epistemological questions arise and the way they are framed, namely as issues of knowledge integration, before introducing the alternative perspective of knowledge creation. Various scholars in the field of transdisciplinary research have made an attempt to label, classify and structure the different kinds of knowledge to be integrated in transdisciplinary research, in order to understand the process of knowledge integration. Scholz and Tietje (2002) for instance distinguish four types of knowledge integration based on different levels of knowledge systems, such as disciplines, systems, interests or modes of thought. Others describe the needs of knowledge-brokers “to facilitate the flow between the different forms of knowledge and know-how contained in the many actors” (Mansfeld van 2003: 36). Distinctions are made between knowledge from natural sciences, social sciences and humanities, between intuitive knowledge and scientific knowledge, lay-knowledge and expert
knowledge, or between knowledge “originating from multiple sub spheres of science, politics, market and civil society” (Klein et. al. 2001: 231). Let us turn to our example to elucidate the perspective of knowledge integration.

From the perspective of knowledge integration we can describe the case of Osdorp Complex 50 as a problem solving process in which different types of knowledge of different actors are integrated. The main actors involved in this process were the architect, the housing association (project leader and participation worker), the environmental expert and the tenants and their coach. Over 30 meetings were held in which the architects, the housing association, the environmental expert and the tenants all worked together in a joint problem solving process. Their objective was to develop integrated solutions to a rich assortment of problems; ranging from social conflicts in shared stairways to the sub minimal technical quality of the dwellings. In this sense we can describe the challenge of the project team in terms of developing socio-technical innovations, in which knowledge of all relevant participants is integrated in a process that recognises and embodies the local conditions and qualities of the area. The approach was innovative in many respects; in terms of sustainable regeneration the project resulted in several innovations and in terms of the renewal process new organisational models were introduced, serving as an example for subsequent urban renewal projects.

In figure 2.1, the process of knowledge integration in the case of Osdorp Complex 50 is visualised. Within the field of transdisciplinary research, the different types of knowledge of all participants (fig. 2.1a) are considered to be of value and efforts should be made “to optimise the use of all these forms of knowledge in the process of problem solving” (Mansfeld van
2003: 37). Burger is right to note that within the field of transdisciplinary research, very few satisfactory answers are given to questions about validity and foundations of these types of knowledge\textsuperscript{13}. Especially the difference between scientific knowledge and ‘lay’ knowledge is considered problematic; scientific knowledge is obtained following the methods of science, and therefore objective and justified, whereas ‘lay’ knowledge is merely experiential. How can for instance the experiential knowledge of the tenants be compatible with the knowledge of the environmental expert, which he presumably has acquired through a process of scientific training? Scientific knowledge, according to those concerned with these issues, refers to an objective world and can be generalised to transcend the specific, whereas experiential knowledge is specific, embodied and contextualised. Even though tenants knowledge may be considered equally valuable in this context of problem solving, it cannot be considered to be equally valid, as it does not refer to the objective foundations that scientific knowledge refers to.

Scholars of transdisciplinary research pay much more attention to the methodology of knowledge integration (fig. 2.1b). Various inventories and checklists have been developed, enabling practitioners of transdisciplinary research to choose from a range of instruments the most adequate one for the phase their project is in (see for example Scholz et. al. 2001; Dammers et. al. 2002). As the nature of knowledge of the

\textsuperscript{13}Questions concerning the validity are regularly posed. Satisfactory answers are however more difficult to find. Gibbons and Nowotny ask the participants of the Zürich conference on Transdisciplinarity to help develop the concept of socially robust knowledge. “The answer we give, and it is an answer that needs to be filled out collectively – we do not have a recipe about how to do it – is that we need in addition to reliable knowledge what we call socially robust knowledge.” (2001: 78)
different actors is not questioned, concerns in this phase are framed methodological rather than epistemological.

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<td>The architect, tenants, representatives of housing association and environmental expert all have their own type of knowledge. Some types are justified by an objective reality through science.</td>
<td>The types of knowledge are brought together and methods are applied to integrate the different types of knowledge.</td>
<td>The end result of this process is new knowledge, manifested as a solution to the problem, or a socio-technical innovation.</td>
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*Figure 2.1 The process of knowledge integration.*

The epistemological question does however arise again in the last phase (fig. 2.1c), as transdisciplinary researchers repeatedly express their concern about the scientific legitimation of their work. This is typically phrased as follows: “Unfortunately until now no broadly accepted criteria which can be used in the evaluation of interdisciplinary research exist […]. The effect is that the evaluation of interdisciplinary projects risks to be grounded either on inadequate criteria or on no criteria at all.” (Defila et. al. 2000: p. 109) The results of transdisciplinary research do not fit easily in disciplinary structures of universities and journals. As a consequence, transdisciplinary research faces the challenge of not being recognised as scientifically excellent research (Klein et. al. 2001).
Relevant concerns with respect to knowledge integration can thus be summarised as follows (see for example Klein et. al. 2001: 239; Mansfeld van 2003: 37):

1. What types of knowledge do all participating actors posses? What are the foundations, validity and limits of data and statements;

2. How can we optimise the use of all these forms of knowledge in the process of problem solving?, which set of methods should be applied to integrate the different types of knowledge?; and

3. What type of knowledge is gained in the process? How can this knowledge be regarded as justifiable and objective?

We have seen that transdisciplinary researchers evade the first (epistemological) question, by instead paying ample attention to the second (methodological) question, stumbling upon the epistemological question again when they are looking for legitimation for their finished transdisciplinary research projects. We would like to contribute to these concerns by taking up the challenge to formulate an epistemology of transdisciplinary research. From our discussions about transdisciplinary research in various contexts we distill two main concerns, which can be summed up as follows:

1) Can we define a foundation for different types of knowledge, and for the knowledge yielded in the process of transdisciplinary research?

2) Can we refute the criticism that transdisciplinary research is mainly about process, by incorporating methodological concerns into the epistemology of transdisciplinary research?
2.3 Knowledge creation

The epistemological discourse of knowledge integration is characterised by a terminology that emphasises distance and difference, as evident from terms employed by the knowledge integration perspective such as bridging gaps and crossing boundaries. This way of talking about knowledge integration carries the risk of separating the use of knowledge from the creation of knowledge, the knower and the context of knowing. We argue that this view of knowledge as disembodied and decontextualised pieces of information is misleading. We start from the premise that knowledge development is essentially a communicative process and therefore propose to study the integration of knowledge as a product of communication and shared practise. To elucidate this perspective we follow two routes; Wittgenstein’s later philosophy and the social studies of science. The first one refutes the necessity of a correspondence between the statements we make and reality, the second one looks at the way scientists produce statements about reality. Both routes lead to the same conclusion; our claims to knowledge are grounded in actual practice, rather than in objective reality.

Wittgenstein’s later philosophy

In his Philosophical Investigations, Wittgenstein shows us that the clear object-subject division, that lies at the bottom of Western science since Descartes’ cogito ergo sum, vanishes if we look closely at the way we deal with our surroundings in terms of language and behaviour. We are not open systems that receive instructions from our environment. Furthermore, our language does not describe or represent the world we live in. An electron is not an object which physicists have been able to identify and subsequently to name. The object, its meaning, and its name do not exist in separate realms. By getting rid of the
myths of an objective realm beyond our representations, and a subjective realm beyond our behaviour, we destroy “nothing but houses of cards” (1953: §118). What then does Wittgenstein think is the foundation of our knowledge of the physical world, if it is not the physical world itself, revealed to us by the methods of science?

Wittgenstein emphasises that the meaning we give to the natural world is rather embedded in our practices, activities and uses. Even though it seems that our behaviour, or language or knowledge are somehow guided or justified by objective rules, we should see those rules as having become second nature to us by applying them regularly, by being accustomed to behave according to them, and by agreeing about them. Continuing a series 2, 4, 6, 8 by saying 10, 12 etc. is correct, not because of something in the mind of the speaker, nor because of some objective and final criteria. Only the practice of mathematicians, in which +2 has a certain use, justifies the correct continuation of this series. Whilst agreeing with the sceptic that no facts, or grounds can be found that constitute meaning or justify following a certain rule, Wittgenstein does not draw the conclusion that the whole notion of meaning has to collapse: “If I have exhausted the justifications I have reached bedrock, and my spade is turned. Then I am inclined to say: “This is simply what I do.”” (1953: §217). About the way logic often compels and therefore seems necessarily true, Wittgenstein says: “No, it is not true that it must – but it does follow: we perform this transition.” (1956: I §12) Wittgenstein then wonders: “But is this counting only a use, then; isn’t there also some truth corresponding to this sequence?’ The truth is that counting has proved to pay.” (1956: I §4) Thus, the meaning of a word, a sequence or an action lies in its use. Truth and meaning do not exist without context, nor without regular use, custom and agreement. Wittgenstein emphasises the
importance of training: only by being extensively trained to use a word in a certain way, does our response to and correct use of that word become second nature to us.

Carefully formulating some preliminary implications for the epistemology of transdisciplinary research, we would say that asking for independent grounds to justify and validate knowledge claims would be to assume that a statement and a corresponding object exist in separate realms. Meriting scientific knowledge of the environmental expert over ‘lay’ knowledge of the tenants on the basis of its reference to objective reality would amount to the same. Here we arrive at our second route; the social studies of science.

**The social studies of science**

In a recent article, Collins and Evans (2002) sketch three different stages, or waves, of the social studies of science (see figure 2.2). In the First Wave, knowledge and truth were considered to be grounded in scientific procedures, implying that the unveiling of truth could be accomplished by means of analysis. Social analysts aimed to understand and explain the success of science, rather than question its basis. The Second Wave encompasses the main body of research on the social studies of science, which we will now describe more extensively.

Since the 1970s, the social studies of science have challenged the idea that there are secure grounds for knowledge. Science studiers have done this on the basis of their research on ‘science in the making’: by looking at how scientific facts come into being, and how the establishment of a fact is influenced, or rather constituted, by the social, cultural, historical and cognitive context in which it is created. A key point in the turn from explanatory to descriptive questions was Kuhn’s “The
structure of scientific revolutions”. His introduction of paradigms, within which scientific claims find a basis for certainty, rather than in a priori, objective criteria, raises the question of how science progresses and why it progresses like it does. This, according to Kuhn, should be investigated by applying psychological and sociological analyses, and is a rejection of questions focusing on the ‘logic of scientific discovery’, as applied by Wave One philosophers of science up to that point, notably by Sir Karl Popper (Kuhn 1970). Kuhn introduced the notion that scientists make choices, depending on what they are prepared to sacrifice, and on their value system (paradigm). Future research should focus on the effects that “rhetorically induced and professionally shared imperatives have on the development of science, and should analyse “institutions through which [the scientists’ ideology] is transmitted and enforced.” (1970: 22, 21).

Figure 2.2 Three Waves of Science Studies (adopted from Collins et. al. 2002)

The idea that scientific knowledge is embedded in paradigms, and therefore should be understood socially, paved the way for
extensive research on ‘science in action’ as has been conducted over the past three decades by Wave Two science studiers. Approaching the study of science with the assumption that scientific knowledge is not determined by the natural world, but that it is constructed, has provided a methodological basis for science studies: one should look at the construction of scientific knowledge, at science in action. “To do so, we either arrive before the facts and machines are blackboxed or we follow controversies and reopen them”. The blackboxed facts and machines are those “devoid of any trace of fabrication, construction or ownership” (Latour 1987: 15). They are not articulated by anyone in particular, but can be found in textbooks and manuals. They do not cause disputes between scientists - they are clearly ready-made science. Before the blackboxing happens however, context and contents merge. Wave Two science studies had shown that the boundaries between scientific knowledge and ‘lay’ knowledge have been constructed (see figure 2.2). An often cited study of science in action is Wynne’s study of the response of Cumbrian sheep farmers to scientific advice about Chernobyl fallout (see box 2.2). It has shown that relevant scientific knowledge is not confined to the realm of scientists.

In figure 2.2 we see that in Wave One the authority in issues that need specialists’ knowledge clearly lies with scientists, or the ‘truth class’. For our two cases this implies that the project leader and architect were wrong to involve the tenants for knowledge reasons (they may legitimately have involved them for political reasons) and the Cumbrian experts were right to consider the farmers ignorant. Involving the ‘laity’ would lead to the epistemological problems we discussed in relation to the knowledge integration perspective. Figure 2.2 shows that under Wave Two, boundaries between scientists and the public have been deconstructed. This has lead science studiers to take up a
normative standpoint and argue for the democratising of science. Collins and Evans start from the same epistemological position as Wave Two but argue that the role of democratic rights and the role of expertise are separate. The distinction is no longer between certified and uncertified specialists as it was under Wave One, nor is the process open to all, as Wave Two suggests. Rather, we (scholars of expertise) should make a distinction between those with and without relevant expertise. Depending on the problem, this may involve mainly certified experts (e.g. fundamental research on semi-conductors) or mainly uncertified experts (e.g. involving end users in technological design of consumer goods). We will come back to this Third Wave of science studies later on.

Box 2.2: The case of Cumbrian Sheep Farmers

After the Chernobyl fallout, farmers at great distance from the disaster location had to take action to minimise the impact of the contamination. Wynne (1996) studied the way sheep farmers in Cumbria responded to this challenge. He found that the sheep farmers knew a great deal about the ecology of sheep, and about their behaviour (and that of rainwater) on the fells. Due to the proximity of the Windscale-Sellafield plant, the farmers in the locality had long experience of the ecology of sheep exposed to (radioactive) waste. They treated the sheep and the fells on the basis of their own experiential knowledge.

Wynne furthermore studied the relationship between scientists and sheep farmers and found that the local knowledge of farmers was not recognised by environmental scientists. The farmers rejected official advice, which was assumed to be caused by their incapacity to grasp rudimentary scientific facts. The experts acted from a Wave One perspective (knowledge is located within the scientific community) whereas Wynne showed that ‘lay’ people have knowledge too, thereby blurring the boundaries between scientists and non-scientists.

In sum, both Wittgenstein and the (Second Wave of the) social studies of science have framed knowledge creation as a social activity. Some have claimed that the above position does not
only lead to epistemological relativism (the idea that all knowledge is culture and time dependent) but also to judgmental relativism (the idea that all statements are equally valid). If our statements about the world cannot be justified with reference to a reality independent of the observer, what than is the validity of our statements? And how can this unwarranted knowledge lead to the best solutions for the complex problems transdisciplinary research claims to solve? Isn’t any solution as good as another?

Before summarising the implications of the two routes for the epistemology of transdisciplinary research, we would like to address the matter of relativism, of ‘anything goes’. To do this we make a short deviation to Wittgenstein again. Wittgenstein talks about coming to understand a language, or a physics theory as becoming absorbed into a ‘form of life’. This is markedly different from learning a system of signs that mirrors our mental or physical world. Rather, it is a matter of becoming acculturated, or acquiring a second nature. It is the deepness of this form of life that refrains Wittgenstein’s philosophy from becoming a relativistic account of the world. Getting rid of the notion of absolute truth in no sense abandons the notion of certainty. Truths do have significance in our form of life. But this significance lies in their use rather than somewhere independently. “We know that the earth is round. We have definitely convinced ourselves of the fact that she is round. We shall always be of this opinion, unless our whole way of looking at nature changes.” Thus, the relativistic notion that our conceptual schemes, our truths, and our values are equally valid to those of others is, according to Wittgenstein, failing to recognise that we are our framework: it constitutes the way we see the world. Seeing our knowledge claims as unwarranted, as merely working hypotheses, is getting our relationship to these claims wrong. Our statements and knowledge enter our lives in
a much deeper way than this. The very nature of our form of life and the knowledge claims we make within this, should not be mistaken with that of an opinion. We can be argued out of an opinion, but we cannot be argued out of our form of life.

2.4 Towards an epistemology of transdisciplinary research

From different perspectives, both routes provide us with an angle on the relationship between ourselves, the world around us and the knowledge claims we make, which helps us address the epistemological questions we raised at the start of this chapter. We want to make some preliminary statements to this end, based on the two discussions, before moving on to an elaboration of these points.

- The grounds for knowledge claims in an epistemology of transdisciplinary research do not lie in their reference to an objective reality, nor do they exist solely in the subject's mind. Knowledge, objects and ourselves do not exist in separate realms. Rather, we conceive of knowledge as embedded in our (communicative) practices, activities and uses.

- Hence, we should resist the temptation to think of transdisciplinary research in terms of the integration of different bits and types of knowledge and reject the visualisation of the process of knowledge integration as presented in figure 2.1.

- The epistemology of transdisciplinary research is not a relativistic one, when we recognise the inseparability of knowledge, their grounds and ourselves. We are the glasses we look through, they cannot be replaced by an equally valid frame of reference.

- Recognising that knowing is being part of a community, and that language, action, experience and knowledge are inseparable is our answer to the critique that
transdisciplinary research is all about process. Context and content merge when we look at science in action, or knowing at work. Separating epistemological issues from methodological ones is misunderstanding the relation between the nature of knowledge and the process by which it is acquired and shared.

Knowledge creation from this perspective on the epistemology of transdisciplinary research may then be visualised as in figure 2.3 below.

![Figure 2.3 The process of knowledge creation](image)

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<tr>
<td>The knowledge of participants emerges from and is justified by shared practice and activities among their communities. Knowledge is thus contextualised, embodied and shared.</td>
<td>The architect, tenants, representatives of housing association and environmental expert are brought together in a process of joint problem solving.</td>
<td>Practices and activities are shared and become second nature. The end result of this process is new, shared knowledge, manifested as a solution to the problem, or a socio-technical innovation.</td>
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While these conclusions may answer some of our questions, it raises others:

a. If we talk about our ‘form of life’ or ‘communicative practice’ as locus of acquiring knowledge and giving meaning, how should we understand interactions between for instance a tenant and an architect, or a sheep farmer
and an environmental expert, who share their form of life partly, but not completely.

b. How can we, on the basis of our new understanding of knowledge, truth and certainties understand the relationship between the (design of the) process of knowledge creation and the knowledge created?

c. If we conceive of knowledge as emerging from and embedded in our activities, for instance the design process of Osdorp Complex 50, does this then imply that knowledge and solutions created in this practice cannot be generalised or applied elsewhere by others? Can this knowledge not be decontextualised and disembodied?

We believe that the concept of Communities of Practice, as introduced by Wenger (1998), provides us with a level of study which is particularly adequate for understanding these types of concerns and interactions in transdisciplinary research.

### 2.5 Communities of Practice

Like Wittgenstein and the second wave of science studies, Wenger (1998) too describes engagement in social practice as the fundamental process by which we acquire knowledge and give meaning. It is by being part of (multiple) communities of practices that we define the world around us as well as ourselves. A community of practice is characterised firstly by the mutual engagement of participants (rather than for instance a formal structure of a project team), secondly by a joint enterprise which is collectively negotiated by the participants; and thirdly by a shared repertoire of resources which are created over time to negotiate meaning, including routines, words, tools, ways of doing things, stories, symbols and gestures (Wenger 1998). It is important to note that demarcation lines around communities of practices are flexible and interpretable. Furthermore, communities of practice do consist of actual
interactions between participants and resources – they are thus defined locally. This means that being part of an organisation, say a university, is not the same as being part of a community of practice, as not all members of the university mutually engage towards a joint enterprise in a substantive way. Nor is a single local interaction defined as a community of practice, as communities of practice are characterised by mutual engagement over time.

Before we go on, let us briefly return to the three waves of Collins and Evans. They have introduced a Third Wave of science studies, which corresponds to our idea of transdisciplinary research. They say that while Wave Two has successfully deconstructed boundaries between scientific knowledge and non-scientific knowledge, it does not tell us who is legitimised to be part of scientific decision-making and who is not. Their objective is to put citizens’ expertise in proper perspective alongside scientists’ expertise. In transdisciplinary research we deal with different actors all with their own expertise. Collins and Evans state that depending on the problem, we (scholars of expertise) should define relevant experts. The distinction is no longer between certified and uncertified specialists (see fig. 2.2), but between those with and without relevant expertise. From this perspective the case of the Cumbrian sheep farmers is a case in which two groups of experts interact, rather than a group of ‘lay’ people and a group of experts (Collins et. al. 2002: 261). The same counts for Osdorp Complex 50, in which tenants are not just stakeholders but they are also experts.

We will now apply the concept of communities of practice to these mixed groups of experts. This allows us to look at epistemological questions of transdisciplinary research more closely and address questions a to c.
Crossing boundaries: alignment and brokering

As one scholar of transdisciplinary research expresses our first concern: “Any attempt to engineer an intellectual “melting pot” in which every participant is completely embedded, will be self-defeating because all those contributing will be acculturated into a single, over-arching world-view.” (Winder 2003: 89). They would have to share their ‘form of life’, to speak with Wittgenstein. Forms of life are however constituted by multiple communities of practice. The question how an architect and a tenant can interact meaningfully, whilst not fully sharing their form of life is understood by looking at the level of communities of practice. One option is that, over time, a community of practice develops in which both the architect and the tenant participate, as suggested by fig. 2.3: c. This does not imply that they share their form of life; they merely share this community of practice, which plays a part in constituting their respective forms of life. In this case the participants, by intensive mutual engagement, develop a shared enterprise they work towards and a repertoire of resources to negotiate meaning. However, from our in-depth interviews with members of the project team of Complex 50 we would not describe all main participants as sharing a community of practice. Even though some described the project team as follows:

“The team consisted of the housing association (the project leader and the participation worker), the architect and his people, and us, the advisors. And fourthly, or actually firstly, the tenants.” (environmental expert)

Other interviewees have described the project team as consisting of two separate parts:

“In fact, there were two parties: the tenants’ coach and the tenants representatives on the one hand, and the housing association and the architect on the other.” (tenants’ coach) which matches our interpretations of the project from the perspective of communities of practice, as we will illustrate below.
In our view transdisciplinary research, and creating knowledge, is always about connecting people, but these people do not necessarily mutually engage intensively over a longer period of time, shaping a community of practice, to be able to interact meaningfully. In order to understand collaboration and interaction between tenants and the others, we will bring into play the concept of alignment, which Wenger (1998) uses as a way of belonging to a community other than engagement in actual practice. “The process of alignment bridges time and space to form broader enterprises so that participants become connected through the coordination of their energies, actions, and practices.” (Wenger 1998: 179) Without actually engaging in the practice of producing academic journals, scientists do align their energies and activities with this practice in order to publish their research. Alignment is about matching deadlines and complying with expectations set by others, but also about belonging to broad systems of styles and discourses, such as political and social movements, or scientific disciplines.

In the case of Complex 50 the tenants clearly had a different relationship to the project than the others. For a start, they were not paid to participate; this was not their professional occupation, but this was about sustaining and re-creating their living environment. Furthermore, it was clearly the project leader and his team\(^1\) that determined the structure of the process, time lines and project phases, which in turn were

\(^{14}\) From here on we consider the project team to consist of the housing association, the architect and the environmental expert, and consider them to have created their community of practice over the course of years. They had clearly developed a shared enterprise: “The thing we shared, which made us a team, was wanting to deal with regeneration in a specific way, together.” (environmental expert) Note however that demarcation lines are flexible and interpretable. If you look more specifically at this community of practice we can see alignment activities from one community to another; e.g. environmental experts are not actually engaged in the process of drawing the floor plans.
aligned to local politics. In order to contribute successfully to the design process, tenants had to align their activities to match the project team's work structure and expectations. In addition, the project team had to give meaning to the tenants' input in their community of practice. We will illustrate how in Complex 50 both the processes of alignment and of giving meaning locally were present.

In the case of the tenants, the tenants' coach who functioned as a broker facilitated alignment. It is important here to emphasise the difference between his job and that of a broker from the perspective of knowledge integration as we described it before, in which case brokering is often conceived of as facilitating the flow of knowledge. Rather, from the perspective of knowledge creation we have developed in this paper, a broker is a person who creates various forms of continuity among communities of practice (Wenger 1998). The tenants' coach did this by preparing meetings together with the tenants (“I would ask the tenants to make drawings of how they wanted it”), joining and supporting them in the design meetings that were held with the project team (“Sometimes I intervened by calling for a break”), and sending them to council meetings (“I didn't go myself. If the voters sit at those benches, it is completely different.”). The tenants were the ones actually participating in other practices, but the coach made sure their activities were aligned to the decision making process and political procedures.

“You have to keep explaining the process. Tell them when irreversible decisions are being made. And explain again and again why an architect has a long term perspective and needs more time.” (tenants' coach)

It is telling that the tenants' coach was actually hired by the housing association; they were very serious about
incorporating tenants’ ideas in the design\textsuperscript{15}. An important feature of a community of practice, and of the process at Complex 50, is that meaning is created in the process, together, and negotiated again and again. It is a dynamic process in which new knowledge and understanding emerges, rather than a static state of affairs, which may or may not adopt knowledge from outside. Interviewees talk about advancing understanding, developing ambitions along the way, organising a collective searching process\textsuperscript{16}. Furthermore, the necessity of listening to each other very carefully is emphasised\textsuperscript{17}. The dynamic process, of which carefully listening to each other was an important feature, meant that tenants knowledge could be given meaning within the project team\textsuperscript{18}.

\textsuperscript{15} Project leader: “we realised very soon that if we did not want to get stuck in endless discussions about light and stairwells, we had to make sure tenants were educated in holding meetings and bringing in their own interests.”

\textsuperscript{16} “The more detailed we worked, the more ambitious the project became. It is a matter of advancing understanding.” (project leader) "A succes factor of this project is that there were no scruples to call in others at an early stage. They didn’t make a plan first for others to respond to, which is what usually happens.” (tenants’ coach) “We started by asking tenants what they found problematic. There was a global urban plan but it was important that it became their plan. So we put aside the existing plan.” (project leader) “This way of working is mainly about organising a collective searching process. We do have ideas but really are open to other ideas.” (architect)

\textsuperscript{17} “You have to keep talking. Where can we find common interests? You have to keep repeating this." (tenants' coach) “The most important thing is to listen carefully. For instance that troublesome man, if you listened carefully, than you could pick up the message just fine.” (environmental expert)

\textsuperscript{18} “Usually, experts do not consider tenants to be experts. This architect does. That’s what I like about working with him.” (tenants’ coach) “We chose the architect for his philosophy that people with small budgets can contribute just as well as people with large budgets,” (project leader) “The architect, the project leader and myself sometimes come up with things that really aren’t very smart. Than it’s good to have critical occupants to point this out to you.” (participation worker) “Completely neglecting the knowledge of occupants is failing to appreciate their knowledge.” (project leader) “The design is definitely different through tenants’ input than what the architect would have come up with behind his drawing table.”(environmental expert)
We can apply the same line of thinking to the Cumbrian sheep farmers. In this case there was clearly no constructive interaction between the sheep farmers and the scientists, even though the sheep farmers had contributory expertise, as Collins and Evans call it. They express the need for a broker with interactional expertise to take care of the alignment. “Cumbrian farmers might well have had more success in their dealing with the scientists from the UK Ministry of Agriculture, Fisheries and Food (MAFF) and from British Nuclear Fuels Ltd (BNFL), if their concerns were mediated by a Greenpeace scientist, a Brian Wynne, or the like.” (Collins et. al. 2002: 256)

Crossing boundaries of disciplines or practices is one of the main challenges of transdisciplinary research, especially when cultures clash. We have shown that by alignment and brokering, knowledge from outside a research project can be given meaning within that project. This does however require a dynamic process, in which people are willing to listen to each other and renegotiate meaning, in which case the project team shares important qualities with a community of practice. Our next question (b) deals with the design of these processes and the relationship between the design of the process and the emerging knowledge.

**Designing the process**

As mentioned before, a whole range of instruments and tools has been developed to facilitate the process of transdisciplinary research. From our understanding of knowledge creation as developed in this chapter, however, we see a danger in separating the design of the process from the process itself. Let us illustrate this with an example. Within the emerging field of transdisciplinary research, there is a temptation to produce lists of success factors – elements which, when applied or implemented, lead to the desired result (e.g. Defila et. al. 2000).
External incentives, such as awards or the status of example project may be on such lists of determinants. In the case of Osdorp Complex 50, its status of example project may indeed be recognised as success factor:

“The success was partly due to the example status the project was given. This created commitment from the different actors. A contract was signed in the beginning.

