

# **Reflexive Governance: Learning to cope with fundamental limitations in steering sustainable development**

*Jan-Peter Voß<sup>a</sup> and René Kemp<sup>b</sup>*

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<sup>a</sup> Öko-Institut for Applied Ecology, Germany  
Novalisstr. 10  
D-10115 Berlin  
Germany  
Tel +49(0)30 280486 62  
Fax +49(0)30 280486 88  
[j.voss@oeko.de](mailto:j.voss@oeko.de)

<sup>b</sup> MERIT, Maastricht University, TNO and DRIFT (NL)  
P.O. Box 616  
6200 MD Maastricht  
The Netherlands  
Tel 31(0)43 3506305  
[r.kemp@merit.unimaas.nl](mailto:r.kemp@merit.unimaas.nl)

## **Abstract**

Sustainable development is a second-order problem of governance – a side-effect of past choices and attempts at steering. How can governance solve a problem of which it is a part? The perspective of reflexive governance helps to recognise this by viewing societal steering as embedded in ongoing dynamics of socio-ecological change. This yields insight to specific conditions of steering in the dimensions of goals, knowledge, and power. Five reflexive strategies can be derived to modulate recursive feedback between distributed steering activities – through integrated knowledge production, adaptive strategies and experimentation, iterative, participatory goal formulation and interactive strategy development. An important element of reflexive governance is the opening-up of governance processes for interaction with their context. At the same time closing down is needed for collective action. Different types of working with this „efficacy paradox“ are discussed.

## **Keywords**

Governance, reflexive modernisation, complexity, strategy, efficacy paradox

# 1 Introduction

Many of the problems with which modern societies are struggling are the unintended result of past choices and attempts at steering. Ecological degradation, technological risk, and disparate life chances across the globe are the unintended outcomes of choices of business and government. They are not caused by external events or natural necessity but are directly attributable to human reasoning, social organisation and technological development that shape industrial development. By the end of the twentieth century accumulated malpractice raises concerns about how societal development itself can be sustained at all. The need for a shift towards another, more robust path of development is being stipulated. This task constitutes a conundrum: If steering is part of the problem, how can steering solve the problem? Or: How does governance look like that addresses the failure of governing?

As an attempt at answering these questions we develop the notion of reflexive governance. It comprises practices of governing that are concerned with the preconditions for their own working – one of them being the embedding of steering activities within societal development itself, the very same process that is to be governed. This necessarily means that governing feeds back on itself. This can be ignored by adopting a perspective in which governing actors see themselves as outside and detached from the processes they govern or it can be worked with by making use of their embedding for interactive learning. The latter option is investigated in this paper. This is done by scrutinizing processes of problem definition, goal formulation and strategy implementation with respect to the limitations for rational steering that appear when governance is viewed as socially embedded. These limitations are characterized by complexity, ambivalence and distributed power. They lead into a new understanding of governance as the modulation of ongoing interactions and feedback relations for open-ended systemic learning rather than achieving defined ends and striving for control.

We develop the concept of reflexive governance with reference to the problem of sustainable development as a fundamental and very “wicked” problem of modernisation (Rittel, Webber 1973). We take the interconnected issues of complexity, uncertainty, path-dependence, ambivalence and distributed control as a starting point to characterise the governance problem of sustainable development. A reflexive understanding of governance leads to the general guideline that governing processes should be opened up for interactions and feedback relations which reflect their embedding in social, technical and natural contexts. Since they

are effectively influencing the outcome of steering strategies, anyhow, once they are implemented in real world contexts, they can as well serve to generate adapted responses, robust strategies, and, eventually, sustainable development. On this behalf we propose particular strategies of reflexive governance that could prevent societal development from being undermined by unintended detrimental effects of steering activities by different actors. The six strategies are: 1) problem definition by means of integrated knowledge production, 2) finding adequate options by experimenting and keeping strategies and institutions adaptive, 3) defining goals through iterative, participatory processes in which diverse societal values are represented, 4) appraising options by anticipation of their possible indirect and long-term effects on system dynamics, 5) strategy implementation by involving influential actors already in the process of strategy development. Brief illustrations of the strategies show that they are not mere theoretical construction, but that they are “for real”: Instances of governing practice which reflect their general idea can already be found in various corners of empirical reality, such as participatory technology assessment, foresight processes, policy integration, and transdisciplinary research. With reflexive governance we add a perspective in which these strategies do not only appear as peculiar developments within their respective problem areas, but as a more widespread tendency to extend the range of factors which are considered relevant for problem definition, goal setting and strategy development – i.e. to open up governance processes to the contextual interactions in which they are embedded.