…” (environmental expert)

We would argue however, that it is not the external incentive that was a determinant, but the way the project team responded to it.

“… You can always wonder how binding such a contract is. Of course it is possible to get rid of it. But it did give the right momentum in the beginning. It ensured that we did not want to risk loss of face with respect to the outside world, and that we really wanted to realise the high level of ambition that we started with.” (environmental expert)

This is an example of alignment, which we discussed earlier. Awards and example status can serve as a trigger for expectations to be given meaning, but only within a community of practice (in development). We should see this as the project teams efforts being aligned with these expectations, rather than the outside measures being determining factors of success. The same is true for previously designed project structures. A practice may respond to design, it is not the result of design (Wenger 1998: 233).

In a similar way that knowledge is created by people, in a specific context, the processes that enable knowledge creation are situationally contingent too. “[T]he influence of other forces (e.g., the control of an institution or the authority of an individual) are no less important, but they must be understood as mediated by the communities in which their meanings are to be negotiated in practice.” (Wenger 1998: 85) The following example illustrates this:
“Don’t reconcile to statements like: ‘this is the only room we were given by the politicians, there’s no other option’. You have to keep looking for solutions. If need be, send the housing association back to politics.” (tenants’ coach)

It is clear that it is not the room given by politicians that determines the outcome, but the way this is responded to locally. The trade-off that is made is in turn related to the locally defined understanding of their relationship with the ‘global’. In the case of the limited budget of the previous example, the housing association did go back to politics, but in another case it was considered wise to stop debating:

“Politicians said that because of social control, the kitchens had to be placed at the street side. This wasn’t the wish of tenants. We then had loads of discussions about it, but at a certain point we stopped. You don’t want to set them up against yourself too much.” (tenants’ coach)

The local and the global

As we have argued, using Wittgenstein, science studies and Wenger, knowledge is created and given meaning within communities of practice. It is about interpersonal relations, negotiating meaning and engaging in action. Which leads us to our final question (c): does the interlinked nature of knowledge, knowledge creation and the context and design of knowledge creation imply that the solutions created in this practice cannot be generalised or applied elsewhere by others? Can this knowledge really not be decontextualised and disembodied at all? We will argue that in three senses knowledge is not solely confined to the boundaries of a community of practice.

First, as we have shown in the previous paragraph, actions and negotiations within communities of practice do give meaning and align locally to broader movements of discourse,
organisational structures or political decisions. When ‘external’ knowledge is adopted and given meaning within a community of practice, this knowledge reaches beyond the community of practice in which it was created. However, this should not be conceived as transfer of disembodied and decontextualised knowledge from one practice to another; knowledge is defined only in the context of specific practices, whether it is the practice that creates it or that adopts it.

Second, the people who were involved in a community of practice, in developing knowledge and innovations, may take these experiences along to other contexts. In the case of Osdorp Complex 50, the members of the project team still use the repertoire of routines, of words and tools they developed together, in new projects:

“The consequence of working together in this way is that we work together again in other areas. We contact each other about new projects, and the ball gets rolling again. This is very important for innovations.” (environmental expert)

Within the project a specific energy system was developed, but not implemented.

“I once saw a roof with sun collectors and ventilation air dischargers. I thought, it should be possible to combine these. Regain the heat through heat exchangers. Within the innovative context of the project we were able to develop this technique parallel to the design process, but could not implement it. We are now applying this technique in another project.” (environmental expert)

The community of practice of Osdorp Complex 50 was able to align to the development of this technique, but not to adopt it. Again we see that knowledge or a technical solution developed in one community of practice can be adopted in another one, but in this case the continuation of people is a key factor.
Can we imagine knowledge created in a community of practice to be both decontextualised and disembodied? As described before, wave two science studiers have shown how knowledge, when studied closely within the community of practice in which it is created, is clearly socially constructed. But they have also shown how scientists systematically decontextualise and disembody this knowledge until plain, blackboxed facts remain. See for instance Latour and Woolgar (1979) for the description of the construction of a specific fact: Thyrotropin Releasing Factor (Hormone). Even though efforts to professionalise transdisciplinary research focus primarily on training researchers skills they did not acquire during their scientific training, such as project management, conflict management, brainstorming techniques, etc., we would like to underline the importance of traditional research skills; namely to decontextualise and disembodied socially constructed knowledge. We can thus imagine that transdisciplinary research, by the same process as regular science, produces ‘generalised’ and ‘objectified’ knowledge, after which it becomes part of a broader discourse to which communities of practice can subsequently align.

2.6 Concluding remarks

We have argued that the use of term knowledge integration may be misleading, as it implies that knowledge is decontextualised and disembodied, thereby neglecting a huge knowledge resource. We hope to have shown that by doing this, we misunderstand the nature of knowledge and knowledge-production. An integrated view on knowledge-creation is proposed, shaping the foundations for the epistemology of transdisciplinary research, the outlines of which we summarise below:

• There are no absolute criteria for establishing knowledge.
Engagement in a community of practice is the fundamental process by which we acquire knowledge and give meaning.

- Knowledge integration is not a detached activity of combining bits of knowledge, but rather sharing a community of practice. The term knowledge creation may be more appropriate. The architect of Osdorp Complex 50 formulates it as follows: “We think that innovations are not about bringing in knowledge from many different sides, but about organising a good process.”

- Hence, knowledge and the process of knowledge creation are intertwined. We should therefore resist the temptation to design the process of knowledge creation, or problem solving, separate from the process itself. “The context dependent nature of transdisciplinary research is not compatible with the development of some kind of blueprint research manual.” (Zweekhorst et. al. 2001) Consequently, talking about transdisciplinary research in terms of ‘organising a good process’ is not merely a methodological matter but, at its foundations, an epistemological one.

- By aligning to other localities or to broader systems of discourses, a community of practice may incorporate and give meaning to knowledge other than that created within the community of practice.

- Sometimes the process of brokering is required to facilitate the alignment between diverse practices, such as the alignment of the project team with the tenants in the case of Osdorp Complex 50 or the alignment of sheep farmers’ knowledge with that of official experts.

- Apart from alignment, there are two more ways in which knowledge can reach beyond sharing a community of practice. First, embodied knowledge may be given new meaning in another context. Second, transdisciplinary researchers can systematically decontextualise and disembodify socially constructed knowledge, after which it
becomes part of a broader discourse to which communities of practice subsequently align.

A final note on the relationship between people, process and environment in sustainable urban development:

“Sustainable urban development, is about involving people, and keeping them involved. And it is always area-based.” (architect)

Locally created solutions, by people in communities of practice through active mutual engagement, is what sustainable urban development has in common with the epistemology of transdisciplinary research as developed in this chapter.

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Chapter 3
The development of a mode-2 evaluation approach for strategies for sustainable development

Including local knowledge is increasingly considered to be beneficial for the development of new, more adequate and sustainable solutions to a wide range of persistent problems. The term transdisciplinary research is used to label a range of research practices in which knowledge from different societal and academic actors is integrated. It is seen as a new form of learning and problem solving, which helps to meet the complex challenges of society, such as those associated with sustainable development.

In the previous chapter we have made a conceptual distinction between knowledge integration (which in the context of this thesis is referred to as mode-1) and knowledge cocreation (which consequently we would refer to as mode-2). We have argued that a well-guided process of knowledge cocreation may unlock a huge knowledge resource, which would have been neglected if knowledge had been considered as decontextualised and disembodied to be integrated and made fit to societal problems through careful but detached analysis.

In furthering our preliminary explorations of mode-2 approaches to problem solving in the context of the RMNO
(Advisory council for research on spatial planning, nature and the environment) project ‘Transdisciplinary Research’\textsuperscript{19}, we found many examples of projects that embarked on the challenge of knowledge cocreation but found themselves reverting to mode-1 practices of knowledge integration. To cite two examples where the process of project formulation was (implicitly) guided by principles of knowledge integration rather than cocreation (Regeer & Bunders, 2007: 106):

A researcher who was involved in an interdisciplinary project in which anthropologists, geologists and economists collaborated, describes the following:

“In the first phase researchers had to engage with each other. This happened through a number of discussions. There were too few discussions. You have to converge to a shared starting point. It is not possible to put two proposals together, delete bits and pieces, and integrate here and there. You have to build up such a project from the ground.” (cited in Van Horssen, 2002)

Similarly, a researcher who took part in a European project with six research partners had the following experience:

“[T]he project had a bad start up. This was not due to a lack of time (because the start up lasted two days), but due to a lack of process management in an earlier phase during which the project proposal was written. Only a small part of the project group wrote the proposal and sent it to the rest of the partners asking for comments. Few of the partners reacted with comments because of a lack of time and interest. As such the proposal was biased by the ideas of the small group and most of the partners were not aware of the content of neither the proposal nor their tasks.” (cited in Tress 2003: 49)

\textsuperscript{19} The RMNO (Advisory council for research on spatial planning, nature and the environment) project Transdisciplinary Research was funded by the Coordination Fund of the Dutch Consultative Committee of Sector Councils for Research and Development (COS) and executed by Prof.dr. J.F.G Bunders and B.J. Regeer M.Sc.
Thus, even though the rationale of these projects was based on the mode-2 principle of knowledge cocreation (assuming that collaboration between scientists of different disciplines and societal actors will result in ‘better’ knowledge), the project proposals were developed from the mode-1 perspective of knowledge integration (assuming that different pieces of knowledge, problem definitions and hypotheses could be simply put together). We then postulated (Regeer & Bunders, 2007: 107) that formulating mode-2 principles could guide the development of the desired processes. That is, if engagement in a community of practice is considered to be the fundamental process by which we acquire knowledge and give meaning (mode-2 principle with respect to the nature of knowledge acquisition) than the implications for the process of proposal development are that in a safe environment, through deliberation and dialogue, assumptions which the different participants may hold with respect to the issue at hand are articulated or explicated, and the problem is reformulated. Only than can be determined to what extent initial research proposals may contribute to the shared undertaking and what additional research and actions are needed.

However obvious this reasoning may sound, we found that in practice it is often hard to recognise the mode-1 patterns in one’s own actions and suggested that reflection by a ‘monitor’ may aid this process. The role of the monitor would be to contextualise mode-2 principles (i.e. (re)formulate principles based on the language and issues of project participants) and to explicitly initiate and participate in an action-reflection spiral (Regeer & Bunders, 2007: 107-111).

In the context of the TransForum programme for the sustainable development of agriculture we were able to test and further develop our ideas on monitoring mode-2
approaches. On the basis of ‘monitoring’ a growing number of system innovation projects, within and outside of the context of the Transforum programme, with a growing team in which mutual reflection and deliberation took place, we were able to develop several tools and propose an evaluation framework that offers guiding principles to assist monitors in evaluating mode-2 projects and programmes. As these mode-2 programmes are characterised by emergent design, learning processes between diverse actors and adaptive management, managers of these kinds of programmes have new demands for evaluation and evaluators. This chapter describes our mode-2 evaluation framework in the context of prevailing evaluation methods for sustainable development (progress assessment, goal-oriented programme evaluation and programme theory evaluation) and as a response to the challenges these prevailing methods meet when confronted with the complexity of designing and conducting mode-2 intervention programmes for sustainable development. 20

3.1 Introduction

Most evaluators would agree that their work should contribute to public change of some kind – be it by providing health professionals with quantitative data, by monitoring CO₂ levels or by measuring effects on student learning as a result of educational reform. As Jean King (2008) recently stated: “We may even regain a piece of paradise through the process and knowledge we create with our evaluations […] in hopes of creating a better world.” A large part of evaluation work (as presented in this and other journals) indeed aims to contribute

20 This chapter (starting from section 3.1 introduction) has been published as: Regeer B.J., A-C Hoes, M. van Amstel-van Saane, J.F. Caron-Flinterman and J.F.G. Bunders (2009) ‘Six guiding principles for evaluating mode-2 strategies for sustainable development’ American Journal of Evaluation, 30 (4), 515-537. The final, definitive version is available at http://aje.sagepub.com/cgi/content/abstract/30/4/515
to the improvement of public programmes and thereby foster societal change. Evaluators can choose from, and skill themselves in, a wide range of available methods and techniques. But what if the problems to be addressed, and the corresponding programmes to be evaluated, are very complex and surrounded with uncertainties? What if problem definitions are highly contested, such as is the case in discussions around health efficiency and quality of life, world food security, the ethics of biotechnology, or sustainable development? What if intervention programmes are more like complex and experimental interaction processes between actors from different institutions than linear processes of problem formulation, project design and implementation? What role can evaluation play in this emerging field of systems change? How than can evaluation contribute to a better world?

In this chapter we look at monitoring and evaluation in the context of emerging intervention strategies for systems change, or system innovation. Various scholars from different academic fields have argued that some of the most complex problems society faces today are in need of new intervention strategies (which we will refer to as mode-2 strategies, see below). Complex, unstructured problems cannot be solved by the interventions of single organisations; they require cooperation of actors from different institutional backgrounds. Moreover, complex problems require strategies that entail changes in established patterns of action as well as in the structures in which they take place. Realising and guiding these systems changes demand new types of monitoring and evaluation. Dutch government adopted the concept of system innovation to address complex societal problems. Large scale innovation programmes are initiated to assist system innovation (see SenterNovem, 2007). We were asked to develop and test a monitoring and evaluation approach for
system innovation projects in the field of sustainable development, based on years of experience with the Interactive Learning and Action (ILA) approach; a participatory research approach developed by Bunders (1990) en Bunders en Broerse (1991), aimed at supporting more inclusive (agricultural, health and (bio)technological) innovation processes. The ILA monitoring approach featuring in this chapter is a further extension of the ILA approach.

In this chapter, we will describe prevailing methods for monitoring and evaluating sustainable development (progress assessment, goal-oriented programme evaluation and programme theory evaluation) and articulate the challenges they meet when confronted with the complexity of designing and conducting mode-2 intervention programmes for sustainable development. Throughout the chapter we will, for the sake of brevity, use the term ‘evaluation’, even though we take a broad view on ‘monitoring’ and ‘evaluating’ new approaches to sustainable development, incorporating both the regular collection of information as well as the assessment and evaluation of programme activities at particular moments in time. The specific approach we developed however, has been referred to as the Interaction Learning and Action (ILA) monitoring approach, which, for the sake of clarity, we will maintain.

In order to explicate our assumptions with respect to sustainable development, we will first discuss the rationale for new types of intervention strategies in the context of changing perceptions on sustainable development.

**Sustainable development requires new intervention strategies**
Since the early 1970s, there is growing consensus that there are limits to the capacity of the (natural) world to adjust to the
increasing use of fossil fuels, production of synthetic materials, and use of natural resources (D. Meadows, Meadows, & Randers, 2004; D. H. Meadows, Meadows, Randers, & Behrens III, 1972). With the publication of the Brundtland report in 1987 the concept ‘sustainable development’ was introduced, being defined as ‘meeting the needs of the present without harming the ability of future generations to meet their own needs’ (World Commission on Environment and Development, 1987). Whilst there is a widespread understanding of and agreement on the abstract idea of sustainable development (being a combination of the conservation of natural resources, quality of life issues, and a commitment to future generations), there is continuous disagreement not only about the extent of the problem, but also about the actual problem definition. By referring to the fundamental changes that have taken place in the way in which we regard and govern the world since the 'end of modernity', the 1997 UNESCO policy paper on sustainability states that: “Contrary to the conventional modernisation and development theory, the present situation is characterised by the agreement that there is no single or universal path of sustainable development.” (Becker, Jahn, Stiess, & Wehling, 1997, p. 20). Or, in a terminology scholars and practitioners of evaluation may be more familiar with, there is no ‘theory of change’ for dealing with the challenges of sustainable development (see also Walker & Kubisch, 2008).

Environmental problems cannot be solved in isolation; they are connected in a complex system of interacting physical, chemical and biological processes, affecting each other at different scales. Moreover, the biophysical environment can hardly be considered separate from societal development; climate change directly affects the livelihood of millions of people, while industrial disasters (e.g. Chernobyl) destroy the health of generations. The activities that lead to pollution, degradation,
and depletion are part of our way of life, embedded deeply in patterns of consumption and production (e.g. Beck, 1986). This understanding of the inherent complexity of the sustainability challenge has resulted in pleas for new strategies (theories of action) that entail changes on many different levels, realised by heterogeneous groups of actors, concerning a diversity of aspects. Correspondingly, new types of evaluation approaches for these new strategies are being developed, notably approaches employing systems concepts in evaluation (Williams & Imam, 2007) and developmental evaluation (Patton, 2008). To understand the kinds of demands these new strategies place on evaluation, let us consider the characteristics of these new programmes in more detail.

Scholars of science, technology and society (STS) have argued that seemingly intractable types of problems, such as those associated with sustainable development, require new ways of knowledge development and a new type of relationship, or ‘contract’, between science and society (notably Funtowicz & Ravetz, 1993; Gibbons et al., 1994; Jasanoff, 2004; Nowotny, Scott, & Gibbons, 2001). They have advocated an inclusive and responsive science; a type of knowledge production that starts from real-life problems and aims to devise solutions in collaborations with multiple stakeholders. Similarly, scholars of policy processes have emphasised that managing for sustainability requires new ways of governance: it is not an exclusive activity of governmental bodies but rather reflects principles of network steering. Traditional intervention modes and policy instruments are replaced or supplemented by notions of reflexive governance (Voß, Bauknecht, & Kemp, 2006), deliberative democracy (Hajer, 2003), and transition management (Loorbach, 2007; Rotmans, Kemp, & Asselt, 2001).

Thus, from different perspectives we hear urgent calls for new ways of approaching problems. Rather than specifying the
differences between these emerging strategies, in this chapter we shall refer to them as mode-2 strategies. Like Patton says in his discussion of the many different terms for describing programme theory: “that label is best that makes the most sense to primary intended uses – the term they resonate to and has meaning within their context” (Patton, 2008: 339). In our experience, some of the more specific designations (such as transition management, transdisciplinary research, systems change, reflexive governance) do not resonate well for a variety of reasons, which is why we have chosen for the less evocative label ‘mode-2’, but it can be replaced by more appropriate terminology depending on the context. We loosely refer to the new modes of knowledge production as proposed by Gibbons et al. (1994, see also Nowotny et al. 2001) and have found the distinction between mode-1 and mode-2 helpful as a heuristic tool in our evaluation activities.

Mode-2 strategies share a commitment to addressing complex sustainability problems by involving multiple actors (notably social and natural scientists, entrepreneurs, administrators and governors, activists, citizens), acknowledging the multi-level nature of the problems and articulating and connecting multiple perspectives. Subsequently, mode-2 intermediaries are defined as the change-agents that facilitate (and participate in) deliberative processes of learning, knowledge co-creation, and developing problem solving strategies for sustainable development. Mode-2 intermediaries can be individual actors or institutionalised organisations, but most often we mean project teams or temporary programme organisations set up to create an impact on sustainable development. We also use the mode-2 prefix when we refer to emerging approaches to evaluation.

Some characteristics of the mode-2 strategies, in relation to characteristics of mode-1 strategies, are summarised in Table 3.1.
Whilst mode-1 strategies would focus on seeking solutions for relatively concrete problems employing well-established methodologies, mode-2 strategies emphasise the creation of conditions for structuring problems and supporting the search for possible directions for solutions (Regeer & Bunders, 2009). Particularly in the case of complex problems, characterised by inherent uncertainty and long time horizons, effective strategies should be based on adaptive, iterative and flexible experimentation. Thus, a linear process of problem formulation, project design and implementation is in mode-2 replaced by an experimental approach with a number of alternative frameworks that induce variation and offers diverse experiences to learn from and evaluate (Voß, Kemp, & Bauknecht, 2006).

Table 3.1 Features of mode-1 and mode-2 strategies

<table>
<thead>
<tr>
<th></th>
<th>Mode-1</th>
<th>Mode-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nature of issue</strong></td>
<td>Structured, well-defined problem and goal</td>
<td>Unstructured, inherently complex</td>
</tr>
<tr>
<td><strong>Relevant knowledge</strong></td>
<td>Disciplinary knowledge (particularly from natural sciences)</td>
<td>Knowledge from natural sciences, social sciences and experiential knowledge</td>
</tr>
<tr>
<td><strong>Steering philosophy</strong></td>
<td>Central steering, top-down</td>
<td>Reflexive governance, network steering</td>
</tr>
<tr>
<td><strong>Relevant actors and relations</strong></td>
<td>Central role project team from established institution, principal-agents relations</td>
<td>Collaboration between entrepreneurs, scientists, civil servants, societal organizations, citizens</td>
</tr>
<tr>
<td><strong>Intervention process</strong></td>
<td>Execution of a linear process of problem formulation, planning, implementation, and evaluation</td>
<td>Emergent design focuses on the stimulation of experimenting and (double loop) learning between different actors</td>
</tr>
<tr>
<td><strong>Intervention impact</strong></td>
<td>Direct project outputs</td>
<td>Beyond project level: impact on system level as well as on individual level</td>
</tr>
</tbody>
</table>
Experience shows that implementing mode-2 strategies is not straightforward and continuous learning (e.g. through monitoring and evaluation) is required. First, mode-2 strategies must be flexible and sensitive to the context in order to respond to the historically contingent and context dependent nature of sustainability; general guidelines do not suffice. Depending on the particular cultural, political and ecological starting points, appropriate strategies for sustainable development allow for a variety of transformation paths. Second, sustainable development implies making different choices and trade-offs, often outside of the realm of the usual behaviour (whether personal or institutional). Connections need to be made between reflecting and acting, which does not imply that reflection can simply lead to change in action. A mode-2 strategy must acknowledge the interrelatedness of action and structure (Giddens, 1984); interactions among agents generate emergent structures that in their turn constrain future behaviour of agents (see also writings on Complex Adaptive Systems in relation to evaluation, e.g. Eoyang, 2007; Parsons, 2007). While fundamental changes are required, existing structures cannot be ignored, overridden or simply by-passed. Hence, these new intervention strategies must act on, or induce change at, multiple levels, ranging from individual actors to incumbent institutional structures, and thus take a broader system perspective (e.g. Churchman, 1970) with the corresponding inherent unknowables and uncertainties that inhibit a predictable course of action.

As a consequence, there is a growing sense of awareness that besides optimising intervention strategies, the difficult route towards a more sustainable world demands the support of careful monitoring trajectories and evaluation activities. Since the coining of the term sustainable development, the number of monitoring and evaluation projects and programmes on
sustainable development has grown vastly, as has the number of approaches to monitoring and evaluating sustainable development, all varying in terms of scope, unit of analysis, purpose, tools, and role of the evaluator.

Below we describe three prevailing approaches in more detail and elaborate on their potential contribution to sustainable development as well as on the challenges they meet when confronted with the increasing complexity, multi-levelness and actor pluralism that sustainable development entails. We suggest that an additional type of evaluation may further the pursuit of sustainable development by contributing to the learning processes of practitioners in their attempts to develop and implement mode-2 strategies for sustainable development. We explore the outlines of a mode-2 evaluation framework, by building on experiences with developing and experimenting with the ILA monitoring approach.

3.2 Three approaches to monitoring & evaluating sustainable development, their (potential) contribution and their challenges

Taking sustainable development as illustrative domain for evaluating mode-2 intervention strategies, a rough distinction into three types of evaluation can be made. Many evaluation programmes were set up to assess national or global trends and facts related to sustainable development (progress assessment). Other evaluation projects and programmes have been launched with the purpose to assess the goals and results of interventions aimed at contributing to sustainable development (goal-oriented programme evaluation). Finally, there are studies that aim to investigate and assess the (often implicit) theories that underlie those interventions (programme theory evaluation). For other domains, such as health, education
and development, similar distinctions between approaches to evaluation can be made (compare Abma's three variations in policy evaluations, 2001; and Guba & Lincoln's three generations preceding their fourth, 1989).

**Progress assessment**

Many evaluation programmes have been set up in an attempt to formulate an answer to the question: 'If there are limits to the capacity of our (natural) world, where do we stand with respect to them?' These types of studies evaluate the state-of-the-world with respect to sustainable development by identifying trends and facts, based on longitudinal measurements or complex models (e.g. IPCC, Millennium Ecosystem Assessment, Biodiversity Outlook). They can be deployed in general or in relation to an intervention programme. Indicator frameworks have been developed to aid the, primarily quantitative, description of the current status of the environment on global, national and local level, as well as of individual sectors, companies, households and ecosystems. Indicator-based sustainability monitoring is rather successful in providing feedback. Through reports and public communication we have become aware of trends in ‘the state of sustainability’, both on global, national or local scale and of a need to change behaviour. Al Gore has been able to draw on many different studies, models and empirical results to support his ‘Inconvenient Truth’.

While progress assessment provides an opportunity to establish a baseline of the existing conditions as well as to identify progress in the natural world (by monitoring at regular intervals), it has proven difficult to accommodate the complex and interwoven nature of various societal (political, social, economical) and ecological subsystems presupposed by a mode-2 view on sustainable development. Thus, the need for
developing innovative indicator frameworks arises (Kemp, Parto, & Gibson, 2005). “If societal processes are to be evaluated in terms of their sustainability, then the different indicator systems cannot be merely reviewed, reformulated or supplemented.” (Becker, Jahn, Stiess, & Wehling, 1997).

We can distinguish at least two development paths for new indicator frameworks required by the complex challenges of sustainable development. First, by stating that change of action is the desired response to the application of sustainability indicators, the issue of agency is introduced into the indicator discussion. “Who wants sustainable development indicators? Who owns the process of their creation and who uses them?” (Bell & Morse, 2004). Becker et al. (1997) contribute to this discussion by proposing that “it should be further examined how the factor of agency might lead to a more self-reflexive approach to the development of indicators” (1997: 31) by exploring the institutional and political contexts within which sustainability measures take place. Thus, there is a suggested shift of focus from the 'what' of measurement to considerations of participative strategies and institutional frameworks.

At the same time, the need is expressed for new sets of indicators themselves, which is the second path; indicators that allow for the assessment of complex relationships between social, economic, political and ecological systems (Hildén & Rosenström, 2008; Kemp, Parto, & Gibson, 2005). The challenge to developing innovative indicators thus has a process and a content dimension.

**Goal-oriented Programme Evaluation**

A second type of evaluation approach aims to answer the question: ‘If we want to change our position with respect to the
limited capacity of our world, what interventions can be considered appropriate and successful? A vast range of (global, EU and national) policy programmes (e.g. Millennium goals, Kyoto protocol), citizen initiatives (e.g. Local Agenda 21, Ecoteams), NGO collaborations (e.g. Anti globalisation movement), and changes in business management (Corporate Social Responsibility) have been initiated since the publication of the Brundtland Report ‘Our common future’ (WCED, 1987). Result-oriented management in the context of both businesses and governments has lead to a growth of performance measurement and (goal-oriented) programme evaluation to provide evidence of impact and effectiveness (De Lancer Julnes, 2006). The dominant focus of this type of approach is on measuring the outcomes of policy programmes and/or corporate initiatives, in terms of achievement of predetermined goals and objectives, after the programme has been completed (i.e. summative); resulting in amongst others annual sustainability reports of companies based on the GRI indicators, or the Environmental Performance Review.

The dominant view on programme evaluation presupposes a linear and rather technocratic policy process, which expects evaluation results to be used by policy makers in a direct instrumental manner (Lehtonen, 2005). Some have argued that the potential contribution of these so called goal-oriented evaluations to subsequent decision making about future action is limited (Patton, 2008). Although programme evaluations are known to have an indirect use through an enhanced awareness (a form of Patton's process use, 2008), the direct use of evaluations in policy decision-making is an exception rather than a rule (e.g. see Lehtonen, 2005). Decision making is influenced and informed by many different sources of knowledge, of which evaluation is only one: “Programme designers and programme managers interact with a number of
different actors: evaluators constitute one group and evaluation a source of knowledge that is to share among many others existing within the organisation” (Marra, 2004, p. 264). Moreover, as interventions are executed, intended and expected as well as non-intended and non-expected effects become apparent (e.g. Dart & Davies, 2003). If these responses in the environment are closely monitored, they may lead to new insights into the aspired challenge or objective, with a change of strategy as a result. This has implications for the role of evaluation in the intervention programme; more emphasis is placed on incorporating evaluation in the intervention process (see also Friedman, 2001). Programme evaluation that focuses on evaluating the programme itself with the purpose of assisting in making timely adjustments (formative) rather than focusing on the end result of the programme (summative) seems expedient in cases of mode-2 approaches to sustainable development and other complex problems alike.

Another important challenge of programme evaluation is to accommodate the *multiple* and *dynamic* understandings of sustainable development. Many evaluators advocate that a rigorous evaluation requires reference to declared goals, even if they are recognised as changing, unstable and fluid (McCoy & Hargie, 2001). In the case of mode-2 strategies for sustainable development, and other complex issues alike, it is suggested that the actual problem articulation becomes an important objective of the programme itself, rather than settling down with an incomplete or inadequate set of goals and measuring the outcomes of the programme against them. The challenge of unstructured problems is not to structure them, but to make their articulation a matter of discussion and part of a learning process between a variety of (policy) actors (Hisschemöller & Hoppe, 1996). Similarly, Friedman et al. (2006) advocate to make goal setting a process of systematic and participative
inquiry into goals, particularly in cases of controversy or dissent.

Programme theory evaluation
In contrast to goal-oriented programme evaluation, 'programme theory evaluation' focuses on understanding how programmes work, addressing the question: *why certain interventions are devised?*. Implicit 'theories of intervention' are explicated, unveiling the set of assumptions underlying policy goals and objectives. The rationale underpinning a particular intervention programme is specified in terms of its inputs, its expected outcomes, the assumed relationships between them, and the underlying mechanisms relating expected programme ends and means to each other (Chen, 1990). These mechanisms, explaining how programme inputs and activities are intended to create the desired outcomes, are referred to as logic models. Logic models can be constructed using various techniques such as 'if...then' propositions or concept mapping (e.g. Rosas, 2005; Yampolskaya, Nesman, Hernandez, & Koch, 2004). Programme theories and logic models can be determined deductively on the basis of academic theory or constructed inductively on the basis of fieldwork (e.g. Patton, 2008, p. 344). User-focused and participative approaches are increasingly used to (collaboratively) construct and articulate the theory of intervention of programme teams (e.g. Christie & Alkin, 2003; Patton, 2008).

Programme theory studies have many potential benefits; they can inform programme evaluation on relevant variables to be included in the analysis, explain events and behaviour, assist practitioners in understanding the workings of their programmes and inform future actions. However, three characteristics of mode-2 intervention strategies pose challenges to programme theory evaluation; their emergent
design, the complexity of the endeavour and their experimental nature (see Table 3.1).

First, programme theory evaluation presupposes a relatively stable programme, of which the activities, goals and intended effect can be univocally described (even if informed by a wide range of stakeholder perspectives). However, as mode-2 strategies are characterised by emergent design, appropriate interventions can only be determined beforehand to a limited extent, and they change considerably during conduct.

Second, the complexity of mode-2 strategies towards sustainable development, (characterised by a plurality of values and perspectives, permanent uncertainties, and pervasive interconnectedness between ecological, social, institutional, political and economical system) makes it extremely difficult to identify causal links (even hypothetically, as in logic models) between interventions and effects. The number of activities and actors involved as well as the various scales at which interventions take place add to the complexity of attributing possible effects to the intervention programme. As Complex Adaptive Systems (CAS) theory states, knowing the factors that influence a system, does not mean we can control these factors and expect predictable outcomes (Parsons, 2007). In the field of evaluation too, the analysis of (causal) links between policy interventions and their outcomes is considered challenging (e.g. see Perrin, 2002) particularly when complex problems or programmes are concerned (e.g. Dyehouse, Bennet, Harbor, Childress, & Dark, 2009; Forrest, 2007; Patton, 2008; e.g. Williams & Imam, 2007).

Third, as mode-2 strategies are fundamentally experimental, academic theory on systems change cannot be straightforwardly translated into practice. Friedman (2001) refers to
Argyris and Schön (1974, 1978) in observing that, particularly under conditions of uncertainty, ambiguity and goal conflict (such as is the case with mode-2 strategies for sustainable development), there are gaps between programme theory and programme practice. Actors are frequently unable to behave in ways consistent with their espoused theories. Thus, even if programme participants’ espoused change theory corresponds to academic theory on complex, multi-level transitions, we can expect that in practice actors will not act accordingly. This has consequences for the use of programme theory in evaluation of mode-2 strategies.

Let us illustrate by means of the current Dutch discourse. As described before, a mode-2 understanding of sustainable development has led to a search for new intervention strategies (mode-2 approaches) better suited to the management of new kinds of problems. In the Netherlands, especially since the 'transition terminology' was embraced by the fourth National Environmental Policy plan (VROM, 2001), a range of intervention theories and tools has been developed and research programmes set up. The hard and pioneering work done in this area has probably resulted in the disposition to approach 'programme theory evaluation' primarily from a prescriptive perspective. In Dutch discourse surrounding the evaluation of transition programmes we observe an inclination to assess whether or not the 'programme theory' (that is, the expressed and/or enacted relationship between objectives, interventions and outcomes) corresponds to the theoretical 'blueprints' of transition management. However, in interviews and informal conversations we held with a range of programme managers and project leaders, they have expressed agitation and annoyance with being confronted repeatedly with the gaps between programme theory and their practice. They argue they know about the theory but struggle with the implementation
and have expressed the need for help and guidance. Thus, extending Friedman's argumentation (2001), the challenges for programme theory evaluation in the context of highly complex issues may rather be described as a) learning why in practice the interventions may not adhere to some of the fundamental aspects of the intended programme theory, and b) finding and monitoring ways to overcome these difficulties.

**Challenges for evaluating mode-2 strategies**

To recapitulate, a distinction can be made between three types of monitoring and evaluating sustainable development, addressing the questions: 1) *Where* do we stand with respect to sustainable development (generally or in relation to an intervention programme)? 2) *What* interventions do we plan and execute and what are their outcomes? 3) *Why* are certain interventions developed and implemented? (see Table 3.2). We have described the different approaches and their potential contribution to sustainable development briefly and elaborated on the challenges they meet when confronted with the increasing complexity, multi-level nature of the issues and actor pluralism that a mode-2 view on sustainable development entails (see Table 3.2).

Below we will look at the implications of these challenges for mode-2 evaluation approaches. We do this by articulating guiding principles that emphasise essential aspects of mode-2 evaluation approaches. The guiding principles are based on our experience with one such approach: the Interactive Learning & Action (ILA) monitoring approach. The guiding principles modestly aim to contribute to the widely expressed need to develop innovative indicator frameworks. Both the nature and the content change in innovative indicator frameworks, henceforth called mode-2 evaluation frameworks.
### Table 3.2 Prevailing approaches to monitoring sustainable development

<table>
<thead>
<tr>
<th>Focus</th>
<th>M&amp;E</th>
<th>Features</th>
<th>Challenge</th>
</tr>
</thead>
</table>
| 1. Where do we stand? | Progress assessment | Indicator-based, modelling | • Participative development of indicators  
• Including social, institutional indicators |
| 2. What effects do interventions have? | Performance measurement | Goal oriented, ex-post | • Acknowledging changing and unstable nature of declared sustainability goals  
• Contribute to intervention strategy |
| 3. Why are certain interventions chosen? | Programme theory evaluation | Logic models | • Accommodating differences in intended intervention theory and practice |

### 3.3 ILA monitoring in practice: focus, tools and role of evaluator

The ILA monitoring approach is an example of a mode-2 evaluation approach and is based on our most recent experiences with evaluating 11 projects with mode-2 aspirations, in the context of two Dutch system innovation programmes on the sustainable development of agriculture. The transition programme TransForum is set up as a six year programme to support the sustainable development of agriculture in the Netherlands by bringing local practices (of farmers, growers, civil servants) together with scientists with the aim to induce changes in both science and practice (see Veldkamp et al., 2008). Different members of the Athena monitoring & evaluation team were involved in evaluating eight of TransForum’s Innovation projects as well as the TransForum
programme itself. The second context in which our research was carried out is that of the programme ‘Monitoring and evaluating networks’ supported by the Dutch Ministry of Agriculture, Nature and Food Quality. Four innovation projects (or practice networks in the language of the programme) were monitored, two of which used ILA as primary approach. In addition, an independent project on regional innovation in sustainable development of agriculture supplements the set of 11 projects. In another section below we will discuss the criteria we used for case selection. The 11 projects together have formed the ‘laboratory’ in which we developed and tested our tools and articulated our focus. In the current section we will use examples from the ILA monitoring approach to illustrate ways to address the challenges to evaluating sustainable development that were put forward in the previous section.

**Focus: the development and practice of interventions by mode-2 intermediaries**

The first guiding principle for a mode-2 evaluation framework concerns the focus of analysis. Acknowledging the relevance of programme theory evaluation we state that a mode-2 evaluation approach focuses on the ‘inside’ of efforts to stimulate sustainable development; that is, on the practices and intervention strategies developed and conducted by mode-2 intermediaries, rather than the outside (e.g. the effects of these efforts, or the cause of the problems). The reason for this is that developing and implementing mode-2 approaches to sustainable development is challenging. Writings on mode-2 approaches contain precautions on the complexity of the task, due to the context dependent nature of sustainable development, the diversity of actors involved, and the many levels at which action is needed. A mode-2 approach not only requires a flexible and context sensitive methodology, it also
requires an interdisciplinary team with interactional expertise of the fields it operates in (Collins & Evans, 2002), competences in project, process, knowledge and network management, and support from its commissionaires. What makes it particularly difficult however, is the power of prevailing modes of operation, institutional structures, and individual and organisational competence that constrains the required change. It is because of hampering conditions, changing circumstances, and unexpected effects that a mode-2 intervention strategy is inherently open to change – it cannot follow a blueprint. Similar notions are apparent in the literature on systems thinking in the context of evaluation (Cabrera, Colosi, & Lobdell, 2008; Churchman, 1970; Dyehouse, Bennet, Harbor, Childress, & Dark, 2009) and Complex Adaptive Systems (Eoyang, 2007; Parsons, 2007). Reflecting and learning are therefore essential features of mode-2 approaches to sustainable development (see e.g. Armitage, Marschke, & Plummer, 2008; Hendriks & Grin, 2007) and can be strengthened by corresponding approaches to evaluation (e.g. Burns, O'Connor, & Stocklmayer, 2003; Imam, LaGoy, & Williams, 2007; Midgley, 2007).

**Guiding principle 1: on the focus of evaluation**

Mode-2 evaluation focuses on the inner workings of intermediaries, in particular by supporting continuous learning about intervention strategies for sustainable development

The ILA monitoring approach aims to help mode-2 intermediaries guide and refine their interventions for sustainable development in response to changing situations and observations. Thus, while the employed mode-2 approaches to sustainable development by intermediaries constitute the focus of evaluation, we do not assess whether the programme theory of the intermediary adheres to the main features of mode-2
approaches, but how they are employed, where it gets difficult, and why, and how these obstacles are resolved. As Friedman (2001) observed: the mechanisms that govern the implementation of a programme theory are not addressed in regular programme theory evaluation and are a potential blind spot in the evaluator's field of vision. Guiding principle 1 thus addresses the challenge faced by programme theory evaluation when applied to mode-2 strategies (see Table 3.2).

Action research approaches (Burns, O'Connor, & Stocklmayer, 2003; Hoes, Regeer, & Bunders, 2008; Reason & Bradbury, 1990; Zweekhorst, 2004) have provided evidence that following a cyclical intervention strategy, whereby tailor made interventions follow observation of and reflection on previous interventions is particularly suitable for dealing with the types of problems associated with sustainable development (see Fig. 3.1). This leads to the second guiding principle:

**Guiding principle 2: on the role of evaluation**

Monitoring and evaluation are intrinsically linked to the intervention process, by being part of the iterative process of defining, implementing and adjusting interventions.

As such, mode-2 evaluation meets the challenge, faced by performance measurement approaches, to contribute to intervention strategies. Our experience has shown that evaluation contributes to this spiral of activities in at least three different ways, indicated by the dotted marks in figure 3.1. First, the evaluator may contribute to investigating the current state of affairs with respect to the challenge at stake (reconnaissance), by performing desk research, stakeholder interviews or focus groups. Interviews with key-players in mode-2 evaluation should be prepared not solely from a research perspective (gathering data), but from an intervention
perspective (affecting actor views and relations) and should preferably be conducted in collaboration with the project team.

Figure 3.1 Action-research spiral (adopted from Kemmis and McTaggert 1988, and adjusted)

Unlike figure 3.1 suggests, we have found that suggesting to start with reconnaissance activities at the beginning is often not well received. Soon after the start of a project, teams often feel a much greater need to start executing part of the project plan, than to reflect upon underlying assumptions. Reconnaissance activities positioned between the first and
second action-research cycle are rich in terms of experiences and observations brought in and of great use for subsequent phases of plan and action. Thus, in order for productive evaluator-project team relations to develop, careful observation of and responding to the dynamics and expressed needs of the project team is important.

A second, commonly employed, role for evaluation in the spiral of activities of a mode-2 intermediary, specifically concerns the activities of observation and reflection (see fig. 3.1). As reflection and learning are recognised as essential aspects of any mode-2 strategy towards sustainable development, sponsors may request allocation of part of the budget to reflection activities, which is subsequently subcontracted. In practice, this strategy risks insufficient use of results, by considering observation and reflection as separable, and hence separate, activities. Emphasis, in terms of time and effort, is on gathering and analysing data, with a steep learning curve on the part of the evaluator rather than the project team. Time spent on reporting back results and mutual reflection is often limited to one or two occasions.

The third way in which evaluation may contribute to the spiral of activities in a mode-2 project, involves including the evaluator in all parts of the cycle. Especially in projects where participant observation is part of the methodology, regular interaction between team members (of which evaluator is one) enhances the possibilities for connecting observation and reflection on the one hand to plan and action on the other hand. The emphasis in terms of time and effort is on interaction between evaluator and other project team members and the mutual (re)articulation of observations, challenges and strategies. Strong communication skills are needed for successful role-sharing between evaluators and project teams, as the empirical study by Cartland et al. (2008) confirms.
Creating a framework for evaluation

Thus, the scope of a mode-2 evaluation framework is set by guiding principles 1 and 2. Focusing on the intervention strategies of mode-2 intermediaries helps them with their difficult task of stimulating sustainable development in a way that incorporates the increased complexity that a mode-2 view on sustainable development entails. Now we have set the scope of the mode-2 evaluation framework, we can turn to the contents. What exactly is being evaluated in this reflexive and iterative manner, and how do we determine this? In other words, what are appropriate mode-2 indicators and how are they developed? We start with the latter, by formulating guiding principle 3, explicitly addressing the first challenge faced by progress assessment approaches.

Guiding principle 3: On the process of creating a framework for evaluation

Employ a participative approach to the development of a mode-2 evaluation framework

If evaluation aims to enable actors to learn about and enhance their practices, their learning objectives should be central to the framing of evaluation issues. Thus, the issues and concerns of stakeholders and end-users constitute the start of the inquiry (see also Greene & Abma, 2001; Guba & Lincoln, 1989; Patton, 2008; Stake, 1967 for a comparable rationale). To show how this may work out in practice we describe the way in which cases are selected in the ILA monitoring approach.

Case selection: mode-2 aspirations

In selecting our cases we find it important that they aim to contribute to a more sustainable way of producing food, organising care, developing urban and regional spaces, or transporting food and flowers; the cases on which our
examples are based are all in the area of the sustainable development of agriculture. Secondly, projects express an interest in the added value of evaluating the project. And thirdly, the ILA monitoring approach is especially conducive to projects that express mode-2 aspirations, albeit not necessarily in those terms. Thus, whilst recent writings about systems based evaluation particularly concern the use of systems concepts to broaden the practice of evaluation, whether applied to large programmes or to the design of a questionnaire (Imam, LaGoy & Williams 2007: 10), our focus is on evaluating projects or programmes that express their belief in a systems based approach to tough problems. Examples are given in Table 3.3.

Table 3.3 Examples of terminologies that indicate mode-2 aspirations

<table>
<thead>
<tr>
<th>Mode-2 aspirations: projects state their focus on:</th>
<th>Variety in terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>• knowledge co-creation</td>
<td>‘building a transdisciplinary network’, ‘connecting the worlds of knowledge and practice’</td>
</tr>
<tr>
<td>• different way of working</td>
<td>‘learning-by-doing’, ‘community of practice’, ‘new role for government’</td>
</tr>
<tr>
<td>• bringing together a variety of actors</td>
<td>‘apply KOMBI-approach’, ‘bring together 5 O’s’</td>
</tr>
<tr>
<td>• creating impact on system level</td>
<td>‘change knowledge infrastructure’, ‘change climate for decision making’</td>
</tr>
</tbody>
</table>

In introductory interviews with project leaders we go to great lengths at trying to understand their main concerns and current struggles. Throughout the discussion we are looking for common ground and a terminology that suits the project. The terminology thus developed forms the starting point of the inquiry and shapes the preliminary focus of the evaluation. The concept of a mode-2 approach functions not as a framework
for assessment, which would make it deficit oriented, but is used instead as a guide to inform our appreciative inquiry (see also Preskill & Catsambas, 2006).

We would like to note here the subtle but important difference between involving stakeholders and end-users in the research process of the evaluator on the one hand and a collaborative learning effort between evaluator and practitioners on the other. In the first case the primacy is with the inquiry of the evaluator where including stakeholder perspectives leads to more complete and integral research results. In the second case evaluation is instrumental to (and at the same time an integral part of) the learning process of the actors; the primacy is with the process of realising sustainable development. The ILA monitoring approach aims for the latter.

The content of a mode-2 evaluation framework: from indicators to sensitising concepts

As established above, mode-2 evaluation needs to acknowledge the changing and unstable nature of declared goals. Sustainability projects or programmes may even benefit from an unfixed, changeable formulation of goals so as to accommodate the multiple interests of concerned parties. Two earlier sustainability programmes (NIDO-DSV and Real Prosperity) evaluated by one of the authors came to similar conclusions: going into the field with a set of goals and definitions defined in advance did not generate the aspired movement towards sustainable development. In both cases, strategies were adjusted; the questions of respectively 'What is sustainable urban development?' and 'What is Real Prosperity?' became leading in interactions with actors concerned; they generated energy and aided the development of agency (Regeer & Bunders, 2009). Thus, through an interactive process of deliberation and dialogue, new understandings of sustainable
development were developed and aligned with local contexts and institutional contexts of participants. In our monitoring we have found that these new understandings contain sensitising concepts, capturing a specific quality of mode-2 indicators. Their function is not to assess but rather to perceive, or make visible, aspects that are or seem relevant to sustainable development. Moreover, the local articulation of mode-2 indicators, stimulates sustainable development through discursive activity. Similarly in the context of systems inquiry and evaluation it is observed that “deeper meaning-making is more likely to promote valuable action than better data” (Imam, LaGoy & Williams 2007: 8).

Guiding principle 4: on the nature of indicators

- Mode-2 indicators do not assess but sensitise
- Mode-2 indicators are context dependent and dynamic

Note that articulating the local meaning of sustainable development is not limited to interaction between the evaluator and the mode-2 intermediary. Entering the dialogue with relevant stakeholders on their understanding of sustainable development is part of a mode-2 intervention strategy to sustainable development. As a result of evolving insights on the part of the mode-2 intermediary and due to an increased number of stakeholders and perspectives entering the interpretative space over time, mode-2 indicators necessarily change during the course of the project.

To further our understanding on the content of mode-2 indicators, in the next section we will describe a specific tool we developed in the context of ILA monitoring: the Dynamic Learning Agenda. It contains sensitising concepts and aims to contribute to both the learning by the mode-2 intermediary and learning about intervention strategies for sustainable development. Two more guiding principles for mode-2 evaluation will be formulated.
3.4 Supporting learning: the Dynamic Learning Agenda

As described above, the focus of our research is on intervention strategies of intermediaries with mode-2 aspirations; i.e. temporary project teams or programme organisations aiming for systems change. The goal of our research is to strengthen the intervention strategy by articulating and generating feedback loops that enable actors to learn. A crucial question on the part of the evaluator is: “How can we capture learning experiences in such a way that the learning process of project participants is enhanced?”.

Capturing learning experiences implies making an intangible process visible. The intervention process is a continuous and ongoing flow of decisions, observations, actions, thoughts, reflections, interactions, adjustments, etc. Much like water; when you try to get hold of it, it disappears. At the same time the reification of the learning experiences can serve the process (Czarniawska & Joerges, 1996). A (temporary) materialisation of ideas and experiences may act as a point of reference, and upon collective reflection it can act as a tool for mutual sense making. In the context of ILA monitoring, we developed the Dynamic Learning Agenda: a tool that both enhances the learning process and makes it tangible. Another technique that seeks to contribute to programme development as well as communication is the Most Significant Change (MSC) technique, which involves the regular collection and participatory interpretations of “stories” of change (Dart, 2003).

**The Dynamic Learning Agenda**

Learning starts with articulating questions. The learning agenda contains the issues (formulated as questions) a mode-2 intermediary struggles with, in the development and
implementation of an intervention strategy for realising sustainable development, at a specific moment in time. By constructing a sequence of learning agendas, the agenda becomes dynamic. While we have used several variations of the Dynamic Learning Agenda, the basic idea is depicted in figure 3.2. Before we will show and discuss some variations drawn from our cases, we will clarify how evaluators may approach creating a Dynamic Learning Agenda.

Figure 3.2 Schematic representation of a Dynamic Learning Agenda

Dynamic Learning Agendas can be constructed in different ways. Often, the first learning agenda is constructed by explicating the challenges, as they are implicitly discussed in a meeting on the progress of the project. The learning agenda then forms input for the next meeting and after some meetings may become a device to structure the meeting and discussions about progress. Learning agendas can also be constructed in interactive working sessions, using interactive group methods such as focus groups, open space, etc. Furthermore, specific working sessions are organised addressing specific questions that remain on the agenda for a considerable amount of time.
Evaluators take different roles in these activities and need corresponding skills; ranging from analytical capacities to facilitation skills. In terms of visualisation we have found that the full learning agenda at a particular moment in time usually looks like a low tech, plain list of questions, possibly clustered in categories (see fig. 3.4). A Dynamic Learning Agenda, showing changes over time, is often organised around a single question or a set of connected questions, and usually shows the actions taken in response to the questions (see fig. 3.3 for a selection of a Dynamic Learning Agenda). Depending on the intended use of the Dynamic Learning Agenda it can be more or less comprehensive; possibly including major events in the environment of the project, the formulation and appropriation of questions by different stakeholders over time, or significant project outcomes.

As a result of our experimentation with Learning Histories (developed by Kleiner and Roth at the Center for Organizational Learning of the MIT in the 90s of the last century) in earlier stages of the ILA approach to evaluating sustainable development, the Dynamic Learning Agenda shares some of the epistemological and methodological assumptions underlying Learning Histories. Dynamic Learning Agendas start from the specific and situational, and are constructed in a participative way, in accordance with guiding principle 3. Like Learning Histories, they should be “judged by the quality of the conversation they provoke” (Kleiner & Roth, 1996, p. 20). As such they are intended to contribute to the sensitisation of participants to the issues that emerge as relevant, which corresponds to guiding principle 4. By including perspectives of a wide range of participants (initiators, followers and opponents of the sustainable development at stake) no one perspective on sustainable development is excluded in advance. Furthermore, the Dynamic Learning Agenda is devised
not as an end in itself but rather as a means towards learning and mutual sense making, and is thus inextricably linked to the intervention process (guiding principle 2). Finally, Dynamic Learning Agendas are particularly aimed at bringing to light the difficult, tough issues, that are normally “swept under the rug” (Kleiner and Roth, 1996: 14). We will elaborate on these persistent questions next.

**A living archive of challenges to realising sustainable development**

The Dynamic Learning Agenda helps to construct and discuss the main challenges ahead on a regular basis and thereby support the learning process of the mode-2 intermediary. In addition, they function as Living Archives of those challenges. Preliminary analysis of Dynamic Learning Agendas shows that some issues remain on learning agendas for a considerably longer time than others. In figure 3.2, questions A and C depict such persistent, tough questions. As the resolution of single loop learning questions lies within the capacities of the practitioners (single loop learning involves doing things better through incremental improvements of existing routines), they disappear from the agenda relatively easily. Double loop learning questions however are particularly persistent (they involve change in underlying beliefs, norms and assumptions), and exceptionally relevant to the challenges of sustainable development (for the original account of single and double-loop learning see Argyris & Schön, 1974; Argyris & Schön, 1978). In a similar vein humanistic philosopher Kunneman (2006) noted in his account of the existential state of contemporary societies, that although tough questions (‘trage vragen’ in Dutch) may be shoved away under the table, from this subordinate position they will continue to give importunate signals. According to Kunneman, these signals can become visible when there is room for exploration and even acceptation of differences...
between people and positions. Reflecting on the Dynamic Learning Agenda in a safe environment aims at exactly that. Likewise, Critical Systems Heuristics (e.g. Reynolds 2007) and Soft Systems Methology (e.g. Attenborough, 2007) may help to get the ‘undiscussibles’ in an evaluation (Imam, LaGoy & Williams, 2007).

On analysing Dynamic Learning Agendas we have found that persistent questions appear in two forms. First, we often see a discrepancy between mode-2 intentions and practice. Armitage et al. (2008) have called this the learning paradox. They have observed that despite increased attention for the importance of learning in resource and environmental management literature, in practice it is employed in an unspecific, vague sense. They contribute to resolving the paradox by a careful examination of literature on learning of emerging governance models in the context of environmental and resource management. The dynamic learning agenda is yet another answer to the paradox; it addresses the discrepancies when they arise and where they arise. Thus, the fifth guiding principle:

Guiding principle 5: on the contribution of indicators to learning

Mode-2 indicators (e.g. in the form of questions on a Dynamic Learning Agenda) are conducive to finding strategies to accommodate the discrepancy between mode-2 intentions and mode-1 practice

An example can be provided using the case of the TransForum programme, which is evaluated using the ILA approach since 2005. The questions on the Dynamic Learning Agenda of TransForum reveal changes in the intervention strategies over time that indicate an increased understanding of what it means to be a mode-2 intermediary (see Fig. 3.3). To start with, TransForum-by-design adheres to the principles of a mode-2 intermediary: it aims to realise a sustainable agricultural sector, not through linear knowledge transfer, but through collaboration.
Figure 3.3 Selection of the Dynamic Learning Agenda of TransForum in the period 2005-2006.

Questions:
- What challenges in Dutch agriculture does the programme address?
- What are appropriate selection criteria for projects?
- How do we support learning and reflection in projects? How can project participants from different domains address constraining conditions?
- What can we learn about constraining conditions from projects?

Responses:
- Formulation of three innovation strategies that each addresses a challenge of Dutch agriculture. Projects are clustered in these three innovation strategies.
- Formulation of project criteria for approval of proposals, and yearly project review.
- Active participation in projects by TransForum staff and evaluators.
- Expand project aims and requirements to include learning and reflection. Deliver lessons learned in addition to "hard" output.

Intervention strategies:
- Realising sustainable agriculture through the execution of collaborative projects.
- Creating conditions for the sustainable development of agriculture by inducing learning about hampering factors in projects.
among scientists, entrepreneurs and government in real life experiments (for more details about the programme see Veldkamp et al. 2008). In its first year of operation much energy was put in setting the scope, creating coherence and formulating criteria. Questions on the learning agenda were related to programme coherence (What challenges in Dutch agriculture does the programme address? What relevant links can we make between the projects and the scientific programme?) and project criteria (What are appropriate criteria that can be used to approve project proposals?). Soon however it was found that setting appropriate criteria for projects (e.g. requesting application by consortia of actors) does not automatically lead to the desired results (i.e. actors were not able to overcome their respective interests and remained in their original domains). TransForum-in-action in its first year appears to adhere more to a regular mode-1 programme in terms of its relation to projects. Tracking the formulation and reformulation of questions on the Dynamic Learning Agenda shows that the more analytical ‘what’ questions are replaced by posing ‘how’ questions that are necessary to develop the ability to act in a meaningful way. The assertion that collaboration is guaranteed through project criteria changes over time to a series of questions addressing the process behind realising collaboration between a diversity of actors (How can we support collaboration between different actors? How can we foster learning in projects in order to build the capacities necessary to deal with constraining conditions?). In terms of action this meant that TransForum staff began to actively participate in projects in order to be part of the cocreation process. In the course of the programme the intervention strategy thus changed from ‘contributing to the sustainable development of agriculture through the execution of projects’ to ‘creating conditions for the sustainable development of agriculture by inducing learning about hampering
Learning Agenda “Project name” at “date”

Project challenges
- How do we involve a broad range of actors, e.g. including leisure or care professionals besides farmers and nature conservationists, each with their own cultures, language, interests, objectives?
- How do we create room to incorporate diverse views whilst at the same time maintaining focus and energy on the initial inspiration?

Contractor context
- How to deal with the tension between originally formulated project deliverables and a process of emergent design?

Academic context
- How can scientists adopt a more interventionist role whereas academic culture demands publications?
- If relevant knowledge questions are collectively defined, how can they be made relevant to the scientists’ field of research?

Political context
- How to align the long-term transition intended by the project with the yearly funding cycles of regional / local governments?
- How to align the long-term process with the four-yearly political cycles of elections?

Entrepreneurial context
- How can the unique qualities of the region be capitalised on the market notwithstanding the famers’ long tradition of operating in highly subsidised markets and perhaps therefore limited perception amongst farmers of potential new value propositions?
- How to deal with the situation that the innovative business idea (e.g. combining sectors like animal husbandry and care, or horticulture and energy, or agriculture and tourism) might be at odds with legal principles in these different domains?

Figure 3.4 Learning agenda showing constraining conditions for sustainable regional development
factors in projects’ (see Regeer, Mager, Beekman, & Bunders, subm. for a more extensive description and current questions).

A second form in which persistent questions appear on Dynamic Learning Agendas is as tension between a mode-2 approach and a mode-1 context. Funders, local politicians, or research managers may not understand the need for discursively shaping strategies for sustainable development in collaboration with previously unfamiliar actors. Moreover, the institutional structures in which they operate do not always allow for changing goals and shifting perspectives. Articulating these tensions carefully and reflecting upon them gives the intermediary the opportunity to move beyond the initial aggravation (“they just don’t understand”) and beyond accepting the constraints as they are (“we could have been successful, but alas, the conditions weren’t right”). It opens up opportunities to develop strategies that create alignment between a mode-2 approach and a mode-1 context (“How can our project contribute to the needs of stakeholder X? What are their needs? And why?”).

The emerging body of literature on systems based evaluation (e.g., Williams & Imam, 2007) has introduced the important notions that we must attend to the deeply held principles, values and beliefs of people in systems and that we must broaden our inquiry from the particular situation of interest towards the broader system of interest, whose boundaries derive from human purpose. Critical Systems Heuristics provides a set of questions that helps describe the boundaries of a system, distinguish what ‘is’ the case from what ‘ought’ to be the case and thereby inform new understandings and practices (see Reynolds & Vince, 2004). Similarly we have found that the questions on the learning agendas of our cases reveal relevant boundaries (in terms of constraining conditions in the
Table 3.4 The guiding principles of a Mode-2 evaluation approach linked to challenges identified

<table>
<thead>
<tr>
<th>Guiding principle</th>
<th>Challenge met</th>
</tr>
</thead>
</table>
| Guiding principle 1: on the focus of evaluation  
Mode-2 evaluation focuses on the inner workings of intermediaries, in particular by supporting learning about intervention strategies for sustainable development | • Contributing to intervention strategy  
• Accommodating differences in intended intervention theory and practice |
| Guiding principle 2: on the role of evaluation  
Evaluation is intrinsically linked to the intervention process, by being part of the iterative process of defining, implementing and adjusting interventions | • Contributing to intervention strategy |
| Guiding principle 3: On the process of creating a framework for evaluation  
Employ a participative approach to the development of a mode-2 evaluation framework | • Participative development of indicators  
• Including social, institutional indicators |
| Guiding principle 4: on the nature of indicators  
Mode-2 indicators do not assess but sensitise Mode-2 indicators are context dependent and dynamic | • Acknowledging changing and unstable nature of declared sustainability goals |
| Guiding principle 5: on the contribution of indicators to learning  
Mode-2 indicators are conducive to finding strategies to accommodate the discrepancy between mode-2 intentions and mode-1 practice | • Contributing to intervention strategy |
| Guiding principle 6: on the contribution of indicators to learning  
Mode-2 indicators make visible the different conditions that constrain sustainable development, e.g. social, political, economical, and institutional factors, and aid their inclusion in strategies for sustainable development | • Contributing to intervention strategy  
• Including social, institutional indicators |
environment of the system) and help identify possible courses for action. Figure 3.4 depicts a typical learning agenda featuring questions that we found in three regional development projects in the area of sustainable agriculture. Various political, economical and institutional factors appear to inhibit the intended course of action, the collective formulation of which allows project participants to broaden the scope and start working on these conditions (see also Broerse, 1998). This leads to the final guiding principle for a mode-2 evaluation framework:

**Guiding principle 6: on the contribution of indicators to learning**

Mode-2 indicators make visible the different conditions that constrain sustainable development, e.g. social, political, economical, and institutional factors, and aid their inclusion in strategies for sustainable development.

Thus, we have shown that the Dynamic Learning Agenda may contribute to the intervention strategy during the process, revealing and accommodating differences in the intended interventions strategy and actual practices. We also saw that it brings to the fore the conditions that constrain sustainable development as well as strategies to cope with these constraints.

In table 3.4, the guiding principles of the mode-2 evaluation approach proposed in this chapter are summarised and related to the earlier mentioned challenges that are faced by common monitoring and evaluation approaches when applied to mode-2 strategies for sustainable development.

### 3.5 Conclusions

Global carbon emissions continue to rise and ecological footprint analyses show that we have exceeded the biosphere’s
natural carrying capacity. Moreover, a fair distribution of welfare and quality of life across the world is far from being realised; rather developing countries are suffering from the effects of climate change to an unrepresentative degree. Policy intervention programmes, grass roots movements, and multinational policy agreements have not been sufficiently successful in changing societal development substantially into a more sustainable direction. This urges the question: *If realising sustainable development is so difficult, how can evaluation contribute to understanding and realising sustainable development?*

In these final conclusions we would like to identify the ways in which mode-2 evaluation as developed here, complements prevailing types of monitoring and evaluation and accommodates some of its main challenges. A combination of elements from prevailing types of monitoring and evaluation, including addressing their challenges, along with elements from interactive approaches such as fourth generation evaluation (Guba & Lincoln, 1989), responsive evaluation (Greene & Abma, 2001) and appreciative inquiry (Preskill & Catsambas, 2006) results in a type of evaluation that is particularly appropriate for problems that arise in the context of the complexity of sustainability endeavour as we understand it now.

In this chapter we have focused our attention on evaluating the intervention strategies for sustainable development that are currently emerging under the banner of mode-2 strategies. The guiding principles for a mode-2 evaluation framework as developed in this chapter start with a seemingly narrow focus, comparable to programme theory evaluation: intervention strategies for sustainable development. Although strategies that incorporate a dynamic view on sustainable development are well described in literature, and programmes are set up to
stimulate mode-2 approaches to sustainable development, we still observe discrepancies between intentions and actual practice and between practice and context.

A mode-2 evaluation approach addresses this challenge by assisting mode-2 intermediaries in their efforts to stimulate sustainable development and is as such intrinsically linked to the intervention strategy. Mode-2 evaluation aims to enhance learning by elucidating discrepancies between intentions, practice, and context and encouraging the development of bridging strategies. Potentially, it also results in generic knowledge about appropriate and successful strategies for realising sustainable development.

Furthermore, the mode-2 evaluation framework can complement the valuable information provided by current forms of progress assessment. Employing the Dynamic Learning Agenda tool in the context of ILA monitoring we found it is possible to track the spreading of persistent questions by regularly interviewing broader groups of stakeholders surrounding a mode-2 project. If mode-2 intervention strategies aim to induce learning (especially double loop) in actors at different levels, in different domains and places, the appropriation of persistent questions by a growing group of actors can be identified as a success. Moreover, monitoring the degree to which constraints in institutions are mitigated, adds to the body of knowledge on the ‘state’ of sustainable development. But above all, with the evaluation framework described in this chapter we aim to enhance the efforts of the many practitioners who contribute to complex societal issues such as sustainable development in the face of continuing change.
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Chapter 4
The development of mode-2 intervention strategies by intermediaries for sustainable development

The mode-2 evaluation framework developed in Chapter 3 has been developed through the engagement with a wide variety of system innovation projects, many of which are part of the TransForum programme. In this process we also worked together with the people at the TransForum office to reflect on the characteristics and development of their programme, the intervention strategies they employ, the competences they and other network managers need, the role project directors play, and the relationship between the so called ‘scientific projects’ and ‘practical projects’.

We organised and facilitated working sessions with the programme team (scientific directors, project directors and management), regularly interviewed and coached the project directors, developed several initiatives together with the manager of the Learning Programme and organised reflection sessions with management and project directors on results of particularly projects and the implications for the programme. Moreover, we participated in events organised by TransForum, such as communities of practice, a three-day expedition, conferences and workshops. The account of the development
of the TransForum programme that we give in this chapter is based on the analysis of the qualitative data resulting from these activities. Transcribed interviews and working sessions and notes of observations were analysed using the qualitative coding system software ATLAS.

In this chapter we take TransForum to be an example of a newly emerging type of intermediary, operating at several boundaries simultaneously, that aims to contribute to sustainable development by fostering processes of knowledge cocreation between entrepreneurs, civil servants, scientists and other societal actors. This chapter demonstrates the challenges and approaches of such an intermediary in its start-up phase. This is done in the context of two paradoxes that emerge from the literature on boundary organisations and the literature on reflexive governance.

4.1 Introduction

For a number of decades, pleas for new approaches to sustainable development have been made by academia from different strands of research: ranging from new modes of knowledge production to new modes of governance. To an extent these pleas share basic principles with respect to strategies for joint problem solving in heterogeneous collaboration (e.g. see Jordan, 2008), with their emphasis on knowledge co-creation, adaptive management, and interactive decision making.

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21 This chapter (from section 4.1) has been submitted for publication as: Regeer B.J., S. Mager, V. Beekman, J.F.G. Bunders (subm.) ‘New approaches to sustainable development. TransForum – the case of a mode-2 intermediary’ to Environment and Planning C: Government and Policy
This chapter looks at an example of a new type of intermediary organisation, or boundary organisation, which has emerged in the Netherlands to aid the transition to a sustainable society. Building on research on the science-policy boundary (Gieryn, 1995, 1999, Jasanoff, 1990) Guston (1999) defines boundary organisations as existing at the frontiers of the two relatively different social worlds of politics and science, with distinct lines of accountability to each. Their role is to resolve the tension between policy and science and facilitate the convergence of interests, ideas, disciplinary languages and perspectives (Cash and Moser, 2000). Their importance in the field of sustainable development and environmental management has been stressed increasingly in recent years (e.g. Cash et al., 2003). The notion of boundary organisations (or intermediary organisations as we will call them in this chapter, see below) is applicable not only to the science/policy interaction, but also to interactions at the interface of more heterogeneous collaborations between scientists from various disciplinary backgrounds, different levels of government, entrepreneurs, NGOs, and citizens. The aim of this chapter is to explore the challenges of intermediary organisations in shaping relations effectively in order to support sustainable development, through the analysis of the emerging identity, organisation structure, and operational procedures from within one such intermediary in its start-up phase.

A heuristic tool

Some introductory notes on our understanding of the term ‘intermediaries’, will help to frame the scope and focus of this chapter. 'Intermediaries' are defined as actors (often organisations) that actively (explicitly as well as implicitly) shape relationships between different domains of society (with an emphasis on the relationship between science and society). In our research we have introduced the distinction between
mode-1 and mode-2 intermediaries as a heuristic tool for developing understanding as well as practice of operating at multiple boundaries (see Table 4.1).

Table 4.1 A heuristic tool for developing and understanding intermediaries (Regeer and Bunders, 2007, based on Vasbinder 2002)

<table>
<thead>
<tr>
<th>Relationship between science and practice</th>
<th>Presumed role of intermediary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode-0</td>
<td></td>
</tr>
<tr>
<td>SEPARATE</td>
<td>TOP-DOWN</td>
</tr>
<tr>
<td>Science and practice are separate from one another.</td>
<td>Knowledge dissemination</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode-1</td>
<td>MATCHING</td>
</tr>
<tr>
<td>CO-OPERATION</td>
<td></td>
</tr>
<tr>
<td>Co-operation between science and practice. No change in working methods of either.</td>
<td>Matching knowledge supply to knowledge demand and vice versa.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode-2</td>
<td>DELIBERATION</td>
</tr>
<tr>
<td>CO-PRODUCTION</td>
<td></td>
</tr>
<tr>
<td>Practice and science both actively seek the best way to structure and manage complex change processes. Responsibilities differ, but <em>modus operandi</em> start to converge.</td>
<td>Articulating knowledge demand, facilitating knowledge co-creation as integral part of joint solution process.</td>
</tr>
</tbody>
</table>

We deliberately employ a recursive use of the concept ‘mode-2’; the process of developing theoretical understanding of mode-2 intermediaries functions on the basis of the products of its own working (by employing the distinction between mode-1 and mode-2 heuristically). As such we aim to contribute to the need, identified by Jordan (2008), to explore the relationship between sustainable development and modes of governing in an empirically grounded yet theoretical manner. As we are reconstructing the meaning of intermediary organisations, by analysing their inner workings in emergence, we have chosen the more generic term ‘intermediary’ instead of ‘boundary organisation’.
Thus, this chapter explores the notion of a mode-2 intermediary from a theoretical perspective and from the experiences of TransForum in its start-up phase. The challenges encountered in the process so far, and some of the strategies employed to respond to these challenges, will be described. As the need for intermediaries on the boundaries of science, policy and society to aid environmental management and sustainable development are widely recognised, the insights gained by this case study can be of use to (intermediary) organisations in similar positions and to standing organisations facing the need for institutional change in the light of changing contexts and conditions (e.g. Schiellerup, 2008).

4.2 Sustainable development: (requires) new ways of governance

The case: TransForum – supporting sustainable agriculture

In 2003 a consortium of scientists and policy-makers formulated a proposal for an interactive research programme on the sustainable development of agriculture. The key challenge was “to speed up the transition to sustainable agriculture by initiating and securing a transition from the existing technology- and supply-driven knowledge infrastructure into a demand-driven infrastructure which transcends boundaries between disciplines and which has a significantly broader scope than at present.” (Innovatienetwerk, 2003) The underlying hypothesis was that in order to make the transition from the “current, industrialised agriculture to a sustainable and multi-functional agriculture that anticipates the social needs for a responsible food production and a beautiful rural area” fundamental changes in the existing knowledge infrastructure were required. (Innovatienetwerk, 2003) In order to bring about the necessary changes in both the agribusiness as well as the knowledge infrastructure, a Knowledge
Consortium for the Transition to Sustainable Agriculture was to be set up. Funding was granted and in 2005 a small organisation (TransForum) was established to run the programme for a period of six years (January 2005 – December 2010).

While the initial project proposal elaborated in great detail the problem definition, key challenges, questions and subsequent research themes, and furthermore the project objectives and targets to be met, it did not explicitly consider the role of the new organisation in the envisioned transition. In its first year of operating the focus in team meetings and reflection sessions slowly moved from discussing and defining the content of the programme to deliberating and reflecting on the process and on the role of TransForum as intermediary between science, (agri)business, government, and society. At the end of 2005 it was explicitly stated that TransForum wanted to act as a 'mode-2 intermediary'.

The TransForum approach to sustainable development reflects the scholarly literature on governing sustainable development in fields ranging from political sciences, environmental sciences, and science, technology & innovation studies. This section will explore the (conceptual) implications for emerging intermediaries, such as TransForum, that can be inferred from current pleas for new approaches. Thus, the question we address in the remainder of this paragraph is: If sustainable development requires new approaches, what characteristics can we delineate for the types of institutions conducting them?

**Sustainable development requires boundary organisations**

Environmental problems cannot be solved in isolation; they are connected in a complex system of interacting physical, chemical and biological processes, affecting each other at different scales. Moreover, the biophysical environment can hardly be
considered separate from societal development; climate change
directly affects the livelihood of millions of people, while
industrial disasters (e.g. Chernobyl) destroy the health of
generations. The activities that lead to pollution, degradation,
and depletion are part of our way of life, embedded deeply in
patterns of consumption and production (e.g. Beck, 1986).
Thus, the challenge of resolving environmental problems is in
essence a socio-ecological challenge, involving biophysical as
well as political, institutional, cultural and economical
processes. This corresponds to the broader defined challenge
of sustainable development as defined by the World
Commission on Environment and Development (WCED,
1987), connecting environmental sustainability to the challenges
of poverty and desperation in large parts of the world and the
obligation toward future generations for being able to meet
their needs. New approaches are called for; approaches that
are able to address the interdependencies between elements of
the complex socio-ecological systems (e.g. Kemp et al., 2005).

Another argument for developing new strategies for sustainable
development is that definite knowledge of the properties of the
socio-ecological system is inherently impossible. As the system
is not ‘knowable’ in a classical sense, the quest for sustainable
development is characterised by uncertainty. There is no
consensus about the facts among scientists and there are
various and conflicting values surrounding issues of sustainable
development. Problems of ‘unsustainability’ are therefore
referred to as ‘wicked’ problems (Rittel & Webber, 1973),
unstructured problems (Douglas & Wildavsky, 1982,
Hisschemöller and Hoppe, 1996) or problems of organised
complexity (Mason & Mitroff, 1981). These types of problem
have no definitive solution, each problem can be considered a
symptom of another problem as it has no identifiable root
cause, the solution one chooses depends on the problem
definition and its perceived explanation, there are no rules to determine whether the solution is correct or false, and finally there is no stopping rule for such problems; there is always room for improvement. Wicked problems ‘defy efforts to delineate their boundaries and to identify their causes, and thus to expose their problematic nature’ (Rittel & Webber, 1973: 167).

Scholars of science, technology and society (STS) have argued that the seemingly intractable types of problems, such as those associated with sustainable development, require new ways of knowledge development and a new type of relationship, or ‘contract’, between science and society (notably Funtowicz and Ravetz, 1993, Gibbons et al., 1994, Jasanoff, 2004). They have advocated an inclusive and responsive science; a type of knowledge production that starts from real-life problems and aims to devise solutions in collaborations with multiple stakeholders. Whereas in normal or mode-1 science, problems are defined and solved in a context governed by the, largely academic, interests of a specific community, in mode-2 knowledge is created in the context of application (see Table 4.2 for characteristics of mode-1 and mode-2 knowledge production according to Gibbons et al., 1994).

Table 4.2 Characteristics of mode-1 and mode-2 knowledge production (based on Gibbons et al., 1994)

<table>
<thead>
<tr>
<th>Mode-1</th>
<th>Mode-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context of specific academic community</td>
<td>Context of application (and implication)</td>
</tr>
<tr>
<td>Disciplinary</td>
<td>Transdisciplinary</td>
</tr>
<tr>
<td>Homogeneity</td>
<td>Heterogeneity</td>
</tr>
<tr>
<td>Hierarchical</td>
<td>Heterarchical and transient</td>
</tr>
<tr>
<td>Autonomy</td>
<td>Reflexivity / social accountability</td>
</tr>
</tbody>
</table>
Primacy for solving persistent problems is not with one institutional domain (e.g. science); different societal actors (including scientists) develop solutions together in heterogeneous collaborative settings. Specifically in the context of sustainable development this has lead to transdisciplinary research (Klein et al., 2001, Regeer and Bunders, 2003, 2007), participative analysis (Kasemir et al., 2003), civic science (Bäckstrand, 2003) and sustainability science (Cash et al., 2003). Policy scientists too have observed an extension of the number of policy actors (multi-actor governance) and levels of governance (multi-level governance). These changes in location of politics have implications for the nature of policy-making. Policy-making is seen to take place in policy networks: relatively stable sets of interdependent actors focused on joint problem solving (Hajer and Versteeg, 2005, Koppenjan and Klijn, 2004). Thus, steering for or managing complex problems is not an exclusive activity of monocentric, national governmental bodies (Jordan, 2008, Rauschmayer et al., 2008).

Cash et al. (2003) argue that little systematic scholarship exists on how to create institutions that effectively harness science and technology for sustainable development. They propose a central role for boundary management, either in specifically designed ‘boundary organisations’ or in existing organisations. Research shows that boundary organisations connect knowledge to action effectively if they 1) treat boundary management seriously; 2) are accountable to actors on both sides of the boundary (i.e. science and policy) and 3) provide a forum in which information can be coproduced by actors from different sides of the boundary (Cash et al, 2003: 8089).

On closer examination the second and third requirements reveal a paradox: if collaboration between science and other societal domains is characterised by genuine coproduction, as is
suggested by requirement 3, the *modus operandi* of both worlds will be affected (also see Table 4.1). On the other hand, stating that the success of a boundary organisation is determined by principals (those that delegate responsibility to agents) on either side of the boundary, presupposes two distinct worlds each with their own *modus operandus* and currency. The blurring of demarcations as a result of coproduction and the simultaneous reliance on a clear distinction, results in what we call the accountability paradox. One of TransForum’s working hypothesis is that sustainable development requires active participation of and a learning process between actors from knowledge institutions, governmental bodies, societal organisations and the business community (Veldkamp et al., 2008). This is referred to as the KOMBI approach (=Dutch acronym). Hence, TransForum is accountable to and at the same time induces learning in a number of principals. We will show in section 4.3 how TransForum addresses this paradox.

**Sustainable development requires reflexive governance**

Adding to the complexity of the sustainable development challenge, and to the need for new approaches, is that there is no fixed, pre-defined goal. There are no unambiguous criteria to determine the ‘sustainability’ of human activity. Sustainable development is, by definition, concerned with a range of human activities at different scales, in different sectors, and at different geographical locations, and interconnected with the evolving ecological systems. Depending on place, time, perspectives of stakeholders, and local circumstances, appropriate approaches are context specific. General guidelines do not suffice – there is no ‘recipe’ to follow. Put positively, sustainable development allows for a variety of transformation paths, with locally defined cultural, political and ecological starting points (Becker et al., 1997, Bruff and Wood, 2000).
In the context of new modes of governance, new steering concepts have been introduced to aid the effective management of resources and the pursuit of sustainable development. Particularly in the case of unstructured problems, characterised by inherent uncertainty and long time horizons, effective strategies should be based on adaptive, iterative, and flexible experimentation. Various authors have sketched the differences between the classical perspective on management and the network perspective of management (Elzen and Wieczorek, 2005, Klijn, 1996, Williams, 2002). New modes of governance are explored and implications for mode-2 intermediaries can be summarised as in Table 4.3.

**Table 4.3 Characteristics of mode-2 management processes**

<table>
<thead>
<tr>
<th>Characteristic of process</th>
<th>Mode-1 (classical steering paradigm)</th>
<th>Mode-2 (network perspective on management)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear process of problem formulation, alternative specification and decision</td>
<td>Complex interaction processes between different actors</td>
<td></td>
</tr>
<tr>
<td>Authority structures; Principal – agent relations</td>
<td>Mutual dependence; Network of actors</td>
<td></td>
</tr>
<tr>
<td>Implementation of formulated goals</td>
<td>Shaping and changing conditions for successful interaction between actors</td>
<td></td>
</tr>
<tr>
<td>Formal rules, regulations and laws</td>
<td>Stimulate learning by means of experiments, demonstration projects, network building, needs articulation</td>
<td></td>
</tr>
<tr>
<td>Differentiation of tasks and functions</td>
<td>Interdependencies</td>
<td></td>
</tr>
<tr>
<td>Takes charge; Provides the right answers</td>
<td>Provides catalyst for action; Asks the right questions</td>
<td></td>
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</table>
Thus, management strategies for sustainable development, such as those employed by mode-2 intermediaries, are characterised by non-linearity, mutual dependency and experimentation. The challenge is how to create a robust yet flexible process (Cash and Moser, 2000). In their account of reflexive governance for sustainable development, Voß et al. (2006) shed light on the so-called efficacy paradox. The efficacy paradox says that on the one hand to be able to act, complexity must be reduced. In the classical paradigm this was done by a linear process of problem formulation and goal setting and implementation through differentiation of tasks. However, this may easily lead to the neglect of long-term system effects.

Yet, on the other hand, consideration of all possible effects, by fully embracing the complexities, interdependency and value pluralism, reduces the capacity to act (2006: 436). They suggest different combinations of opening up and closing down of the problem analysis, goal formulation and strategy implementation to cope with the efficacy paradox (amongst others those depicted in fig. 4.1 a, b, c). The strictly linear version in which no opening up occurs (fig. 4.1a) and the version which only allows for opening up (fig. 4.1b) together lead to the efficacy paradox.

An alternative is of the type ‘exploring experiment’ and pictures a phase of opening-up (of problem, goal and/or strategy) and a phase of experimenting with a number of alternative frameworks of problem definition, goals and options (see fig. 4.1c). This strategy induces variation and offers experiences from which society can learn what sustainable development is. Moreover, effects can be compared and based on evaluations strategies may be terminated or strengthened. Transition programmes like TransForum are devised just like this: diverse perspectives on sustainable development are explored in interaction between different actors and experiments are set.
up to support learning. In section 3 we will see how TransForum learned to address the challenges posed by the efficacy paradox.

**Figure 4.1a, b and c. Respectively: No opening, No closing, Subsidiary/experimental closing (Voß et al., 2006)**

**From theory to practice**

The case study featured in this chapter can be seen in the light of the experiments that have been set in motion in recent years under several different banners, such as transition experiments, system innovation projects, transdisciplinary research, and deliberative policy analysis. They share a commitment to addressing complex problems by involving multiple actors (notably social and natural scientists, entrepreneurs, administrators and governors, activists, citizens), acknowledging the multi-levelness of the problems and articulating and connecting multiple perspectives. Rather than specifying the differences between these types of strategies, in this chapter we refer to them all as mode-2 strategies; and their ‘agents’ as mode-2 intermediaries.

To summarise the implications for mode-2 intermediaries that follow from the accounts of new approaches presented in this section:
- If sustainable development is considered inherently complex, situated and contingent, and if sustainable development encompasses social, technical, ecological, political and economical aspects, then:

- Primacy for problem-solving is not with one institutional domain. Therefore mode-2 intermediaries are required that connect disciplines, perspectives and institutional domains;
  - Challenge: How to accommodate the paradox of accountability?

- There is no one route to sustainability. Therefore mode-2 intermediaries should maximise variation by supporting experimentation and social learning in niches;
  - Challenge: How to accommodate the efficacy paradox?

Striking about the literature review is that it offers many propositions for requirements that are believed to lead to desired new types of knowledge production and related problem solving strategies, but insights on how to realise these conditions are rare and ways to address both paradoxes are scarce. Studying a mode-2-intermediary-in-the-making gives us the opportunities to witness the intransigence that becomes apparent at many different levels and places when actually putting these theories into practice. Our findings correspond to Grin et al. who state that reflexive design (as they call what we would refer to as a mode-2 strategy) requires “more than the usual involvement of stakeholders and co-producers in design” (2004, p. 128). They further state that:

“Institutionally embedded assumptions, knowledge claims, distinctions, roles and identities which are normally taken for granted, must now be critically scrutinised. Given that specific institutional arrangements are needed for reflexive design so as to mitigate the problem of ‘institutional void’ (Hajer, 2003) and considering that such arrangements tend to be influenced by their wider institutional
environment (Grin and Hoppe, 2000), reflexive design presents institutional and methodical challenges that deserve much more attention than they have hitherto gained.” (2004, p. 128)

We now turn our attention to one such intermediary – TransForum, and turn our view inwards. This will yield novel insights into the particularly engaging question of How to be a mode-2 intermediary in practice and how to address the paradoxes, complementing the above review on What a mode-2 intermediary would be in theory. Indeed both institutional and methodical challenges will become apparent.

4.3 TransForum: Ambitions and Intransigence

This section offers a systematic reflection on the evolution of the learning agenda of the staff of TransForum during the period September 2005 (shortly after the general manager was hired) until September 2007 (the publication of the Mid Term Review for the financing committee). During the course of our research we developed several tools to aid the types of learning and reflection processes that are argued to be central to the challenges of sustainable development, such as the Dynamic Learning Agenda (Regeer et al., 2009). The benefits of this tool are that it enables the (collective) articulation of encountered challenges; the analysis of ‘tough questions’; (mutual) reflection on learning processes; and the elaboration of subsequent intervention strategies. In this chapter we employ the Dynamic Learning Agenda retrospectively. Transcribed discussions with staff members of TransForum and notes of staff meetings were analysed at different moments in time and phrased as ‘learning agendas’.

We will use selections from the Dynamic Learning Agenda to illustrate how TransForum has learned to address the
requirements as formulated above. The Dynamic Learning Agenda shows conceptual changes over time in:
1. the relationship between TransForum’s intervention strategy and the broader goal of contributing to the sustainable development in agriculture, and
2. the corresponding role perception of TransForum as intermediary (the identity).
As such we hope to contribute valuable insights into the challenges of governance for sustainable development by mode-2 intermediaries.

**TransForum – setting the scope (2005)**

TransForum’s intervention strategy is devised like the ‘exploring experiments’ type of dealing with the efficacy paradox (Figure 4.1c) by developing ‘a variety of problem-handling frameworks into a portfolio of experiments’ (Voß et al., 2006, p. 433). In the case of TransForum, from the outset three alternative frameworks, with corresponding problems analysis, goal formulation and intervention strategy, were developed for supporting the transition towards sustainable agriculture and green spaces; namely Vital Clusters, Regional Development and International Agro-food Networks (Veldkamp et al, 2008). Each of the intended total set of 30 Innovation Projects (IP’s) corresponds to one of the innovation strategies. At the TransForum office, three Project Directors are responsible for the innovation strategies.

The unique feature of this approach to developing a programme, which was at its start in essence a research funding programme, was the start with projects in the Practical Programme (referred to as ‘no-regret’ projects). Its counterpart, the Scientific Programme, was to be defined by the experiences in the projects. This approach thus induces demand-driven rather than supply-driven research. To give some structure to the emerging scientific programme, five
themes were defined, each headed by a Scientific Director; a renowned researcher in the field appointed to TransForum for one day a week (for details see Veldkamp et al, 2008). In addition to the Scientific Programme and the Practical Programme, there is a Knowledge Programme, originally aimed at disseminating and anchoring the knowledge developed during the course of the programmes. Significantly, the Knowledge Programme changed its name and scope into Learning Programme in the course of its development, facilitating the learning in projects, between projects and from projects.

To summarise, at the start of the programme (2005) TransForum can be described as an intermediary between science and practice that aims to realise sustainable development in agriculture by diverging from the traditional linear knowledge transfer model, through stimulating a transition in the knowledge infrastructure. The scientific programme has been explicitly set up to address knowledge questions from practice projects, inducing a climate of research which is sensitive and responsive to the research needs of societal parties. The intervention strategy is based on supporting projects (scientific, practical and knowledge), that all in their own way contribute to this overarching goal. A total of 60 million Euro is available to this end, of which 30 million Euro is matched by partners in the practical, scientific and knowledge projects, which further strengthens the transdisciplinary nature of TransForum. Thus, in various respects TransForum-by-design adheres to the requirements of sustainable development as outlined in section 4.2. We will next look at TransForum-in-action.

In September 2005, when our heuristic tool was presented, it was exclaimed that: ‘this is what we have been doing for the
past three months; trying to move from a mode-1 to a mode-2 organisation!’. This development continued in the second year of operation (2006) and is manifest in at least two salient themes on TransForum’s learning agenda: the relationship between TransForum and Innovative Projects and the changing identity of TransForum as intermediary. Correspondingly, the relationship between the intervention strategy and the aspired transition towards sustainable development was reconsidered, reformulated and reconfigured. In its third year of operation (2007), the increased ambiguity culminated in two intertwined processes of reification and participation on the one hand, and a further reconsideration of the identity of TransForum and its role in the aspired transition. We will describe both developments below.

4.4 Changing intervention strategies and the efficacy paradox

In November 2005, the general manager of TransForum and the programme manager conducted their yearly project review. Preceding the interviews, they sent each project leader a list of questions, including: ‘How do the project outcomes relate to the goals of the programme?’. The most striking result of the project review in 2005 was that none of the project leaders could answer this question. Moreover, projects felt that TransForum was interfering with, or even intruding in, ‘their’ projects. Conversely, TransForum felt that all knowledge developed in the projects about realising sustainable development evaporated over time, as the ‘real’ questions and experiences were not documented. As a consequence, the initial ‘no-regret’ projects were increasingly regarded as ‘regret’ projects.
At the start of TransForum (2005) the relationship between the office in Zoetermeer and the projects can be characterised as a principal-agent relationship. Guston (2001) refers to Arrow (1991) to define this relationship as consisting of (a series of) delegations of authority from principals to agents within or between organisations\(^\text{22}\); in the case of TransForum “part of the aspired transition is realised by means of a number of Innovative Projects in a Practice Programme” (May 2005). In principal-agent theory, regular problems with principal-agent relationships are twofold (Guston, 2001 referring to Arrow, 1991). First, it is difficult to select appropriate agents (adverse selection), which in the case of TransForum was manifest by the comprehension that no-regret project were actually regret-projects. And second, it is difficult to assure the conduct of a chosen agent (moral hazard), which in the case of TransForum becomes manifest in the first project-review.

2006: From executing projects to learning about hampering conditions

Having expressed the wish to become a mode-2 intermediary and reflecting on their own role regularly, the responses to these problems by TransForum staff was not merely to adjust criteria, select new projects and tighten control over the conduct of projects, as a ‘principal’ in a classical sense would. Rather, it triggered new questions. The focus shifted from ‘what do we want project to do for us?’ to ‘what can we learn from projects?’. It was expressed that knowledge was needed on how to organise transitions, how to organise mode-2 knowledge production, and on the constraining factors in realising the intended transition, both on process level and on

\(^{22}\) Note that Guston (1999, 2001) uses principal-agent theory to describe the relationship between the boundary organisation (agent) and the two worlds it is accountable to, science and politics (the principals).
institutional level. As the general manager said: “To put it bluntly: I really don’t care if project X is realised in the end, because I will not be accountable to the successes of project X. I will be accountable to the question: If I want to realise another X, do I know how to do this?”²³ (Pers. Comm. July 2006).

Thus, questions of programme coherence and project criteria were replaced by questions on programme aim and programme strategy. This shift in focus had implications for the perception of intervention strategies. Rather than executing projects, TransForum stimulates reflection and learning on constraining conditions within and around projects. The presupposition is that this will lead to the development of useful knowledge and competencies for a more sustainable development of Dutch agribusiness. This view corresponds to current literature on sustainability science, which emphasises the need for enriching our understanding of the institutional, social and economical processes linked to the environmental processes (Becker et al., 1997, Kates et al., 2001). And it corresponds to current literature on mode-2 management, which emphasises the importance of creating conditions, asking questions and stimulating learning through experimental projects, rather than taking charge and implementing interventions (see Table 4.3).

Due to the experiences of the first year, a new line of projects was developed in which project directors play a much greater role in defining them. The procedure for submitting projects was changed. Whereas before complete project proposals could be submitted directly, now a first conversation with one of the project directors takes place after which a one page...
proposition is developed by the project leader in collaboration with the project director, which is subsequently discussed in the programme team meeting at TransForum. Only then will it be developed into a full proposal. Also projects are stimulated to reflect on their learning process and are asked to make available lessons learned about obstacles, how to overcome them, and necessary conditions for pursuing both transitions (sustainable development and knowledge infrastructure). The process of articulating and documenting learning processes is supported by dedicated monitors (Regeer, Hoes et al. 2009) and invitation to participate in Communities of Practice. Furthermore, a formal split is made between the ‘control’ relationship between projects and TransForum (administrative issues are henceforth discussed with the business manager) and the ‘development’ relationship between projects and TransForum (which are built up and maintained by project directors and supported by monitors).

**2007: From participation to reification**

As Voß et al. have described, opening-up (along various dimensions) is required to enable responding to unexpected and changing situations and to create space and energy for new options and possibilities. In the case of TransForum it is through active participation of project directors in projects (as opposed to through control on a set of criteria that are believed to foster change) that the particular conditions of the project are incorporated, that timely adjustments are made and that meaning is co-created. As a result, in 2006 the relationship between IP's and TransForum's programme level can be characterised as increased divergence, or opening-up in the terminology of Voß et al. In his writings about Communities of Practice (as the IP's have been characterised in the context of TransForum), Wenger proposes that visitors (i.e. project directors) must “background” their home membership (i.e.
TransForum) in order to advance the boundary relation (1998, p. 112). However, “backrounding” TransForum’s stake carries the risk of losing sight of the focus on the aspired transition as formulated by TransForum, by instead just supporting separate projects. Project directors indeed moved into a role of creating conditions for change (see Table 4.3) by supporting learning and reflection in projects, and responding to the needs of each project.

A countermovement of closing-down emerged in the third year (2007) through the persistent emphasis on a shared framework, particularly by the general manager. “Our primary aim is not to realise projects, but to learn about changing the Knowledge Infrastructure, organising mode-2 knowledge production, and realising a sustainable development of agriculture.” This process of focusing, or closing down in the terminology of Voß et al. (2006), was fostered by the need for producing a Mid Term Review in September 2007, stating the success and deliverables of TransForum to date and for the years to come.

In order to understand how TransForum handles the efficacy paradox, we need to gain insight into the relationship between opening-up (through participation) and closing-down. To this end, let us bring in the concept of reification as used by Wenger (1998). In Wenger’s terminology: boundary practices combine reification and participation. By giving form to experiences by producing abstractions, tools, symbols, stories, terms and concepts (in all, processes of reification) we create points of focus around which the negotiation of meaning becomes organised (1998, p. 58-59).

This dialectical relationship between participation and reification is clearly visible in the practice of TransForum, and in
particular in the shaping of the relationship between the separate projects and the TransForum programme as a whole. By actively participating in projects (through the involvement of monitors, project directors, exchange sessions between project leaders, etc.) competences and insights on 'how to deal with constraining factors' and 'how to stimulate collaboration between entrepreneurs and scientists' are developed and fostered in practice. This constitutes learning in IP's. And, by reifying the experiences in the IP's, fruitful approaches to transdisciplinary collaborations are articulated and a conceptual framework for the work of network managers is developed. This constitutes learning from IP's. At the time of writing (medio 2008) the TransForum approach is further abstracted and described as realising 'Metropolitan Agriculture' through 'Shared Valued Development'.

Thus, the efficacy paradox is dealt with through a governance process that is characterised by a simultaneous opening-up (through active participation in projects) and closing-down (through reifying vision, approach and lessons from projects in books, articles, fact sheets, case descriptions, etc.). The question of how to develop and maintain iteration between participation and reification gained a central position on the learning agenda of TransForum.

**Dynamic learning agenda**

In the case of TransForum, from the outset three alternative frameworks, with corresponding problems analysis, goal formulation and intervention strategy, were developed for supporting the transition towards sustainable agriculture and green spaces. A governance style of experimentation and interaction was built in by requesting application by consortia of actors in a wide range of Innovative Projects. However, as our case study has shown, it is the enactment rather than the
cognitive analysis of an approach that generates insights (and, for that matter, agency as well).

Thus, we see that, starting with a business plan, which is inherently affirmative (or closed down in the terms of Voß et al.), in the start-up phase a lot of effort is put in opening up. Interestingly, the opening up does not necessarily entail revising the assumptions with respect to goal and strategy. It rather seems to entail posing the how question which is necessary in order to develop agency, i.e. the ability to act in a meaningful way. To illustrate with an example, the business plan in 2004 states: “Collaboration between knowledge institutions and businesses is guaranteed through the central role of Integral Projects in this proposal.” (2004, p. 18). Tracking the formulation and reformulation of questions on the dynamic learning agenda shows that this statement transforms over time from assertion (of the form ‘collaboration is guaranteed through …’), via a question to reveal the process behind realising collaboration between a diversity of actors (How can we support collaboration between KOMBI parties?) to multiple questions addressing the different levels at which change is needed or desired (How can we foster learning in projects in order to build capacities to deal with constraining conditions in a growing number of instances? And How can we learn from this in order to be able to 'provide answers' to others that embark on the challenge to guide transition projects or programmes).

Hajer and Laws (2006) cite a study by Lester and Poire (2004) on the competence they observed in engineers and other practitioners involved in technical innovation to language development. They argue that “language evolves from clarity to ambiguity – in precisely the opposite direction of evolution one finds in analytical problem solving. Language development evolves, in other words, towards the creation of interpretative space.” In the case of TransForum, the interpretative space provided by asking questions contributed to capacity building
and emerging (intervention) design on programme level as well as on project level. Hence, the role of TransForum changes from taking charge, to providing catalysts for action, to a set of roles ranging from active participation to experimenting with different forms of reification. Asking questions is combined with providing answers, learning in is combined with learning from, participation is combined with reification.

4.5 Changing identity: from intermediary to change-agent

In the course of the programme the intervention strategy has changed from executing projects in order to contribute to the sustainable development of agriculture (corresponding to the three frameworks as initially defined as experimental spaces), to inducing learning about hampering factors in projects in order to create conditions for the sustainable development of agriculture (see also Broerse, 1998). This change in strategy has consequences for TransForum’s role as intermediary in the aspired transition, as we will illustrate in this section.

Some scholars define the functions of boundary organisations mainly in terms of mediating between different actors, adjusting the actions of one to the needs of the other (for instance through funding requirements). TransForum instead states that finding solutions to the problems of sustainable development requires close collaboration between different societal actors (including scientists) in order to generate knowledge that not only addresses societal problems but also contributes to their solution (action oriented). The experience of TransForum shows that this process of coproduction is not unambiguous. Providing a forum for coproduction of information (one of the requirements of boundary organisation, as cited in section 2.1) is not enough to face the hampering factors induced by the differences in culture, currencies, language and reputational
system of each of the collaborating parties. What is needed is an intensive process of opening-up problem definitions, goal formulation and intervention strategies, involving frame reflection and competence development. TransForum no longer acts as a neutral in-between; participation is crucial to facilitate the articulation of implicit needs, knowledge and interests (Hoes et al., 2008) and the development of alignment strategies (Regeer and Bunders, 2007).

Table 4.5 From intermediary to change-agent

<table>
<thead>
<tr>
<th>From intermediary:</th>
<th>To change-agent:</th>
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</thead>
<tbody>
<tr>
<td>Reactive</td>
<td>Proactive</td>
</tr>
<tr>
<td>Funder</td>
<td>Partner</td>
</tr>
<tr>
<td>Control</td>
<td>Develop</td>
</tr>
<tr>
<td>Neutral in-between</td>
<td>Stakeholder</td>
</tr>
</tbody>
</table>

The change of procedure for proposal submission, the formal split between administrative and developmental issues, and the proactive involvement of project directors in the projects are manifestations of a change from TransForum as intermediary, being perceived mainly as funder, to TransForum as change agent (see Table 4.5). This change was explicitly formulated at TransForum’s first scientific conference in October 2006. Not only was this a place to further develop the Scientific Programme together with people from practice. It also gave the TransForum staff an opportunity to present the current state of affairs and declare its aims, position and strategy publicly. With respect to the role of TransForum in the aspired change process, the conference documentation said: “TransForum must not confine itself to the role of an intermediary that serves purely as a link between stakeholders. […] TransForum wants to be a change agent that focuses on the development of
knowledge and competences of all stakeholders in order to achieve innovations and a more sustainable development together.” (TransForum, 2006, also see Figure 4.2)

Figure 4.2a and 4.2b: Intermediary is connector (a) versus change-agent supports interaction (b) (adopted from TransForum, 2006)
Thus, in the years after the initial statement that TransForum wants to be a mode-2 intermediary, it has become aware of what this implies. In its Mid Term Review it states: In its first year of operation the orientation of the programme shifted from ‘doing’ to ‘learning’, particularly with respect to the two challenges: developing new perspectives for the agro sector and adapting the current KIS to become more effective towards those new perspectives. It then follows: “After again one year even this learning approach turned out to be insufficient. Next to doing and learning it was necessary to understand that TransForum is part of the changing KIS.” (2007, p. 3).

The accountability paradox naturally arises in this context. Cash and Moser argue that within the boundary organisation they analysed, it is because of faculty appointment of scientists within the boundary organisation that credibility was maintained within the scientific arena and the organisation is insulated from political intrusion (Cash and Moser, 2000). In TransForum, however, the functioning of the scientific arena, and the political one for that matter, is questioned rather than adapted to. TransForum aims for a change from a linear Knowledge Infrastructure to an open-ended and interactive Agro Innovation System. In effect, TransForum is accountable to the same regimes it is trying to change. This is bound to provoke forms of resistance not envisioned in more traditional types of boundary organisations.

How is the accountability paradox addressed in the practice of TransForum? Accountability requires reification of experiences and experiments into concrete results that are meaningful to the 'principals'. From the epistemological position that has emerged in the current analysis, it would be hard pressed to claim that generic successes and results can be determined unambiguously. Rather, again it is a matter of creating meaning,
usually through a process of coproduction. TransForum currently experiments with generalising contextualised experiences in different ways, through multiple and dynamic frameworks inferred from the scientific themes, from innovation strategies, or constructed inductively through monitoring and Dynamic Learning Agendas. Moreover, this is done in various configurations of actors, involving KOMBI parties at different levels, from participants in niche experiments to regime players. Accounting to principals is thus a dynamic, constructive and participative process and as a consequence recursive.

4.6 Reflections on the development of an emerging intermediary between science and practice

Both governance and sustainable development are contested concepts (Jordan, 2008). Primacy for problem-solving is not with one institutional domain, knowledge of sustainability is not indisputably obtainable and a blueprint for conduct is not available. This poses several challenges to boundary organisations aimed at supporting a transition to sustainable development. Employing the heuristics of mode-1 and mode-2 to the challenges encountered, we see that being, or rather becoming, a mode-2 intermediary, implies dealing with, or developing strategies for, the intransigence of mode-1 practice at many different levels and places. Intransigence can be seen in two types of dynamics that are central to the workings of mode-2 intermediaries. The internal dynamics encompasses the development of strategies to deal with the difference between mode-2 intention and actual practice. It involves learning with respect to the intermediaries own role, strategy and competence and developing ways to handle the efficacy paradox. The boundary dynamics encompasses the development of strategies to deal with the difference between prevailing
modes of governance, knowledge development, assessment procedures, etc. and the mode-2 aspirations of the intermediary. It thus involves dealing with and resolving the accountability paradox.

We use the phrase ‘development of strategies’ (to deal with the differences between mode-1 and mode-2) intentionally to emphasise that the challenge for emerging intermediaries is not primarily in defining mode-2 intermediaries analytically and subsequently adhering to the prescribed description. Rather the challenge is in developing an identity of, or becoming, a mode-2 intermediary. As this challenge contrasts with much of the prescriptive writings that increasingly appear in the literature on new governance, sustainable development, and transition management, we would like to emphasise the distinction between two possible readings of the development of TransForum: bridging discrepancies versus becoming through enactment.

It is tempting to describe the learning history of TransForum as an increased congruency between what Argyris and Schön (1974) have called “espoused theory” (reflecting what people intend to or believe they do) and “theory-in-use” (which can be inferred from actual behaviour). Thus, whilst mode-2 intentions were clearly stated in the initial business plan (e.g. demand-driven knowledge infrastructure, learning-by-doing), in practice the TransForum case shows many different instances of ‘defaulting’ into mode-1, particularly in its first year (e.g. practising a hierarchical principal-agent relationship). One could justifiably claim that over time, a progressive alleviation of the discrepancies between mode-2 intentions and mode-1 practice in conducting a transition programme took place. Whilst this is an identifiable account of the history of the emergence of TransForum, we would like to propose a different reading of
events. A reading that acknowledges the challenges faced by intermediary organisations with mode-2 aspirations, in the light of the inherent uncertainties associated with the ‘wicked’ nature of sustainable development and the correspondingly proposed reflexive nature of governance.

The Dynamic Learning Agenda of TransForum shows that an understanding of what it means to be a mode-2 intermediary can only be developed through the enactment thereof. TransForum started with a strategy (e.g. support sustainable agriculture by spanning boundaries between science and practice), which is soon turned into a quest (e.g. how to create effective collaboration between science and practice?), with its own role at the centre of this quest (e.g. what intervention strategies and competences are needed to create effective collaboration between science and practice?). Thus, over time, assertions turn into questions and questions become specified, branch out into more questions, moving from one theme to another, and address different levels and locations of constraints. It is the evolution of questions, generated through enactment, that teaches us what it entails to be a mode-2 intermediary.

In writings about the challenges of boundary organisations it has been noted that ‘a major obstacle to the implementation of adaptive management is a culture that is unwilling to accommodate the risks inherent in experimentation’ (Cash and Moser, 2000). However, in accordance with the above we would rather argue that implementing adaptive management involves developing alignment strategies to deal with surrounding cultures (be it scientific or political) that are unwilling to accommodate the risks inherent in experimentation. As Guston (2001) states: an important characteristic of boundary organisations is their ability to successfully internalise boundary
negotiations. Or, as Smith (2006) observes; experimental strategies are more likely to invoke the desired change if they show a degree of compatibility with the incumbent regime.

The role of mode-1 processes, procedures and documents should not be undervalued. Consequently, tensions emerge at many levels: there is a need for coherence and structure and at the same time a need for adaptivity and flexibility; there are formal requirements, but also a need for space to experiment; there is a need for involving regime parties and at the same time these actors bring with them constraining requests. Moreover, as no practice equal to the one performed by TransForum exists, none of its staff members can be expected to have all the necessary competences needed for the specificity of the task. The gap between the rhetoric on participation and real-life implementation of participatory environmental governance, as revealed by Rauschmayer et al. (2008) in the case of biodiversity, is an example in case.

In conclusion, what does this tell us about boundary organisations operating amidst the uncertainties surrounding ‘wicked’ issues such as sustainable development? It tells us that even if informed by theoretical considerations, adequate strategies for sustainable development can only be developed in action, with the simultaneous development of agency. Mode-2 practice includes developing strategies to accommodate the mode-1 contexts, mode-1 habitual mechanisms and mode-1 competences that are inherently part of the endeavour to implement new modes of governance for sustainable development.

24 Without a clear business plan, including projects ready to be executed and a coherent programme, TransForum would not have been approved. Also, as one of the project directors noted: “You don’t go to the accountant with a mode-2 story”.

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Chapter 5
The development of mode-2 communication tools to support vicarious learning for sustainable development

5.1 Introduction

As described in the previous chapters, in recent years a range of intervention theories and tools has been developed aimed at the management of complex, unstructured problems; problems that defy boundaries between disciplines, organisations and systems and even boundaries delineating the problems themselves (Rittel and Webber, 1973). In this context, the Dutch government supports so-called ‘system innovation programmes’ for the sustainable development of energy, transportation, water management, health care and agriculture.

System innovation programmes are large national programmes conducted by consortia of research institutions, government, entrepreneurs and societal organisations aimed at inducing

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profound change in established patterns of action as well as in the institutional structures of which they are part (see e.g. Broerse and Bunders, 2009, Elzen and Wieczorek, 2005, Grin et al., 2004, Rotmans et al., 2001). These intervention programmes not only ‘go against the organisational grain’ (Vince, 2002) by challenging prevailing modes of operation, they also challenge prevailing divisions of responsibilities, power relations, reward systems as well as assumptions about relevant knowledge, relevant actors, and relevant competence of participants. As a consequence of the many uncertainties, intervention approaches aimed at system innovation are characterised by emergent design; they cannot follow a blueprint. Therefore, learning and reflection are essential features of these approaches (Hendriks and Grin, 2007, Regeer et al., 2009), whereby individual capacity building is combined with collective learning in heterogeneous collaborations (see Hoes et al., 2008, for an analysis of the latter). In an attempt to raise awareness of the distinct features of intervention approaches for system innovation, we have started to (heuristically) label them ‘mode-2’ approaches. We refer loosely to the new modes of knowledge production as proposed by Gibbons et al. (1994, see also Nowotny et al., 2001), but there is no harm in possible associations with Model II learning (Argyris and Schön, 1974) with its emphasis on open communication, mutual inquiry and the public evaluation of perspectives.

The TransForum programme for sustainable development of agriculture is one of the system innovation programmes described above; it experiments with new forms of collaborations between scientists, public administrators, (agri) entrepreneurs and other societal actors in over 20 ‘Innovative Projects’ (Veldkamp et al., 2008). How to effectively manage, or rather, support these ‘mode-2’ projects is a major concern for practitioners and scholars alike (e.g. in the fields of
sustainability science, transdisciplinary research, transition management, reflexive governance). This chapter, however, addresses another concern, closer to the fields of organisational learning and knowledge management: that of communicating insights and results of the experimental projects to others. There is an accountability aspect to this concern (how can we make visible to funders that we delivered as promised) and a learning aspect (how can we help others by making available our learning experiences). Typically, system innovation programmes tackle these questions in programme divisions like 'knowledge transfer' or 'knowledge dissemination'. Even though today the terminology has largely distanced itself from the transmission metaphor, with efforts now being called 'knowledge embedding' or 'knowledge anchoring', many theoretical, conceptual and practical questions still remain.

To illustrate some of the challenges involved, let us consider experiences with cross-project learning described by researchers that have experimented with projects similar to TransForum. Experimenting with the scaling-out of what Armitage et al. (2008) call adaptive co-management shows that transmitting learning across levels or sites is challenging. Outcomes from these learning processes appear to be context and time-specific, and generalising findings to other situations is difficult. As Armitage et al. write, “There is no guarantee that learning strategies working in one area can work in another area” (2008: 94). Moreover, the learning outcomes associated with these efforts are difficult to document, especially with respect to learning in complex social-ecological systems. Similarly, scholars in the field of organisational learning have struggled with making the experiences and insights of a pilot team relevant to the rest of the organisation. Kleiner and Roth (1996) for instance aim to move beyond the standard
engineering practice of “lessons learned” reports. Even though these reports may lead to valuable technological cross-fertilisation, too often they are filed and forgotten. More importantly, they do not capture “what really happened, underneath the report” (1996, 16, see also Newell et al., 2006). Thus, challenges arise from the context and time-dependent nature of learning and knowledge development in mode-2 approaches.

The question we address in this chapter concerns the way in which a web-based tool may accommodate the desired ways of communication. This is not because we believe a digital archive is the most appropriate tool; face-to-face communication, training sessions or collaboration could be argued to provide better opportunities for tailor-made communication between actors involved in the projects and others wanting to learn from them. Indeed, even though in organisations ICT-based tools are dominant in knowledge management, evidence shows that knowledge stored on databases and available through ICT do not ‘achieve significant exploitation of learning’ (Newell et al., 2006: 170). The lack of success of many cross-project knowledge transfer initiatives is considered to be rooted in ignoring the embedded nature of knowledge. Newell et al. (2006) draw the conclusion that some knowledge can be possessed independently of practice, making ICT transfer possible, while other knowledge is deeply embedded in practice, making social networks necessary for knowledge sharing. Others too state that the social nature of the innovation process and the tacit nature of knowledge limit the possibilities of ICT-based knowledge management (see also Lueg (2002) and Riedl (2002) cited in Chiva and Alegre, 2005, Currie and Kerrin, 2004).
We deliberately suspend passing judgement on this conclusion for practical and theoretical reasons. A practical reason is that a temporary programme organisation like TransForum (running from 2005 to 2010) will develop a digital archive of results available for consultation after the programme has ended, in addition to all regular communication activities conducted by TransForum and its projects already. Rather than advising TransForum to store solely explicit knowledge, we find it challenging to start imagining how this digital archive can capture tacit knowledge and how it can enable learning. The second practical reason is that those involved in (co)creating knowledge about transition processes do not have unlimited amounts of time to advise others. A time and place independent tool for accessing their experiences is thus called for. A more theoretical consideration is that we believe re-examining some of the commonly drawn conclusions with respect to cross-project learning, particularly those regarding the (in)effectiveness of indirect communication, will result in generic design principles that could be applied to other instances and manifestations of indirect communication, and as such may aid the organisation of collective reflection in a broader sense.

Thus, in addition to TransForum's ongoing activities to support learning from projects, the current research project aims to provide a dynamic archive of accessible learning experiences, owned and sustained by a growing network of actors within the Agro-Innovation System. The project is named: TransLearning, which refers to both the artefact(s) to be developed (that is, www.translearning.nl) and the experimentation that forms its foundation. We continue this chapter in the spirit of experimentation – the actual website is under construction and its wider use has not yet been tested.
Our aim is to show how we developed a richer understanding of relevant design principles for a web-based environment for learning about TransForum projects through an interactive and reflective design approach that we will explain below. In doing so we will meet and challenge three common preconceptions about communicating knowledge in web-based environments:

The first preconception is about the nature of the means for communication;
1. The medium through which knowledge is communicated to its public(s) functions as 'transmitter'.
   We will develop the thesis that a departure from the transmission paradigm opens up the possibility for a digital archive to be much more than a storehouse for static pieces of information.

The second preconception is about sharing process knowledge;
2. Much knowledge involved in managing complex problems is process knowledge. This knowledge is tacit and is deeply embedded in practice. It can therefore only be shared through social networks.
   We will develop the thesis that showing how tacit knowledge is manifested in practice opens up the possibility of sharing it in a mediated environment.

The third preconception is about sharing explicit knowledge;
3. Explicit knowledge is disembodied and de-contextualised and can be transferred unproblematically through repositories.
   We will develop the thesis that effective sharing of explicit knowledge entails giving potential knowledge users the opportunity to re-contextualise knowledge by giving meaning locally.

In the period mid-2007 – mid-2008, a first set of experiments was conducted by the authors of this chapter, in collaboration with partners at the TransForum office as well as at different project sites. We thus present a grounded theory study of web-
environment development in the context of learning about mode-2 approaches in sustainable agriculture. This research is further enhanced by our participation\textsuperscript{26} in TransForum’s evaluation programme. TransForum’s mode-2 projects require a new type of project management, whereby the project leader is not primarily concerned with reaching predetermined goals, but with guiding the ongoing process of reformulating and reassessing the possibilities together with participants. In order to aid this process, which is filled with anxieties (Vince, 2002) and intransigence (Regeer and Bunders, 2007), reflection is organised in the form of additional guidance by evaluators employing an action research approach (Regeer et al., subm.-a). Our observations of, and participation in, the projects and the overall programme have informed and supported our experimentation in the context of TransLearning.

In sum, in this chapter we will tentatively formulate design conditions for a web-environment that adequately address the challenges of what we call ‘mode-2 communication’, by integrating the theoretical and empirical underpinning of these presuppositions. As such we develop a design framework, exemplified by a series of interconnected questions initiated in the practice of mode-2 projects and programmes. To explain how we connect theoretical considerations to the development of a framework for web-based communication, we will first establish our methodological framework. This takes us on a short detour into the design process of software design – a field of research providing conceptual guidelines for developing a design rationale alongside the development of the actual artefact(s).

\textsuperscript{26} Regeer and Bunders
5.2 Methodological framework

In the fields of software engineering research and educational design, an increasing focus on the design process, rather than the artefacts it produces, is apparent. The idea of reflective and participative design processes are gaining acceptance; see for instance Van den Akker et al. (2006) on Educational Design Research, and Bradburne (1999) on the new role of the designer for informal learning. Louridas and Loucopoulos (2000) formulate a Generic Model for Reflective Design applicable to the design of computer software and beyond. We will use this model as our methodological framework, and elaborate on its features and our application in this section.

Shared by approaches in the field of Design Rationale\(^\text{27}\), the Generic Model for Reflective Design focuses not on improving the design process ‘by defining or altering it, \textit{but by aiding it through a fostering of the appropriate reflective stance} [Schön 1983].’ (Louridas and Loucopoulos, 2000: 200, italics in original). Thus, it is not an approach that gives guidelines on how to set up a design process. Rather, the model focuses on capturing the why behind the how in design; the arguments used for the choices made in the design process (the design rationale). It provides tools for careful and open consideration of the reasons behind the decisions taken, often by deliberating in collaborative settings. As such it supports the actual design process itself, but its main concern is to explicate the design rationale. This is relevant to our concern in this chapter, as we aim to formulate design principles for a web environment for communicating a particular kind of knowledge, based on the

communication challenges formulated and experienced in practice. General characteristics of the General Model for Reflective Design are summarised in table 5.1 below, clustered into three sets of features.

Table 5.1 Characteristics of a Generic Model for Reflective Design (based on Louridas and Loucopoulos 2000 and adapted)

<table>
<thead>
<tr>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participation</strong></td>
</tr>
<tr>
<td>1. To be used in collective, collaborative design processes</td>
</tr>
<tr>
<td>2. Pluralistic: inclusion in the design team of participants traditionally not labelled designers</td>
</tr>
<tr>
<td>3. Supports deliberation and argumentation</td>
</tr>
<tr>
<td><strong>Relationship reflection - design</strong></td>
</tr>
<tr>
<td>4. Non-prescriptive &amp; non-intrusive</td>
</tr>
<tr>
<td>5. The design rationale is produced by the design itself (not separate from)</td>
</tr>
<tr>
<td><strong>Deliverables</strong></td>
</tr>
<tr>
<td>6. It captures process rationale (why are certain decisions taken)</td>
</tr>
<tr>
<td>7. It captures product rationale (why are artefact features as they are)</td>
</tr>
</tbody>
</table>

The way a Design Rationale is usually constructed is by providing a small set of concepts appropriate for representing the deliberations taking place (2000: 202). The generic model proposed by Louridas and Loucopoulos comprises a number of concepts that are related in a dynamic process: the Reasoning Loop (see Fig. 5.1). The generic concepts are: Goals, which designate any objective to be reached, demand to be satisfied, problem to resolved, issue to be discussed; Hypotheses, which designate any suggestion, proposal or idea about the resolution of a problem in the design process; Justifications, which designates the arguments and assumptions underlying hypotheses; Design actions, which represent any action taken in the course of the project. Finally, Artefacts are those objects that are used and produced during the process. They are the
direct result of design actions; they follow from the Reasoning Loop but are considered to exist in a separate realm (see grey boxes in fig. 5.1). Although the reasoning cycle is represented as a closed loop (signifying the resolution of the issue defined), in practice the reasoning underlying the design process can be described as a repeated application of the reasoning loop, where new loops result from previous ones (e.g. Loop 3 in fig. 5.1), but also from hypotheses or justifications, providing a way to include meta-discussions (e.g. Loop 2 in fig. 5.1).

Figure 5.1 Reasoning Loops (integrated version of Louridas and Loucopoulos 2000: figure 11, 12 and 13)

In this chapter we will use the Reasoning Loop as a structuring device to describe the way in which design principles for mode-2 communication have emerged in three pilot projects. We will construct two sets of Reasoning Loops (fig. 5.2 and fig. 5.3) that depict significant deliberations that have taken place in the design process. Moreover, each of the deliberations results in one or more Artefacts: i.e. substantial contributions to TransLearning, such as actual content developed. These concrete contributions are shown in Tables 5.3 to 5.5. Thus, by
transarently integrating our experiences from pilot projects with theoretical insights in the fields of communication theory, science communication, (organisational) learning and science studies, we hope to offer new and functional insights into effective communication strategies for mode-2 innovation projects.

5.3 The nature of tools for communicating knowledge

We started by exploring the general characteristics of communication goals, forms and processes in the context of transitions towards sustainable agriculture by organising collective deliberations with programme managers at TransForum. An internal session was organised at TransForum (January 2007) with the aim to develop ideas about the results of TransForum at the end of 2010. The session was centred on the already formulated aim to deliver:

broadly supported and unavoidable recommendations for an Agro Innovation System that enhances the sustainable development of Dutch agribusiness and rural areas.

The rationale behind this goal was that TransForum experiments with new types of collaborations, transforming the linear mode of knowledge generation and dissemination into co-creation of understanding, knowledge and solutions, thus laying the foundations for a non-linear Agro Innovation System. The end result should thus be recommendations about the processes involved, competences needed, and conditions required, to realise sustainable perspectives for agriculture, formulated for each of the (institutional) domains involved; i.e. science, business, government, societal organisations.

However, the adjectives 'broadly supported' and 'unavoidable' give a different meaning to the implications of (developing) recommendations. In deliberating on the formulated aim, all participants agreed that the recommendations should not be
laid down in a traditional advisory report. It is not an advisory report from TransForum to the outside world, formulating lessons to be implemented. Rather, it demonstrates how the broader network of TransForum has already started to become the Agro Innovation System (AIS). In the session one of the participants noted that the recommendations should not say 'build that network and this is how you should', but, ‘we have built this network, and this is what we experienced' (Hoes et al., 2007). A growing network of people from all institutional domains has already been mobilised to experiment with and learn about TransForum’s assumptions that collaboration between KOMBI\(^{28}\) partners and transdisciplinary research support a more sustainable development of agribusiness (Veldkamp et al., 2008). The end of the programme is merely a moment in this continuous process, and the recommendations are a record of lessons learned on the one hand, and inspiration for continuation on the other. They are a ‘screen shot’ in an ongoing movie; or rather, a series of screen shots highlighting relevant aspects from the perspectives of different participants.

To describe different ways of scientific knowledge development, TransForum has adopted the mode-1 / mode-2 terminology originally coined by Gibbons et al. (1994), where mode-1 refers to monodisciplinary, academic research and mode-2 refers to transdisciplinary knowledge development in heterogeneous collaborative settings. The distinction between mode-1 and mode-2 has also been applied as a generic tool to help reflect on the particular challenges TransForum faces in other respects (Regeer et al., subm.). As a consequence, the deliberations on the 2010-advice resulted in hypotheses with

\(^{28}\) Dutch acronym for Knowledge Institutions, Government, Societal organisations, Business Community and Intermediaries.
respect to what was called 'mode-2' communication (see Table 5.2).

Table 5.2 Mode-2 communication as understood by TransForum

<table>
<thead>
<tr>
<th></th>
<th>Mode-1</th>
<th>Mode-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sender</strong></td>
<td>TransForum main office</td>
<td>TransForum network</td>
</tr>
<tr>
<td></td>
<td></td>
<td>participants</td>
</tr>
<tr>
<td><strong>Receiver</strong></td>
<td>Funders, and anyone</td>
<td>(potential) network</td>
</tr>
<tr>
<td></td>
<td>interested</td>
<td>participants, including</td>
</tr>
<tr>
<td></td>
<td></td>
<td>funders</td>
</tr>
<tr>
<td><strong>Position in</strong></td>
<td>Completion of work</td>
<td>Temporary recording</td>
</tr>
<tr>
<td><strong>process</strong></td>
<td></td>
<td>between what happened and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>what will happen</td>
</tr>
<tr>
<td><strong>Form</strong></td>
<td>Unambiguous report</td>
<td>Stories, experiences and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lessons from different</td>
</tr>
<tr>
<td></td>
<td></td>
<td>perspectives</td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>Accountability (did we</td>
<td>Capture as well as induce</td>
</tr>
<tr>
<td></td>
<td>deliver as promised?)</td>
<td>learning experiences</td>
</tr>
</tbody>
</table>

The twofold objectives of communication about results (accountability and learning) are integrated in mode-2, assuming that TransForum delivered as promised if it can display the workings of the approach it developed. A subsequent goal that can be extracted from the deliberations is: How can we communicate about the work of TransForum in such a way that it enables participants (and their institutions) to internalise their learning experiences, and stimulates the continued development of a non-linear, sustainable AIS?

Following the line of thought presented above we discover different perspectives regarding the nature of the so-called ‘repository’. The mode-1 perspective on communication reflects the so-called ‘transmission’ paradigm of communication, which assumes that knowledge is transferred from sender to receiver either through or without a medium. Ways to improve this process involve research on existing
levels of knowledge of the target groups, and other factors influencing the absorptive capacities of the presumed receivers, as well as on the ability of the ‘transmitter’ (in our case the Artefact under construction www.translearning.nl) to attract attention and provoke interest in the topics on display. This sender-message-receiver model, however sophisticated in terms of feedback loops, does not capture the essence of mode-2 communication. In mode-2, the archive does not stand between the senders (TransForum projects) and receivers (target groups) but actively connects the two, and by doing so changes both. A repository with results of TransForum projects may thus be viewed as a support system (De Zeeuw, 1985) that enables tailor-made use, activity and learning by (potential) members of the growing network that makes up the Agro Innovation System.

Table 5.3 summarises the different ways in which the deliberations above contributed to TransLearning (in the sense of the Artefact itself and the experimentation that lies at its foundation). **Content** refers to actual materials produced during this part of the design process that may form input for www.translearning.nl. At this stage, the content box is still empty. **Design Principles** refer to the features of the Artefact to be developed that will guide the design process. The design principles that have resulted from the deliberations with TransForum refer to the nature of the repository; a mode-2 archive acts as a support system that enables learning. Finally, the contribution to the **Design Process** may be the outcome of the deliberation and/or a next question to be considered, which again will lead to content, design principles and new questions in the reasoning process: it marks a passage between two reasoning loops. Indeed, the next Reasoning Loop that we consider deals with all three aspects of the question posed in
Table 5.3; it considers particularly the capturing of knowledge that is personal and unarticulated.

**Table 5.3 Contribution to TransLearning (1)**

<table>
<thead>
<tr>
<th>Content</th>
<th>Design principles</th>
<th>Design process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repository is support system:</td>
<td></td>
<td>Goal: Communicate about the work of TransForum in such a way that it enables the members of the network to continue to learn. What does this imply for the content to be displayed, the process of creating this content and the use and learning it enables?</td>
</tr>
</tbody>
</table>
- it enhances competence and enables learning |
- it is not an in-between but a co-creator |

**5.4 Sharing personal, unarticulated knowledge**

Newell’s et al. (2008) study into cross-project learning in 13 projects revealed that project lessons documented in project reviews were typically articulated in terms of their deliverables (i.e. what had been achieved in relation to targets). How the project was developed and managed was often not part of project reviews. Interviewees reported that the latter aspect, which Newell et al. label process knowledge, is difficult to capture and document for various reasons. First, there is no structure to learn from knowledge about processes; the strategies the team deployed to reach targets and deal with difficulties were not recorded as ‘lessons learned’ in post-project reviews, largely because they had already been resolved. Moreover, post-project reviews hardly ever request this type of information. Second, project participants felt that other activities than capturing lessons for future potential benefits had higher priority during the course of the project. Third, respondents noted that there is no language to capture these lessons;
process lessons are better shared informally and directly with the people involved.

The projects conducted in the context of TransForum are different in a number of respects. First, Transforum does offer a structure to record process lessons learned; its commitment to learning about how to manage the complex processes involved in realising sustainable development is tightly, even recursively, linked to its mission. The aspiration to contribute to a transition towards sustainable agriculture implies involving different stakeholders, developing the necessary capacities and intervention strategies together and stimulating learning through interaction between various actors (Regeer et al., 2009, Voß et al., 2006). How to effectively manage this transition is a major concern for practitioners and scholars alike (e.g. in the field of sustainability science, transdisciplinary research, system innovation, transition management, reflexive governance) and TransForum aims to build capacity and develop knowledge to this end. This commitment to learning is operationalised in different ways: yearly project reviews focus particularly on process knowledge, rather than project results, and are conducted in the spirit of appreciative inquiry rather than accountability (Regeer et al. subm-b). Also self-evaluation with a particular emphasis on learning experiences is formally required after each project phase. And in many projects, dedicated evaluators (employing action learning approaches) assist project teams in collectively articulating learning experiences during the course of the project, and thereby support developing intervention strategies (Regeer et al. 2009). The latter practice in particular helps to overcome the second obstacle to capturing process lessons, as time spent on reflecting is repaid in an increased understanding of how to proceed, thereby resolving potential priority conflicts.
The third obstacle to sharing process knowledge is not evidently solved by the way TransForum is structured, so let us consider in more detail the notion that process lessons are better shared informally by means of personal contact. Why do so many authors state the necessity of social networks and informal contacts for sharing knowledge? What is the foundation of their arguments and do these arguments imply we cannot conceive of learning from unarticulated personal experiences through indirect media at all? Next, we will investigate the challenges concerned in sharing process knowledge and employ the Reasoning Loop to capture our reasoning. The result will be depicted in figure 5.2 and references will be made in the texts to its various parts, for instance; the goal (G1) of our present deliberations is to explore the challenges involved in sharing process knowledge (see fig. 5.2, G1).

**Perspectives on knowledge**

Two perspectives on knowledge can be distinguished as we did earlier (Regeer and Bunders 2003), and as is commonly found in literature on organisational learning (e.g. Chiva and Alegre, 2005, Cook and Brown, 1999, Currie and Kerrin, 2004). From one perspective knowledge is considered to be a static entity, ‘contained’ in people or reified in procedures, books, scientific articles, legislation, etc. Knowledge can be stored, and as such exist independently from the knower. In this way it can be transmitted to others, remaining unchanged. This view of knowledge is referred to as the cognitive, possession, or stock approach.

The second perspective on knowledge starts from the premise that knowledge development is essentially a communicative process, and that our claims to knowledge are grounded in actual practice, rather than in objective reality. Scholars of orga-
Figure 5.2 Reasoning Loops on communicating process knowledge
nisational learning and knowledge co-creation have referred to philosophers like Dewey (Hemetsberger and Reinhardt, 2006, e.g. Reynolds and Vince, 2004) and Wittgenstein (e.g. Gherardi, 2000, Regeer and Bunders, 2003), and to the concept of Communities of Practice as developed by Wenger (e.g. Chiva and Alegre, 2005, Regeer and Bunders, 2003), to support this view.

This ‘knowledge as practice’ view is gaining recognition in the scholarly literature on organisational learning and has resulted in the following argument: because knowledge is deeply embedded in practice [this we label Justification 1.1, see fig. 5.2, J1.1], knowledge sharing involves face-to-face contacts in social networks [Hypothesis 1.1, see fig. 5.2, H1.1]. Web-based tools that function as repositories are not appropriate. Some scholars (e.g. Newell et al. 2006) see a way out by stating that if we do want to share the knowledge implicit in our actions and practices, we need to explicate this knowledge in order to make it available through repositories [Hypothesis 1.2, see fig. 5.2, H1.2]. In order to make our position on developing strategies for knowledge sharing clear, let us respond to this possible way out.

The idea of the explication of implicit knowledge has been described by two scholars of knowledge management, Nonaka and Takeuchi, in their famous “The Knowledge-Creating Company” (1995). They made an enormous contribution by emphasising and elucidating the importance of implicit knowledge in organisational learning. Their ‘knowledge creation cycle’, in which tacit knowledge can be made available through a process of externalisation, combination, internalisation, and socialisation, has been adopted widely. However, they have also been criticised for treating tacit and explicit knowledge as two oppositional concepts, and for treating knowledge as a
resource that can be possessed, made explicit and transferred from one person to another (Tsoukas, 2003). Indeed, as Tsoukas (2003: 425) argues convincingly on the basis of Polanyi’s writings on tacit knowledge, the interpretation of tacit knowledge as ‘knowledge-not-yet-articulated’ or ‘knowledge awaiting for its “translation” or “conversion” into explicit knowledge’ [which we call Justification 1.2, see fig. 5.2, J1.2], is misunderstanding the significance of its tacit nature. Polanyi’s famous illustration of the tacit knowledge involved in hitting a nail with a hammer (as soon as we focus explicitly on the hammer or nail we miss) serves to show the inherently embedded nature of tacit knowledge. As such, Tsoukas argues that tacit knowledge cannot be transferred, translated, or captured, ‘but only displayed and manifested in what we do’ (2003: 410).

Thus, if knowledge is deeply embedded in practice and is essentially indivisible, perhaps we should not put our efforts in attempting to find the most accurate articulations and representations of this ‘implicit’ knowledge, but instead to ‘show it as it is’; in context, at the time of expression, by the people at stake. Or, taking Wittgenstein’s position that language is fundamentally connected to knowledge and knowledge development, we would argue that: “the confusions which occupy us arise when language is like an engine idling, not when it is doing work.” (1953, § 132). The implication for sharing knowledge through web-based environments is that they should display the activities of those we want to learn from; in our case the individuals or collaborative groups involved in TransForum projects.

With this in mind we turn to the commonly drawn conclusion that repositories, while useful for storing codified knowledge, are not appropriate to induce the learning and sharing of tacit
knowledge [questioning this established presupposition, we start a meta-loop with Goal 2, see fig. 5.2, G2]. Hemetsberger and Reinhardt’s analysis of learning and knowledge-building in open-source communities refutes the common claim. Closely observing a dispersed web community that collaboratively writes source code for interface designs for open source operating systems reveals that ‘enabling re-experiencing constitutes the fundamental mechanism for learning and knowledge-building to occur online’ (2006: 195). Activities, rather than explicit knowledge, are stored and displayed in such a way that users can re-view those activities and their rationale, and even get a sense of re-experiencing them. Direct contact between users is not required, but access to the learning processes in the context in which they take place is. Consequently, in contrast to what is commonly claimed, repositories of information may induce and support learning [hence, Hypothesis 2, see fig. 5.2, H2], but the extent to which users are enabled to learn depends on the type of information stored and the way in which it is displayed. Hemetsberger and Reinhardt show that it is not the results of activities and processes that induce learning, but actually showing the processes and activities themselves.

Thick description to support vicarious experience
The concept of re-experiencing corresponds to the concept of vicarious experience, which was introduced by Guba and Lincoln (1989) in the context of contemplating the possibility to produce evaluation reports that support learning, much like our current experiment. Learning through vicarious experience refers to the capacity to learn by being given access to other people’s experiences [J2]. “While vicarious experience is not equivalent to actual experience, it does provide the same opportunities to learn. It is via this process that even idiographic (non-generalisable) knowledge can be applied in a
second setting.” (1989: 181) What are the characteristics of a report that can bring about vicarious experience? Guba and Lincoln assert that a generalised format for this type of writing is not appropriate, but general characteristics can be found in their writings (1989, 1988). They argue that a case report, characterised by thick description, allows the reader to “walk in the shoes” of the local actors and thus provides a vicarious experience of the situation (1998: 223). Thick description (a term originating in anthropology, Geertz, 1973) helps the reader make sense of the situation by providing extensive and careful description of the time, the place, the context and the culture in which the project took place. More importantly, the case report also shows the underlying motives, feelings and rationales leading to the description of the states of affairs presented [D2]. Guba and Lincoln assert that the “report cannot simply be about the [project] and its context, but must enable readers to see how the constructors make sense of it, and why” (1989: 223).

The effect of a case report with a thick description of both the case and underlying interpretations, is that the reader can make their own sense of the situation. “[It] helps readers assimilate the joint construction into their own, thereby generating personal reconstructions different from either the negotiated joint construction or their own prior constructions.” (1989: 224) Of particular importance to our current inquiry however, is the argument that it helps readers apprehend their own “worlds” in more informed and sophisticated ways. The provision of vicarious experience may aid people to re-assess their experience; seeing how it is the same as or different from the experience of others (1989: 248). Let’s look at one of our pilot projects to learn more about the implications for TransLearning of ‘capturing tacit knowledge-in-action’ [G3].
Pilot: The Making of Greenport Venlo

Streamlining Greenport Venlo is a project supported by TransForum. It experiments with new ways of ‘steering’ complex societal processes by organising a learning process between a variety of actors involved in Greenport Venlo. Greenport Venlo is one of the five ‘Greenports’ designated by the Dutch government as growing regions for greenhouse agriculture and horticulture. In Venlo ‘Greenport’ has become a regional ‘brandname’ that encompasses ‘Cradle to Cradle’ (C2C) developments. The TransForum project facilitates the co-development of the many local initiatives: hence the project name Streamlining Greenport Venlo. It starts from the assumption that Greenport Venlo has a different meaning for different stakeholders, but that the overall interest in the economic and ecological development of the wider region is shared. This TransForum project supports the regional process by stimulating network building, problem articulation and competence development on network management in a Community of Practice (Termeer 2006, Kranendonk et al. 2006). Much interest is taken in the process by outside parties, and there is an urgent need to capture and visualise learning experiences.

Several project team discussions were held about ways to communicate about Greenport Venlo, in particular about the struggles involved, obstacles experienced, and strategies developed in the process of creating Greenport Venlo. Similar to our experiences at TransForum programme level, it was felt that developing communication about Greenport Venlo from the perspective of only the project team of the TransForum project would be inappropriate. Central to the network approach of Greenport Venlo is the shared ownership of the concept and its meaning by all those involved (professionally and otherwise) in the development of the region, of which the
team members of the TransForum project (Streamlining Greenport Venlo) only form a very small part (with a core team consisting of five members of which only two are living and/or working in the region). One of the challenges was to develop shared ownership for the communication challenges and make it an effort by rather than about the region.

Another communication challenge identified by the project team touches directly on the issues described in the previous section: it deals with the question of what and how learning experiences should be recorded in order to make them useful to others in similar projects. It was felt that not only the concrete results of the change effort were to be communicated (e.g. number of hectares of newly build greenhouses, publication of shared vision on Greenport Venlo), but also the activities and choices underlying those efforts. The remainder of this section will describe how we went about conceptualising ways to communicate what Newell et al. (2006) would call process knowledge.

Early in the project it was noted that documenting the process of devising interventions and their underlying arguments is hardly ever done, but nonetheless this was essential for future projects to learn from Streamlining Greenport Venlo. Moreover, experiences with consultations from Greenports in other parts of the Netherlands raised the question to what extent local culture and history and the experience of local actors with network approaches in the recent past affected the change effort. It was decided to draft a ‘Learning History’ (Regeer, 2006) [H3], based on the format developed by Kleiner and Roth (1996). The essential feature of this tool is that it tells the story literally in the words of participants. A Learning History includes direct quotations, not to illustrate a point made by the authors of the report, but as the core of the
jointly told story. It uses a two-column format; the right-hand column consisting of edited primary data and the left-hand column consisting of interpretative comments (already included and/or to be included). Vicarious experience is supported through first hand experiences of the process and its context in detail from multiple perspectives in the right-hand column; it thus adheres to the principles for reporting as formulated by Guba and Lincoln (1989) by enabling users to make sense of the situation as well as making them aware of the choices made and activities employed. Moreover, learning through vicarious experience is supported through interpretative comments in the left-hand column; giving access to the way other people (e.g. participants, outsiders, researchers) made sense of what happened allowed users to make their own re-construction of the project and to re-assess their own experiences [J3]. In this way, a Learning History serves the goal of providing learning experiences in a non-direct, non-personal way, but still supports communication of tacit knowledge (people talk in detail about what they do, not necessarily in terms of articulated lessons) and process knowledge.

In a reflecting session on Learning Histories (of Greenport Venlo and other TransForum projects) we found that the textual nature of the Learning Histories was not well received by some of the stakeholder groups. In order to make the experiences of Greenport Venlo accessible to a broader range of stakeholder groups, we decided to start experimenting with audiovisual (AV) Learning Histories [D3].

In the case of Greenport Venlo a number of network members were interviewed (AV) on issues central to the development of Greenport Venlo. The interviews were edited according to a series of themes to show the different perspectives on the topics as well as the shared enthusiasm and sense of urgency of
Greenport Venlo. Adding a time dimension resulted in a ‘Learning Timeline’ about Greenport Venlo showing changes in perspectives as well as choices made throughout the course of the process, that would otherwise dissolve into the invisible history of Greenport Venlo. In order to promote the shared ownership of this communication process, a very rough sketch with only an excerpt of the Learning Timeline was presented to a group of 35 network members. This resulted in commitment from communication specialists and others to continue with this project in a collaborative way. At present, more network members are involved and interviewed. The audiovisual Learning Histories will be consolidated in a web-environment that has been named: ‘The making of Greenport Venlo’, a title that captures precisely the intended perspective on the content and experience.

The process of developing a rich audiovisual Learning History for “The Making of Greenport Venlo” at this stage was deliberately kept open-ended in order to give others the opportunity to actively join a process that is not yet ‘carved in stone’. A more complete audiovisual Learning History was developed in the context of another TransForum project: Regional Fresh Chains. It uses the storyteller system as developed by one of the authors, Michael Murtaugh (Davenport and Murtaugh, 1997, 1996). Essential feature of the storyteller system is that units of content (e.g. video-clips) are not explicitly linked to each other (as they would be in regular branching systems) but that they are potentially connected to each other through clusters of keywords. As units of content are not determined in advance, sequences evolve during the viewing experience according to choices made by the user, allowing viewers to play a more active role in moving from one material to another (Murtaugh 1996). Table 5.4 summarises the
different ways in which the deliberations above contribute to TransLearning.

Table 5.4 Contribution to TransLearning (2)

<table>
<thead>
<tr>
<th>Content</th>
<th>Design principles</th>
<th>Design process</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV material for The Making of Greenport Venlo</td>
<td>Sharing tacit knowledge implies:</td>
<td>Tool development:</td>
</tr>
<tr>
<td></td>
<td>- enabling re-experiencing through providing detailed account</td>
<td>– Audio Visual Learning History</td>
</tr>
<tr>
<td>AV material for Regional Fresh Chains</td>
<td>- enabling re-assessing through providing interpretation and history of changes</td>
<td>– Learning Timeline</td>
</tr>
<tr>
<td></td>
<td>Tool development:                    System Development:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Audio Visual Learning History</td>
<td>– new version storyteller system</td>
</tr>
<tr>
<td></td>
<td>- Learning Timeline</td>
<td></td>
</tr>
</tbody>
</table>

5.5 Making sense of explicit knowledge

Pilot: Biopark Terneuzen

In the previous sections we considered the requirements and possibilities for communicating tacit knowledge through indirect means. In this section we will illustrate our reasoning and the resulting design requirements with respect to storing explicit knowledge in repositories. As stated earlier, problems with explicit knowledge stored in database systems or repositories are often concerned with the ability to identify and locate relevant information, and not as much with the nature of knowledge itself. How to turn concrete research results into relevant information for potential users was our concern in the pilot Biopark Terneuzen.

Under the banner Biopark Terneuzen a number of large companies in the southern province of Zeeland in the Netherlands work together to reach sustainability goals by utilising each other’s redundant streams of energy and material. TransForum supports scientific research on a number
Figure 5.3 Reasoning Loops on communicating explicit knowledge

of aspects (technical, policy, legal, organisational) to support the realisation of Biopark Terneuzen. Knowledge developed in the context of Biopark Terneuzen has relevance for comparable projects elsewhere in the Netherlands. The Athena Institute was asked to help communicate the knowledge resulting from the research [G4, fig. 5.3], by developing a format that could be
used by scientists to communicate their knowledge to the target groups [H4]. The proposed solution to the challenge of sharing knowledge (i.e. develop a format) embodies several assumptions. First it assumes that the knowledge to be communicated could be univocally determined, namely the result of the research projects [J4.1]. Second it assumes that the format serves as an instrument to translate the originally developed knowledge into a form that is attractive, understandable and relevant to the users [J4.2]. In our design process meta-discussions emerged about these assumptions, and in figure 5.3 two meta-loops originate in J4.1 and J4.2, which we will now consider in more detail.

First, let us consider the contention that the knowledge to be communicated can be univocally determined as the objective result of the research projects (possibly laid down in peer reviewed articles or scientific reports) [G5]. In organisational management literature, the view that explicit knowledge can be unproblematically transferred from one context to another is often rejected as being a ‘positivist’ position on knowledge and learning. As argued above, we view knowledge as essentially being embedded in social practices. How are we then to understand the sharing of explicit or even objective knowledge?

The separation of knowledge from the creation of knowledge, the knower and the context of knowing is common practice in scientific knowledge development. Scholars of the social studies of science (STS) have shown how knowledge, when studied closely within the context in which it is created, is socially constructed and how scientists systematically decontextualise and disembodify this knowledge until plain, ‘black-boxed’ facts remain (Latour, 1987). The way this is done differs in each epistemic culture, defined by Knorr-Cetina as those "arrangements and mechanisms which [...] in a given field, make
up how we know what we know” (1999, 1). Science thus produces 'generalised' and 'objectified' knowledge that becomes part of a broader discourse (through textbooks, procedures etc.). As all knowledge gains meaning and is defined in the context of a specific practice, the application of this decontextualised and disembodied knowledge in new contexts should be seen as the alignment of local practices to broader discourses, rather than as the transfer of knowledge from one context to another (Regeer and Bunders, 2003). We can imagine that in a similar way, knowledge developed in Biopark Terneuzen can be decontextualised and disembodied into generic statements after which they are given meaning locally in other practices [J5]. We thus needed to revise H4: we do not want 'scientists to communicate their knowledge', but we want 'potential knowledge users to give meaning to this knowledge in their practices'.

As a consequence of these arguments, we decided to design and organise what we have named an 'eye-opener' workshop [D5] (see Regeer, 2007, for an extensive description of the workshop design). In a web-based video interview, the key scientist of one of the research projects conducted in the context of Biopark Terneuzen, answered questions regarding the content of his research. The interview was then shown in the eye-opener workshop. Participants (potential users of the information) were asked to attribute meaning to the fragments of information by indicating whether something was an eye-opener, raised questions or tapped into additional knowledge on the part of the participant. Responses were threefold: 1) participants required more detailed and concrete data and numbers on the system that the scientists had developed, 2) participants positioned the development of Biopark Terneuzen in a broader discussion on the sustainability of such Agroparks, creating alignment with broader political and social discussions,
3) issues were raised with respect to the role of scientists in the process, uncertainties in results, and the effective ‘management’ of multi- and transdisciplinary projects, which in effect ‘opened up’ the black box of the knowledge creation process. In the last part of the workshop these issues were discussed with the scientist.

The second meta-loop concerns the understanding of the 'format' we were asked to develop [G6]. We concluded that the format does not serve to translate knowledge to target groups, but instead, the format encompasses the process of giving meaning to the results of a research project from the perspective of various potential users [H6]. We have seen that within such a process (for instance using the eye-opener workshop) a dynamic interplay takes place between the initial research results, the story of the researcher, the questions of potential users and the knowledge of these users. The format thus connects experiences to facts, knowledge to contexts, projects to societal debates and researchers to users [J6]. Hence, H4 is revised again to say: 'a format is devised that enables potential knowledge users to give meaning to this knowledge in their practices'. Table 5.5 summarises the concrete contributions of this pilot project to TransLearning.

Here we have shown how an interactive workshop (such as the eye-opener workshop we developed in the context of this project) may be employed to make transparent the process of giving meaning to explicit knowledge in various local practices. It results in the 'framing' of the information, and as such contributes to creating an initial set of keywords to be used in TransLearning to navigate through the material. Of particular interest is our finding that whilst starting off with explicit, black-boxed knowledge, (i.e. decontextualised and disembodied knowledge separated from people and practices), by involving
the principal researcher in the eye-opener workshop the black box is opened up again, returning to issues of sharing personal and contextual knowledge as discussed in previous sections.

**Table 5.5 Contribution to TransLearning (3)**

<table>
<thead>
<tr>
<th>Content</th>
<th>Design principles</th>
<th>Design process</th>
</tr>
</thead>
</table>
| AV material Biopark Terneuzen (including system of keywords) | Sharing explicit knowledge implies:  
- enabling (potential) users to give meaning to the presented from their local practice  
This may result in:  
- initial set of meaningful keywords  
- connection between knowledge, context, process of creation, social aspects  
- additional knowledge as well as voids in the presented | Tool development:  
- Eye-opener workshop |

**5.6 Concluding remarks**

In this chapter we have shown our thoughts and deliberations regarding the development of a web-based tool for storing results of TransForum projects that enables users to learn, called TransLearning. We have made visible the often invisible side of the design process by explicating our thinking by means of Reasoning Loops. In essence, we have done what TransLearning itself aims to do: to show that which is normally hidden, in order for others to learn.

TransLearning is experimental in at least the following ways:
1. it experiments with different ways to capture and communicate learning experiences and results effectively;
2. it experiments with different ways to connect, co-create and manage content together with project participants (and possibly users).
3. it experiments with different ways to induce learning in project participants, potential network members and beyond.

On the basis of our first round of experimentation we can draw the following tentative conclusions regarding the theses phrased in the introduction. First, we resist the temptation to view tacit knowledge as untransferrable through indirect means, but do not revert to the idea of 'explicating' the implicit. Instead we argue that tacit knowledge can be 'captured' by showing how it is manifested in practice. By providing detailed accounts of the project, process, context and choices, vicarious experience may be enabled. Moreover reassessing one's own situation is enabled through providing multiple interpretations of the account (for instance with audiovisual Learning Histories) and a history of changes (for instance with a Learning Timeline). Second, we found that effective sharing of explicit knowledge entails giving potential knowledge users the opportunity to recontextualise knowledge by giving it meaning locally.

Third, the design rationale as developed in this chapter with respect to the sharing of both tacit and explicit knowledge has implications for our thinking about the nature of a 'storehouse' of project results. In the context of Translearning we interpret the function of the 'repository' as follows. Translearning (the Artefact under construction) supports giving meaning to the results of Innovative Projects. It supports articulating results in ways that incorporate the political and social context, as well as
other less tangible aspects. It supports the creation, processing and storage of new understanding and insights. It supports users in learning and developing their competences. Moreover it supports the further development of a non-linear, sustainable Agro Innovation System. In this way, TransLearning can be seen as a concrete manifestation of everything that TransForum itself aspires to be.

In all, with this chapter we have hoped to contribute not only to the conceptualisation of knowledge sharing through web-based environments in and between projects, but also to the process of organising learning and reflection itself as part of communication efforts in and between projects, and even in and between organisations.

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Chapter 6
Conclusions

This thesis aims to contribute to the theoretical clarification of the characteristics of new strategies for sustainable development. It is primarily a conceptual exploration of the concepts of mode-2 intervention strategies, mode-2 communication and mode-2 knowledge production, which at the same time is grounded in practice, through intensive and regular interaction with the intermediaries. It is also a methodological exploration of the conduct and rationale of a mode-2 evaluation strategy that aims to enhance the practice of mode-2 strategies for sustainable development.

6.1 Shedding light on blind spots

In this thesis I have aimed to enhance our understanding of mode-2 approaches to sustainable development by showing and interacting with ‘mode-2-strategies-in-the-making’. In all chapters one proposition was consistently made from a large variety of (academic) perspectives, ranging from science studies and organisational learning to evaluation and design studies. It was argued to open the black box of knowledge production (Latour, 1987), to show theory-in-action as compared to espoused theory (Argyris & Schön, 1974; 1978), to bring to light the tough issues that are normally swept under the rug.
(Kleiner & Roth, 1996) or shoved away under the table (Kunneman, 2006), to show the rationale behind decisions taken (Louridas & Loucopoulos, 2000) and the processes, activities, motives and feelings themselves (Guba & Lincoln, 1989). Thus, in various ways it is suggested that successful strategies (whether for contributing to sustainable development, for monitoring, or for supporting learning) involve shedding light on blind spots, or making the invisible visible. In this thesis, this has been done in a number of ways, making use of the conceptual and theoretical work quoted above.

First, we have closely observed the actions and argumentations of intermediaries with mode-2 aspirations, by taking part in project team meetings, conducting in-depth interviews and facilitating working sessions. This has resulted in the identification of two types of intransigence, or blind spots; one situated in the internal dynamics of intermediaries (there where intervention strategies are devised and conducted) and the other situated at the boundary (there where the new multi-stakeholder practices meet the prevailing institutional settings of their participants). Chapter 4 in particular shows how a transition programme faces the challenge of performing the mode-2 characteristics as prescribed by literature. As Grin et al. (2004) have remarked, “reflexive design [a mode-2 approach] presents institutional and methodical challenges that deserve much more attention than they have hitherto gained.” (Grin et al., 2004: 128). With this thesis I hope to contribute to this as yet underexposed aspect of mode-2

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29 Shedding light on blind spots in no way is meant to suggest that we are able to see and do what others are blind to. On the contrary, in the interactive process of action and reflection, challenges and intransigence are articulated by participants themselves. Moreover, we have been inspired by other scholars who have done valuable work in this area; they are cited in the text.

30 “Apart from some important exceptions – such as Forester’s enlightening reflection on practical experiences (Forester, 1999) and Fischer’s recent insightful theoretical explorations (Fischer, 2003a,b)” (Grin et al., 2004: 129)
strategies for sustainable development, and supplement the work that is done on these issues by others – e.g. on reflexive design by Grin et al. (2004), on boundary work by Metze (2006), on anchorage (Elzen, Leeuwis, & Mierlo, subm.).

Second, as a result of this underexposed but crucial aspect of mode-2 strategies for sustainable development, we have embarked on developing a way to contribute to the practice of mode-2 strategies by means of monitoring & evaluation. The overall aim of the methodology is to bring to the surface the challenges that so often ‘fall out of focus’, in order to understand the pitfalls and to develop strategies to deal with them. Chapter 3 describes the development of this methodology, and its relation to other types of monitoring & evaluation in the field of sustainable development. Chapter 4 is a result of its application. In this way we hope to supplement emerging research on policy learning (Grin & Loeber, 2007; Loeber, Mierlo, Grin, & Leeuwis, 2007), and on reflexive process monitoring (Arkesteijn, Mierlo, & Potters, 2007; Mierlo, Arkesteijn, & Leeuwis, 2007).

Third, we developed tools to share more broadly the often invisible processes behind what is being achieved by innovative projects, mode-2 intermediaries, transition programmes or network managers. These tools uncover, or rather help articulate, the rationale behind decisions, the moments when events do not develop according to plan or expectation and the doubts and uncertainties involved in pursuing mode-2 approaches to sustainable development. As Rip (2006) suggests, we may need to embrace the co-evolutionary understanding of societal and technological development at its core and create narratives about unintended consequences of intermediaries actions. The Dynamic Learning Agenda and the Audio-Visual Learning Histories aim to shed light on what is usually hidden, they expose ‘The making of’. Chapter 5 describes these tools
and moreover exposes in detail the Design Rationale of the design process itself.

In sum, shedding light on blind spots in this thesis refers to:
• learning from the different types of intransigence that become apparent when putting mode-2 approaches to sustainable development into practice (learning about blind spots);
• contributing to accommodating the intransigence met by mode-2 intermediaries through the development and conduct of the Interactive Learning and Action (ILA) monitoring approach (contributing to dealing with blind spots);
• developing and implementing tools to make the invisible visible and employing these tools not only to enhance learning within projects or programmes aimed at system innovation for sustainable development, but also to enhance learning from these endeavours by other intermediaries (network managers, change agents, transition programmes), (exposing blind spots).

And finally, like any other practice, this thesis has shed light on some blind spots but not on others (or rather, inherently created others). It has its own blind spots that may be addressed by future research in the fields of system innovation, transition management, action research, monitoring & evaluation, transdisciplinary research, and science, technology & society studies. In this final chapter I will further describe the contribution of this thesis to shedding light on the blind spots as well as possibilities for future research. This is done by revisiting the research questions as posed in the introduction.
6.2 A mode-2 epistemology

New approaches to persistent problems require the integration of perspectives and knowledge from different stakeholders. This raises epistemological questions:

- What type of knowledge is gained in the process of mode-2 knowledge production?
- How can the (scientific) quality of this knowledge be guaranteed?

Furthermore, in the context of our overall aim a relevant question is:
- What are the implications of this new epistemology for intervention strategies that aim for knowledge cocreation between multiple actors?

I started this research with an analysis of the epistemology of multi-stakeholder collaborative problems solving strategies (Osdorp Complex 50), by exploring the essentially communicative nature of knowledge production. Building on Wittgenstein's later philosophy of language and Wenger's communities of practice we proposed that knowledge is created and given meaning within communities of practice. Mode-2 knowledge production is about interpersonal relations, negotiating meaning and engaging in action. We also brought to the fore the difference between science-in-the-making and science-ready-made as exposed by scholars of science, technology and society (STS). Particularly the idea that scientific knowledge is socially constructed within ‘epistemic cultures’ (Knorr-Cetina, 1999), where context and content merge, fits our understanding of transdisciplinary knowledge production.

In terms of mode-2 strategies for sustainable development, what does my conceptual analysis on the nature of knowledge
and knowledge production imply for the role of scientific knowledge production in the process of addressing persistent problems? And what salient characteristics of mode-2 knowledge production emerge?

Table 6.1 Different perceptions of knowledge in mode-1 and mode-2

<table>
<thead>
<tr>
<th>Assumed role of scientific knowledge (development)</th>
<th>Nature of knowledge</th>
<th>Knowledge integration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode-1</strong> Development of policy relevant or applied knowledge leads to solving societal problems</td>
<td>Focus on ‘science-ready-made’ where scientific knowledge is objective, disembodied and decontextualised</td>
<td>Combining different pieces of knowledge by applying methods for knowledge integration</td>
</tr>
<tr>
<td><strong>Mode-2</strong> Scientific knowledge development is part of the collaborative problem-solving process AND The process is part of scientific knowledge development</td>
<td>Emphasis on ‘science-in-the-making’ where ‘how we know what we know’ is determined by epistemic cultures</td>
<td>Creating a shared community of practice in which new (socially robust) knowledge is developed</td>
</tr>
</tbody>
</table>

Table 6.1 shows the essential differences between a mode-1 perspective on knowledge and knowledge integration and a mode-2 perspective (based on the argumentation in chapters 1 and 2, and partly extended from Regeer and Bunders, 2007). The assumption is that persistent problems, such as those associated with sustainable development, require a mode-2 approach to knowledge development and problem solving, in which knowledge from scientists (both natural and social) and societal actors is integrated. This seemingly complex process, which raises questions of methodology (how do we integrate dissimilar bits of knowledge?) and quality (how scientifically valid can the resulting knowledge be?), is mitigated when we
realise that all knowledge acquisition is rooted in practice. Engagement in a community of practice is the fundamental process by which transdisciplinary knowledge is acquired and given meaning. Just like engagement in an epistemic culture is the fundamental process by which scientific knowledge is acquired and given meaning. Understanding the process of scientific knowledge production from a mode-2 perspective (science-in-the-making) provides ample opportunity to include other actors and create socially robust knowledge (Nowotny, Scott, & Gibbons, 2001).

Further research that follows from here may focus on the conduct of mode-2 knowledge production in the context of funding requirements of large system innovation programmes. In my research I focus mainly on local practices of developing and implementing mode-2 approaches to sustainable development and the tools and actions that may enhance this practice. The projects usually take place in the context of larger system innovation programmes with corresponding funding structures (e.g. ICES/KIS). My research indicates that the requirements of these funds have significant implications for the conduct of mode-2 knowledge production. Further research may provide more insights into hampering and conducive factors of funding structures for successful knowledge co-creation (see also Klerkx & Leeuwis, 2008).

Another topic for further research that came out of the conceptual analysis of the epistemology of mode-2 knowledge production is the need to conceive of a way in which knowledge can have meaning beyond the community of practice in which it was originally developed. This question was taken up in a subsequent phase of the research (see Chapter 5) and will be separately discussed in section 6.5 below.
Recognising that knowing is being part of a community (in which language, action, experience and knowledge are indivisible) implies that epistemology and methodology are inseparably linked to one another. Shedding light on the other side of the coin of mode-2 knowledge production, I will now continue with the implications of this new epistemology for intervention strategies that aim for knowledge co-creation between multiple actors, by considering the essential characteristics of mode-2 intervention strategies.

6.3 Mode-2 intervention strategies

Central to our research are the intermediaries and the intervention strategies they conduct.

- What are essential characteristics of intervention strategies for persistent problems?
- What common blind spots can be formulated on the basis of our research and how can they be accommodated?

The case that was used to illustrate our considerations of an epistemology of transdisciplinary research, Osdorp Complex 50, gives insights into the characteristics of mode-2 intervention strategies, because an epistemology of knowledge co-creation (as opposed to knowledge integration) has implications for the design and pursuit of the process (Chapter 2).

A shared enterprise, open process and genuine interest in each other. In an epistemology of knowledge co-creation, ‘communities of practice’ are the locus of ascribing meaning, acquiring knowledge and devising solutions. A community of practice is characterised firstly by the mutual engagement of participants (rather than for instance a formal structure of a project team); secondly by a joint enterprise which is collectively negotiated by the participants; and thirdly by a shared repertoire of
resources which are created over time to negotiate meaning, including routines, words, tools, ways of doing things, stories, symbols and gestures (Wenger, 1998).

The analysis of the characteristics of the collaborative process at Osdorp Complex 50 supports the idea that good processes are open-ended. No strict conditions had been formulated in advance for the renewal project, allowing for collective problem definition and unforeseen connections. The importance of a project leader who is very capable of leading complex processes like this and listening carefully to tenants and other parties was emphasised by all interviewees. It was furthermore noted that the whole project team was characterised by a genuine interest in other people’s opinions and perspectives. Moreover, there was a shared commitment to dealing with regeneration in a specific way; a shared enterprise had been developed over time.

Even though mode-2 approaches to sustainable development are always about connecting people, these people do not necessarily mutually engage intensively over a longer period of time to be able to interact meaningfully; that is they do not share a community of practice. Indeed, in the case of Osdorp Complex 50, several communities of practice were connected to each other in the process. What can we learn from this process of ‘mediating’ about essential characteristics of mode-2 intervention strategies?

The process of mediating: creating forms of continuity
It was found productive to conceive of the process of mediating as creating various forms of continuity among communities of practice, rather than as translating from one community of practice and back. Through alignment, communities of practice become connected through the co-
ordination of their energies, actions, and practices (Wenger, 1998). For instance, without actually engaging in the practice of producing academic journals, scientists do align their energies and activities with this editorial practice to publish their results. Alignment is about matching deadlines and complying with expectations set by others, but also about belonging to broad systems of styles and discourses, such as political and social movements, or scientific disciplines.

In the case of Osdorp Complex 50, the intermediary created alignment between on the one hand the activities of tenants, and on the other hand the decision-making process and political procedures in relation to the regeneration of their houses. Not by representing their views in design meetings, but by preparing the meetings with the tenants (articulating their views), supporting them in the design meetings (calling for a break), and sending them to council meetings. The project team responsible for the design of the new housing blocks had to actively give meaning to the input of the tenants in their community of practice. Conducive conditions for this appeared to be the open process where ambitions were developed along the way and the genuine belief in the relevance of tenant's knowledge. The analytical point is that the tenants input is not to be conceived of as an external force intruding into the design process, but should rather be understood as “mediated by the communities in which their meanings are to be negotiated in practice” (Wenger, 1998: 85), in this case by the design team. Similarly, the analysis of the TransForum case in Chapter 4 has shown that becoming an effective intermediary implies dealing with the boundary dynamics, which encompasses the development of alignment strategies to handle differences between prevailing modes of governance, knowledge development and assessment procedures, and the aspirations of the intermediary.
In the context of monitoring three TransForum projects it was found again that heterogeneous collaboration does not necessarily imply bringing all parties together in a process of developing a single community of practice (see Hoes, Regeer, & Bunders, 2008). Homogeneous learning spirals (e.g. entrepreneurs developing a shared vision together, or tenants articulating their needs) in which the under-articulated needs of specific actor groups are formulated aid the overall process of collaboration. The heterogeneous collaboration is envisaged as multiple homogeneous learning spirals interacting at a number of points. At these points of interaction, knowledge, values or views developed in the learning spiral of one group of actors is given meaning, or recontextualised, in the learning spiral of another group of actors. Again we see that creating knowledge, understanding and meaning takes place locally, but may be aligned to forces external to the community of practice at stake. Dynamic, open-ended homogeneous learning trajectories appeared particularly conducive to creating alignment.

Both examples show that groups of actors that actively develop their mode of operation in the context of the project (e.g. through homogeneous learning trajectories or through a community of practice), are more conducive to incorporate ‘external’ inputs into their domains than groups of actors that already know what to do\(^{31}\) or than actors that haven’t formed a group at all (see Hoes et al., 2008). Thus, successful mode-2 intervention strategy are developed en route to ensure the possible inclusion of a greater number of actors and aspects.

\(^{31}\) Note here the comparison with Whitley’s (1984) finding that scientific groups with a high task uncertainty (and low mutual dependencies) are more likely to collaborate with external parties than colleagues with low task uncertainty (see also Bunders, 1987; Knorr-Cetina, 1999).
What does the conceptual analysis of intervention strategies for sustainable development implicate for the salient characteristics of mode-2 strategies?

Table 6.2 Characteristics of intervention strategies in relation to problem structure

<table>
<thead>
<tr>
<th>Problem structure</th>
<th>Actors and relations</th>
<th>Intervention strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode-1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Realising sustainability is the objective</td>
<td>Representatives or delegates</td>
<td>Linear process of problem formulation, planning, implementation and evaluation</td>
</tr>
<tr>
<td></td>
<td>Principal-agent relations</td>
<td></td>
</tr>
<tr>
<td><strong>Mode-2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainable development is an ongoing inquiry</td>
<td>Individuals</td>
<td>Emergent design with a focus on internal dynamics and boundary dynamics</td>
</tr>
<tr>
<td></td>
<td>Dispersed control in network</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.2 shows the essential differences between a mode-1 perspective on intervention strategies and a mode-2 perspective (based on chapter 2 and chapter 4, and partly extended from Regeer & Bunders, 2007). Assumptions with respect to the structure of problems are related to perceptions of relevant actors and their relations (see Willems & Regeer, 2009) and have implications for the characteristics of the intervention strategy.

**Internal dynamics and boundary dynamics**

Thus, from the above account of the research presented in this thesis the following preliminary conclusions can be drawn with respect to mode-2 intervention strategies for sustainable development:

- There are conducive conditions such as sharing an enterprise (ambition), an open process and a genuine interest in each other, which we refer to as conditions of the *internal dynamics*. 

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There are conducive conditions such as mediating across boundaries, creating forms of continuity among cultures, groups and practices, which we refer to as conditions of the boundary dynamics. It follows that successful intervention strategies for sustainable development encompass activities in the internal dynamics and activities that enable the successful internalisation of boundary negotiations.

The analysis of TransForum as mode-2 intermediary (Chapter 4) shows that the challenge for emerging intermediaries is not primarily in defining the characteristics of their workings (e.g. the conditions just mentioned) analytically and subsequently adhering to the prescribed description. Rather, the challenge is in developing an identity of, or becoming, a mode-2 intermediary. Particularly, the differences between mode-2 intentions and mode-1 practice (internal dynamics), and between the intermediary and its surroundings (boundary dynamics) need to be accommodated by developing adequate strategies over time. In order to aid this process, we developed the Interactive Learning & Action monitoring approach. It not only aims to find strategies to accommodate the discrepancies between mode-2 intentions and mode-1 practice, but also makes visible the different conditions that constrain sustainable development, e.g. social, political, economic, and institutional factors, and aid their inclusion in strategies for sustainable development. Before I turn to a discussion of the monitoring approach in section 6.4, I make suggestions for further research.

Further research into mode-2 intervention strategies for sustainable development may focus on the following. First, the current research provides the opportunity to further analyse in depth the various strategies conducted in the pursuit of
realising sustainable development. This may lead to the formulation of a generic framework, such as the one proposed by TransForum, provisionally called Shared Value Development (see Boon, Beekman, Regeer, Mager, & Bunders, 2009), or other new insights with respect to particular aspects of the intervention strategies. As already noted in chapter 4, this is to be done against the background of our understanding that generic lessons cannot be determined unambiguously, but that they are constructed over time through multiple and dynamic frames with various configurations of actors.

Second, it has been noted that emerging fields of inquiry lack the shared repertoire of language, tools and paradigmatic examples that established fields do have (e.g. Hirsch Hadorn et al., 2008) and that are essential in furthering the field. Sharing stories, methods and especially examples that are typical for mode-2 strategies for sustainable development is needed. Tools such as the Dynamic Learning Agenda and the mode-2 framework for evaluation may contribute. And specific learning agendas may provide examples that capture quite accurately the types of questions mode-2 intermediaries deal with (an example is provided in chapter 3, fig. 3.4). The extent to which these stories, illustrations and cases may prove to be exemplary can be investigated with the use of tools like the eye-opener workshop. On the basis of this thesis, I hypothesise that typical learning agendas feature tensions between mode-1 routines, structures, expectations and mode-2 practice or aspirations.

Third, because of these tensions, further research may focus on the analysis and proposition of the various alignment strategies that may aid the development of strategies for sustainable development. Recent writings on alignment strategies may contribute to, and may be extended by, this inquiry. Examples are the empirical study on the relationship between radically
novel sociotechnical practices in niches and the mainstream social-technical regimes they seek to influence (Smith, 2006), different forms of anchorage, notably technological anchorage, network anchorage and institutional anchorage (Elzen, Leeuwis, & Mierlo, subm.), and the suggestion to accommodate the interaction between attempts at reflexive governance on the one hand and the cognitive and institutional patterns they create on the other hand, by embracing repair work, opening-up of learning spaces, macro-alignment of actors and anticipation-in-action (Rip, 2006).

6.4 A mode-2 methodology for Monitoring & Evaluation

Mode-2 intervention strategies are not linear processes of problem formulation, project design and implementation. They are more like experimental interaction processes that require cooperation of actors from different institutional backgrounds. Experience shows that conducting mode-2 strategies is not straightforward and continuous learning is required. A mode-2 approach requires a flexible and context sensitive methodology, an interdisciplinary team with interactional expertise of the fields it operates in and competence in project, process and network management. What makes it particularly challenging however, is the power of prevailing modes of operation, institutional structures and incumbent regimes. It is because of hampering conditions, changing circumstances and unexpected effects that a mode-2 intervention strategy is inherently open to flexible adaption. Reflecting and learning are therefore essential features of mode-2 approaches and can be supported through the conduct of monitoring and evaluation.
How can our research contribute to enhancing the reflexivity required by mode-2 approaches to persistent problems?

What monitoring & evaluation approach may shed light on blind spots and make them productive?

The monitoring methodology developed in the course of this research project aims to help mode-2 intermediaries to guide and refine their interventions for sustainable development in ways that incorporate the increased complexity that the challenge of sustainable development entails. The ILA monitoring approach aims to strengthen the intervention strategy by articulating and generating feedback loops that enable actors to learn; individually and collectively. The Dynamic Learning Agenda developed in this context, brings to the fore the conditions that constrain sustainable development (e.g. social, political, economic and institutional factors) as well as strategies to cope with these constraints. As shown before, the latter focus in particular on generating alignment between the conducted strategy and hampering conditions; on internalising boundary negotiations. Thus, the ILA monitoring approach assists mode-2 intermediaries in their efforts to stimulate sustainable development and is as such intrinsically linked to the intervention strategies. A selection of essential characteristics of mode-2 evaluation in comparison to mode-1 characteristics is shown in Table 6.3.

Like mode-2 intermediaries, evaluators too are confronted with external expectations of donors and contractors that may not be congruent with the approach proposed above. Funders, local politicians and research managers may not understand the need for discursively shaping frameworks and indicators for evaluation in collaboration with different stakeholders. And, particularly when a programme progresses towards closure, initial commitment to focus on learning may gradually be
overtaken by the urgent need to show concrete results. Enhancing strategies to combine accountability motives with learning motives for evaluation is a matter for further research.

Table 6.3 Different perceptions of evaluation in mode-1 and mode-2

<table>
<thead>
<tr>
<th>Assumed role of evaluation</th>
<th>Creating a framework</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode-1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support decision-making by providing reliable information</td>
<td>The evaluation framework is based on the goals the programme wants to reach</td>
<td>Indicators can be used to assess progress over time against a stable reference</td>
</tr>
<tr>
<td><strong>Mode-2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsically linked to the intervention process by being part of the iterative process of defining, implementing and adjusting interventions</td>
<td>The evaluation framework is developed through interaction and engagement with participants</td>
<td>Indicators (e.g. in the form of questions on the dynamic learning agenda) do not assess but sensitise and are context dependent and dynamic</td>
</tr>
</tbody>
</table>

Another point of discussion concerns the role of the evaluator in relation to the project. In the context of experiments of ‘reflexive design’ (Grin, Felix, Bos, & Spoelstra, 2004), Bos (2008) has noted that reflection should ideally be done: “by participants themselves, not (only) by a dedicated philosopher, removing the blinds of the unknowing others. We otherwise would relegate the reflective work to dedicated personnel, not only repeating the classical division of labour of modernity, but also risking a highly biased critique, detached from the context in which any technology has to function (cf. Radder 2008).” The ILA monitoring approach is characterised by active engagement and appreciative inquiry, rather than by a detached critical stance. This approach at the same time may carry the risk of losing sight of embedded patterns; creating blind spots. In the ILA monitoring team we address this issue by always being
involved in more than one system innovation project, by involving secondary monitors (ILA monitoring team members) in project activities, by moving back and forth between project issues (i.e. issues on the learning agendas) and system analyses (e.g. those conducted with project directors of TransForum) and by employing tools that enable us to compare, and thereby enrich, our understanding of, the monitoring results of different projects (e.g. collaboratively deliberating on the Dynamic Learning Agendas of different projects in the ILA monitoring team meetings).

6.5 **Mode-2 Communication**

The aspiration of TransForum, and other transition programmes alike, to contribute to sustainable development implies involving different stakeholders, developing the necessary capacities and intervention strategies together and stimulating learning through interaction between various actors. TransForum’s commitment to learning about how to manage, or guide, the complex processes involved in realising sustainable development is tightly, even recursively, linked to its mission. A relevant question that arises is:

- How can we capture lessons learned in such a way that it enables learning by a growing network of people (and institutions) involved in efforts to stimulate sustainable development?

As stated at the start of the study, knowledge acquisition takes place in action, by being part of and simultaneously constituting a community of practice. Hence, learning does not happen via a process of transmitting a message from sender to receiver (see also Leeuwis, 2004). How then are we to conceive of the content and the process of communication?
In Chapter 5, it was argued that the tacit knowledge involved in guiding and managing complex system innovation projects can be ‘captured’ by showing how it is manifested in practice. Through extensive and meticulous description of the time, place, context and culture in which the original process took place, the reader (user, viewer) can make sense of the situation in their own terms. Lessons learned can thus be re-experienced or re-contextualised. Furthermore, specific attention is paid to the articulation of underlying motives, feelings and rationales that have led to the state of affairs as presented. In this way, readers (users, viewers) are enabled to understand how choices were made and make their own assessment of the situation. Learning can thus be induced through providing opportunities for vicarious experience.

The implications, for those capturing learning experiences for wider communication (evaluators, programme managers and communicators alike), are that efforts should focus on 1) the process of articulating underlying rationales, choices and feelings and 2) on the process of reification; creating a (temporary) materialisation of ideas and experiences. During the course of the research, a number of tools and methods was developed (e.g. Audio-Visual Learning Histories, Dynamic Learning Agenda, Learning Timelines, Eye-opener workshop) that aim to enhance collective reflection and mutual sense-making and at the same time make the learning processes tangible.

As a mode-2 approach to sustainable development is seen as an ongoing inquiry in which learning and reflection between and with various stakeholders are essential, the tools, methods and principles are applied by monitors, project leaders and knowledge managers alike. From this perspective we see a convergence of the approaches employed by monitors, project
leaders and knowledge managers in their efforts to enhance sustainable development. Future research could further investigate cross-discipline enrichment by combining insights, methods and experiences from fields ranging from organisational learning, design processes and evaluation to transition management and reflexive governance.

In a similar vein, further conceptual explorations on mode-2 intermediaries as support systems (e.g. De Zeeuw, 1985) and associated role identity and competence, could be applied both to non-human intermediaries, such as web-environments aimed at enabling learning about strategies for sustainable development (or exhibitions, see Bradburne, 2000; Regeer, 2004) and human intermediaries, such as monitors and project leaders of system innovation projects, and at the same time enrich scholarship on communities of practice (Wenger, 1998), intermediaries and boundary organisations (Guston, 2001).

I conclude this thesis by shedding some more light on the essential attributes of these converging approaches, by bringing them in relation to the idea of the discursive nature of sustainable development.

6.6 In conclusion: making the invisible visible

Since the early 1970s, consensus that there are limits to the capacity of the (natural) world to adjust to the increasing use of fossil fuels, production of synthetic materials, and use of natural resources is growing (Meadows et al., 1972; Meadows et al., 2004). With the publication of the Brundtland report in 1987 the concept ‘sustainable development’ was introduced, being defined as ‘meeting the needs of the present without harming the ability of future generations to meet their own needs’ (WCED, 1987). Since its introduction in 1987, the
The concept of sustainability appears to be an example of what has been called an “essentially contested concept” (Gallie, 1956), a “wicked” problem (Rittel & Webber, 1973), an “unstructured problem” (Douglas & Wildavsky, 1982; Hisschemöller & Hoppe, 1996), a persistent problem (Loorbach, 2007) or an inherently complex reality (Funtowicz & Ravetz, 1993). Whilst there is a widespread understanding of, and agreement on, the abstract idea of sustainable development (being a combination of the conservation of natural resources, quality of life issues, and a commitment to future generations), there is continuous disagreement not only about the extent of the problem, but also about the actual problem definition and possible approaches to its resolution. The diversity of views, interests and values could be seen as a threat to a coherent and uniform strategy to resolve the variety of related problems residing under the banner of sustainable development. However, accepting rather than regretting the multiple views of sustainability can provide us with new ways for addressing the present challenges. Various scholars have embraced the view of sustainable development as a discursive field rather than as a set of ‘wicked’ or unstructured problems. Keulartz (2005) emphasises the ability of the concept of sustainable development to unite diverse and often divergent perspectives and objectives. Becker et al. (1997: 12) state that the discursive nature of sustainable development allows for the articulation of differences and offers possibilities to link social and ecological debates.

In line with the approach proposed in this thesis, I do not consider discourse primarily as ‘discussion’, but rather assume a constitutive relation between language, experiences and knowledge. This position recognises the central role of language in, not only describing the world, but actually shaping the world. Hence the discursive nature of sustainable development...
refers to the idea that an evolving set of concepts, ideas, and terms structure the opportunities for and challenges to sustainable development. Analysis may become part of an effort to provide the interpretative spaces needed to induce sustainable development (Hajer & Laws, 2006: 264).

With the research presented in this thesis I have aimed to provide and enhance interpretative spaces by the simultaneous processes of opening-up (highlighting the often unarticulated assumptions and bringing to the fore the tough questions) and closing-down (the reification of the lessons and underlying struggles in concrete forms). In the introduction I argued that the distinction between mode-1 science and mode-2 knowledge production is not a distinction between two different modes of knowledge production existing alongside each other, but rather that the fuzzy and uncertain process of knowledge production (mode-2; made visible through studying science-in-action) is reified into an image of science as provider of objective knowledge and certainty (mode-1).

In a similar vein I have shed our light on intermediaries-in-action in an effort to describe the fuzzy and uncertain process of devising and conducting intervention strategies for sustainable development. Explicating and unveiling the assumptions underlying these efforts provided the interpretative spaces needed to develop strategies for coping with the intransigence met at different levels and locations. In their turn, intermediaries themselves found that in their intervention strategies, moving from strategies-ready-made to strategies-in-the-making (by turning strategy into quest) proved conducive to generating energy, aiding the development of agency, and mobilising actors. Thus, through an interactive process of deliberation and dialogue, new understandings of sustainable development are developed and aligned with local
and institutional contexts. In this way, by making visible what is usually hidden, mode-2 approaches contribute to sustainable development-in-action.

In all, this book offered a conceptual-methodological exploration of approaches (whether intervention, monitoring, or communication) aimed at enhancing the efforts of the many practitioners who contribute to the pursuit of sustainable development in the face of continuing change.

References


CHAPTER 6


CONCLUSIONS


Samenvatting

Het onzichtbare zichtbaar maken

Analyse van strategie-ontwikkeling en van nieuwe manieren van kennisproductie voor de aanpak van hardnekkige problemen op het gebied van duurzame ontwikkeling

Inleiding

In de huidige samenleving worden we op allerlei vlakken geconfronteerd met hardnekkige problemen: milieuproblemen als gevolg van industrialisatie, problemen met voedselveiligheid in de voedingsketen, wachttijsten in de gezondheidszorg, etc. Deze problemen zijn niet eenvoudig op te lossen. Er is samenwerking nodig van meerdere partijen die onderling verschillen in belangen, visies en behoeften; wat voor de één een oplossing is, creëert voor de ander juist een probleem. Ook is er bij dit type hardnekkige problemen vaak onenigheid over de feiten en bestaat er verschil tussen de waarden waarvanuit men handelt.

Dit speelt allemaal een rol bij het oplossen van problemen rondom duurzame ontwikkeling, waarop ik mij in dit proefschrift richt. Duurzame ontwikkeling vraagt om veranderingen op vele niveaus en in meerdere systemen; ecologische, economische, politieke, wetenschappelijke en maat-
schappelijke. Daarbij moeten vaak keuzes en afwegingen gemaakt worden die radicaal verschillen van de gangbare manieren van doen en waartegen derhalve een flinke weerstand kan bestaan. Ook zien we dat het ontwikkelen van specialistische kennis op deelgebieden van het probleem onvoldoende mogelijkheden biedt om de beoogde veranderingen te realiseren. Er wordt daarom in toenemende mate gepleit voor een andere benadering van hardnekkige problemen en een andere rol van wetenschappelijke kennisontwikkeling daarin.


De noodzaak voor dit type betekenisvolle en praktijkgerichte interacties wordt alom gevoeld. Tegelijkertijd zien we dat ‘integrale’, ‘participatieve’ of ‘interactieve’ projecten in werkelijkheid vaak minder verschillen van de reguliere

**Waar theorie en praktijk elkaar ontmoeten**

Het onderzoek dat in dit proefschrift wordt beschreven, bevindt zich op het snijvlak van theorie en praktijk. Het heeft tot doel:

- bij te dragen aan de theoretische verheldering van kenmerken van mode-2 benaderingen van hardnekkige problemen op het gebied van duurzame ontwikkeling;
- bij te dragen aan een beter begrip van, en omgang met, de weerbarstigheden die zich voordoen in de praktijk van deze nieuwe benaderingen.

De nieuwe aanpakken moeten:
• duurzaam zijn, zodat toekomstige generaties niet lijden onder de keuzes die we vandaag maken;
• verschillende soorten kennis betrekken (wetenschappelijke, technologische, maatschappelijke, en vaardigheden);
• verschillende partijen (bedrijven, kennisinstellingen, maatschappelijke organisaties en overheden) betrekken om ervoor te zorgen dat alle relevante aspecten (bestuurlijke, organisatorische en technologische) meegenomen worden.
Omdat het veranderingen betreft op meerdere niveaus, en koppelingen van meerdere systemen, wordt er gesproken over systeeminnovaties.

Kortom, deze systeeminnovatieprogramma's hebben mode-2 ambities, in ieder geval op papier. Maar hoe werkt dat nu in de praktijk? Om die vraag te beantwoorden heb ik verkennend onderzoek verricht naar het programma Duurzame Stedelijke Vernieuwing van het NIDO (Nationaal Initiatief Duurzame Ontwikkeling, uit de tweede ICES/KIS ronde) en diepgaander onderzoek naar het programma TransForum, gericht op een duurzame ontwikkeling van de landbouw en groene ruimte (uit de huidige ICES/KIS ronde, ook wel BSIK genaamd, naar het Besluit Subsidies Investeringen Kennisinfrastructuur). Daarbij heb ik ook gekeken naar de praktijkprojecten die worden ondersteund door deze programma's. Ook die projecten hebben mode-2 ambities; ze beogen een blijvende verandering naar een meer duurzame wereld te bewerkstelligen door actoren met elkaar te verbinden in gezamenlijke kennisontwikkelings- en leerprocessen. Bijvoorbeeld door bewoners actief te betrekken bij de renovatie van naoorlogse woonwijken, door de zorgsector te verbinden aan de landbouwsector waardoor zorgcliënten op de boerderij kunnen werken, door overheden, bedrijfsleven en kennisinstellingen gezamenlijk invulling te laten geven aan een
regionale visie en ontwikkeling van een zogenaamde 'Greenport', door lokale industrie, landbouw en woningbouw aan elkaar te koppelen waardoor vrijgekomen energie (warmte) of CO2 elders kan worden gebruikt, of door producten van de boerderij rechtstreeks aan consumenten te verkopen, waardoor duurzame relaties tussen de herkomst van groenten of fruit en consumenten opnieuw gelegd worden.

Ik heb dit onderzoek verricht vanuit de functie als 'monitor' bij deze systeeminnovatieprojecten en -programma's voor duurzame ontwikkeling. De term 'monitor' wordt gebruikt voor een onderzoeker die participeert in het proces, naast de programma- of projectleider en deelnemers, en die tegelijkertijd generieke lessen trekt uit de observaties, gebeurtenissen en ervaringen. Deze generieke lessen worden weer in het proces gebracht waardoor een voortdurende wisselwerking ontstaat tussen de theorie en de praktijk van mode-2 strategieën van duurzame ontwikkeling. Bij dit type participatief onderzoek is het traditionele onderscheid tussen de onderzoeker en het onderzochte, tussen objectieve kennis en subjectieve beleving, tussen hypothese en resultaat, niet langer vanzelfsprekend. Het ontwikkelen van een methodologie die zowel maatschappelijk als wetenschappelijk robuust is, maakt een belangrijk onderdeel uit van het onderzoek en dit proefschrift (zie hoofdstuk 3).

Dit onderzoek resulteert in nieuwe inzichten in de kenmerken van mode-2 benaderingen, in termen van de perceptie op kennisontwikkeling (hoofdstuk 2) en interventiestrategieën door intermediairen (hoofdstuk 4). Daarnaast levert dit onderzoek nieuwe instrumenten en methodieken op om het leren in de praktijk van intermediairen op het gebied van duurzame ontwikkeling te bevorderen (hoofdstuk 3) en de geleerde lessen op zo'n manier te communiceren dat anderen
er daadwerkelijk van leren (hoofdstuk 5). Het onderzoek kan derhalve getypeerd worden als een conceptueel-methodologische verkenning naar mode-2 strategieën voor duurzame ontwikkeling.

Kenmerken van mode-2 strategieën voor duurzame ontwikkeling

Mijn onderzoek is gericht op intermediairen die actief pogen kennisintegratie en commitment rondom een probleem-oplossingstraject tot stand te brengen. Hoe kunnen gezamenlijke leerprocessen georganiseerd worden waarin verschillende actoren door uitwisseling van impliciete en expliciete kennis, nieuwe kennis en oplossingen ontwikkelen? Er is hierbij geen sprake van concrete problemen die met welomgeschreven methodieken aangepakt kunnen worden. Het gaat om hardnekkige problemen, waarbij de betrokken en betroffen actoren velerlei zijn, en er geen overeenstemming is over wat het probleem precies is, laat staan wat de meest geëigende manier is om het aan te pakken. Een eenduidig stappenplan of handleiding voor een mode-2 benadering van hardnekkige problemen is niet te maken. Wel is het mogelijk een aantal cruciale elementen te noemen.

De methode voor een mode-2 benadering hangt samen met het perspectief op kennisontwikkeling en kennisintegratie (of kenniscreatie) dat ik in dit proefschrift ontwikkel, voortbouwend op het werk van anderen (zie hoofdstuk 2). Dit perspectief behelst dat wij kennis verwerven, en betekenis geven aan deze kennis, door deelname aan sociale praktijken, ook wel 'communities of practice' genoemd. Een 'community of practice' wordt gekarakteriseerd door wederzijdse betrokkenheid van de deelnemers (in plaats van een formele structuur van een project team), door een gezamenlijk doel dat
door alle deelnemers samen is bepaald, en ten slotte door een gedeeld repertoire van middelen die na verloop van tijd ontstaan om betekenis te verlenen (ofwel kennis te creëren), zoals routines, woorden, instrumenten, manieren van doen, verhalen, symbolen en gebaren. Kennisontwikkeling is een communicatief proces dat plaatsvindt binnen een gedeelde praktijk. Bovendien zijn kennis, communicatie en handelen onlosmakelijk met elkaar verbonden; ze creëren elkaar. Vanuit dit perspectief kan kennis niet los worden gezien van praktijk of context, maar wordt kennis verworven of krijgt het betekenis binnen een gedeelde praktijk. In de monodisciplinaire kennisontwikkeling die plaatsvindt door wetenschappers aan universiteiten is dit niet anders – observaties en experimenten vinden plaats in en worden gewaardeerd binnen zogenaamde epistemische culturen.

Dit perspectief op kenniscreatie heeft consequenties voor het handelen van mode-2 intermediairen, die kenniscreatie door verschillende actoren willen bevorderen teneinde duurzame ontwikkeling te stimuleren (zie hoofdstuk 4). De intermediairen uit mijn onderzoek zijn niet zozeer te karakteriseren als bruggenbouwers, die verschillen overbruggen tussen losstaande werelden (van bijvoorbeeld de wetenschap, overheid, bedrijfsleven, maatschappelijke organisaties) of afstemming daartussen organiseren. Uit mijn onderzoek blijkt dat mode-2 intermediairen eerder te zien zijn als 'change agents' die interactie tussen mensen uit die verschillende werelden organiseren, waardoor nieuwe kennis en betekenis wordt gegenereerd. Deze intensieve interacties hebben ook effect op de modus operandi van die verschillende werelden – de gangbare 'manier van doen' wordt uitgedaagd waardoor ruimte ontstaat voor verandering op systeemniveau. Bovendien maakt een intermediair als 'change agent' zelf ook onderdeel uit van het veranderingsproces.
In de wetenschappelijke literatuur bestaan aanwijzingen voor het handelen van een dergelijke intermediair. Deze intermediairen voeren geen vooraf vastgesteld plan uit, maar organiseren interactie tussen verschillende actoren. Ze sturen niet door middel van criteria en regels, maar door het stimuleren van leren door experimenteren, reflecteren, demonstratieprojecten, etc. Zij houden het heft niet in eigen hand door de juiste antwoorden al te weten, maar mobiliseren anderen door de juiste vragen te stellen. Het ontwerpen van een mode-2 aanpak is kortom een interactief en iteratief proces waarin de intermediair continu afwegingen maakt over interventies en in te zetten instrumenten. De ervaring leert dat dit allesbehalve eenvoudig is. Het vereist een flexibele en contextgevoelige methodologie, een interdisciplinair team met interactionele expertise van de velden waarin het werkt, en competenties in project-, proces- en netwerkmanagement. Maar wat het vooral moeilijk maakt is de kracht van gangbare manieren van werken, institutionele structuren en bestaande systemen. Door de tegenwerkende condities, veranderende omstandigheden en onverwachte effecten is een mode-2 interventiestrategie inherent dynamisch en adaptief. Daarom maken reflectie en leren onlosmakelijk deel uit van een mode-2 aanpak. Leren en reflecteren kunnen worden ondersteund door een bijpassende monitorings- en evaluatiemethodologie.

De mode-2 monitoringsmethodologie die ik, samen met anderen, heb ontwikkeld tijdens dit onderzoek heeft tot doel mode-2 intermediairen te helpen met het ontwikkelen van hun interventies, waarbij de complexiteit die samenhangt met de uitdagingen van duurzame ontwikkeling wordt meegenomen (zie hoofdstuk 3). Door deel te nemen aan vergaderingen van projectteams, door diepte-interviews en door de ontwikkeling en begeleiding van specifieke werksessies, werden de weerbarstigheden in de praktijk van intermediairen met
mode-2 aspiraties zichtbaar. De in dit onderzoek ontwikkelde Dynamische LeerAgenda helpt bij het zichtbaar maken van deze worstelingen en bij het genereren van 'feedback loops'.

De Dynamische LeerAgenda is een instrument om de uitdagingen van systeeminnovatieprogramma's en -projecten te formuleren, vast te leggen en door de tijd heen te volgen (zie ook hoofdstuk 3). Het geeft inzicht in de uitdagingen die zich gedurende het proces voordeden, hoe deze zijn opgepakt en welke veranderingen deze interventies tot gevolg hadden (dit laatste wordt zichtbaar door het verdwijnen of veranderen van leervragen op een bepaald aspect). De Dynamische LeerAgenda is niet alleen een concreet document (een kort document met de leeragenda), het is vooral een instrument om het gesprek over de uitdagingen waar het project voor staat te ondersteunen en te entameren en het leerproces ten aanzien van de uitdagingen te visualiseren.

De analyse van TransForum als mode-2 intermediair met behulp van deze monitoringsmethodologie laat zien (in hoofdstuk 4), dat de uitdaging voor nieuwe intermediairen niet primair gelegen is in het analytisch definiëren van een aanpak, op basis van beschikbare wetenschappelijke kennis, en het vervolgens uitvoeren hiervan. Daarvoor zijn de problemen rondom duurzame ontwikkeling te complex en de effecten van handelingen in een samenspel van meerdere actoren te onvoorspelbaar. Bovendien kan van geen van de medewerkers worden verwacht dat zij de finesses in de vingers hebben van zo een nieuw fenomeen. De uitdaging is vooral gelegen in het ontwikkelen van een identiteit van een mode-2 intermediair, door het actief pogen tot handelen als mode-2 intermediair en het reflecteren op de effecten daarvan. Dan blijkt dat er voortdurend verschillen zijn tussen mode-2 intenties en de mode-1 uitvoering (interne dynamiek). Ook heeft een mode-2
intermediair te maken met een grensdynamiek (betreffende de betrokken deelnemers, hun institutionele setting en de wijdere context). Bij het aanpakken van hardnekkige problemen op het gebied van duurzame ontwikkeling op een mode-2 manier, krijgt men te maken met instituties, regels, werkwijzen en opvattingen die niet congruent zijn met de mode-2 aanpak. Men kan dus eigenlijk al anticiperen op deze spanningen: ze zijn onvermijdelijk.

Het omgaan met deze verschillen en het ontwikkelen van strategieën op maat, maakt inherent onderdeel uit van de doelen, taken en vaardigheden van een mode-2 intermediair. Er moet dus gelijktijdig (of afwisselend) worden gewerkt aan een creatief en innovatief proces op programma- of projectniveau (het ontwikkelen van een nieuwe 'community of practice'), en aan de inbedding en draagvlakverwerving op institutioneel niveau (het creëren van aansluiting tussen de nieuwe praktijk en de reeds bestaande praktijken in de omgeving van deelnemers). Een mode-2 monitoringsmethodologie beoogt hieraan bij te dragen. Bovendien geeft het nauwgezet vastleggen en volgen van deze spanningen inzicht in de verschillende omstandigheden die duurzame ontwikkeling belemmeren, bijvoorbeeld maatschappelijke, politieke, economische en institutionele factoren, en in de mogelijke strategieën om met deze belemmeringen om te gaan.

Het onzichtbare zichtbaar maken

Met de beschreven monitoringsmethodiek wordt leren door een intermediair bevorderd door het articuleren en expliciteren van de weerbarstigheden, spanningen en afwegingen die ten grondslag liggen aan de voortdurend veranderende interventiestrategie. Wat normaal gesproken onzichtbaar blijft, of oplost in het verleden, wordt op deze
manier zichtbaar gemaakt. Dit gebeurt in regelmatige interactie tussen intermediair en monitor, in de gedeelde praktijk die hiermee ontstaat, waardoor niet alleen de onderzoeker (monitor) nieuwe inzichten verwerft, maar leren juist ook plaatsvindt bij de andere deelnemers van het proces.

Een relevante vraag die zich voordoet is: hoe kunnen we de opgedane lessen vastleggen, op zo’n manier dat het het leren bevordert van een groeiend netwerk van mensen die duurzame ontwikkeling middels mode-2 strategieën nastreven, zonder dat zij hebben deelgenomen aan de betreffende praktijken (zie hoofdstuk 5). Ik heb beredeneerd dat de impliciete kennis die mode-2 intermediairen inzetten, niet zozeer geëxpliciteerd moet worden, maar getoond moet worden zoals het zich voordoet in de praktijk. Juist door het nauwkeurig vastleggen van de tijd, plaats, context en cultuur waarin een ontwikkeling plaatsvond, kunnen buitenstaanders zelf betekenis geven aan het proces. De geleerde lessen kunnen dan in een nieuwe context een eigen betekenis krijgen. Als ook onderliggende motieven, gevoelens en redeneringen worden getoond kunnen buitenstaanders begrijpen hoe keuzes werden gemaakt en hun eigen situatie beter beoordelen.

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