In the second part of the paper we follow a second line of thought which is prompted by the stipulated need to open up governance in order to adequately respond to the problem of sustainable development. In this respect we introduce the *efficacy paradox* of reflexive governance and discuss ways to govern sustainable development. The efficacy paradox refers to the contradicting requirements of opening-up and closing-down in social problem-handling: On the one hand processes of problem-definition, goal setting and strategy development need to be opened up for the interaction of diverse factors, values and interests, because they may prove relevant for the effect of strategies when implemented in real world settings. In order to produce robust knowledge and strategies system boundaries need to be widened, governance processes need to be embedded in their system context. On the other hand, selection of relevant factors, weighting of conflicting values and convergence of interests is necessary to take decisions and act. Here lie limits for what can be practically handled. Strategies for opening up therefore need to be complemented and balanced with

appropriate strategies to close down, i.e. reduce complexity and achieve stable strategies.

At the end of the paper we give a short summary of our arguments and discuss the desirability and feasibility of reflexive governance as a meta-model of governance.

## **2 Sustainable development as a problem of governance**

A useful starting point in discussing sustainable development is the long-standing definition of the Brundtland Commission about “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987) which is accepted everywhere as a general normative orientation. Attempts have been made at operationalising this general concept by demanding equal consideration of various dimensions of development in strategy making - such as ecological, economic and social issues. But when it comes to implementation in the context of daily practices the concept seems to dissolve into nothing more than rhetoric which disguises well-known conflicts about concepts, goals and instruments that have dominated societal action in problem areas such as energy and transport and agriculture and housing for the preceding decades.

A wide-spread attitude (at least among ecologists and economists) is that the concept of sustainability does not add anything new for practical problem treatment. It is said that the new parameter of political decision making that was introduced by the concept of ecological carrying capacity is now watered down by the concept of sustainability (cf. Matthes 2002). Under the heading of sustainability the organisational and technological set-up of modern society is said to be reproduced and developed with all its ambivalences (Conrad 1997). The vague label diffuses concrete challenges and allows particular interest groups to row back under the veil of sustainability from responsibilities and commitments which they have been urged into through intense public argumentation and political struggle before. For many, sustainability is an empty phrase at best and a Trojan horse for a redefinition of the public interest by a powerful few at worst. This paper takes a different standpoint. It argues that the multi-dimensional and dynamic concept of sustainability (Rammel, van den Bergh 2003; Kemp et al. 2005; Farrell et al. 2005) has fundamental implications for the governance of modern society: It furthers a widening and shifting of the system boundaries within which factors and actors are considered relevant for certain strategy processes.

The systemic and long-term nature of social, economic and ecological developments that are at the outset of sustainable development bring interactions to the front that have so far been

ignored in daily decision making. The interaction of industrialisation in the North on development opportunities in the South and the interaction between economic production and ecological dynamics are examples in case. Complexity and uncertainty emerge as key issues in such a context. Sustainability cannot be translated into a blueprint or a defined end state from which criteria could be derived and unambiguous decisions be taken to get there. Within this view, sustainability “refers to a process and a standard—and not to an end state—each generation must take up the challenge anew, determining in what directions their development objectives lie, what constitutes the boundaries of the environmentally possible and the environmentally desirable, and what is their understanding of the requirements of social justice” (Meadowcroft 1997, p. 37).

But this challenge can not be taken up through scientific analysis and policy approaches aimed at achieving predetermined outcomes. The uncertainty about cause and effect relations and feedback between steering activities and the dynamics of social, technological and ecological development defy such an exercise. Sustainability calls for new forms of problem handling, in which feedback from the real world context in which strategies shall work is injected into governance. This must happen in anticipatory manner, by opening up the institutional arrangements in which problems become defined, goals are being set and strategies developed. The normative content of the concept sustainable development thus becomes articulated through the procedures in which social development is governed, rather than through a predefined blueprint for the future state of society. For reasons argued more extensively in the next section, sustainability should be understood as a specific type of problem framing and respective institutional arrangements and procedures for problem treatment which emphasise the interlinking of different problems and scales, as well as long-term and indirect effects of actions that result from it. In this paper we set out to explore these new modes of societal problem treatment under the heading of “reflexive governance”.

### **3 Reflexive governance**

Beck has coined the term *reflexive modernisation* for the *self-confrontation* of society with risk bearing outcomes of its own working: “Risk society (...) designates a development phase of modern society in which the social, political, economic and individual risks increasingly tend to escape the institutions for monitoring and protection in industrial society (...). It arises in the continuity of autonomized modernization processes which are blind and deaf to their

own effects and threats (...) Then ‘reflexive modernisation’ means self-confrontation with the effects of risk society that cannot be dealt with and assimilated in the system of industrial society” (Beck 1994, 5-6). In response, society builds up capacities for repair and adaptation. Environmental policy, development aid, technology assessment, and social policy are examples. The notion of reflexive modernisation captures this dynamic through a re-conceptualisation of society as spiralling around itself, stumbling over its own feet and being busy with self-created problems – rather than progressing towards ever better mastery of the social and the natural world. The governance implications of the idea of reflexive modernisation however remain largely undeveloped. By introducing the concept of reflexive governance this paper represents an attempt at picking up this thread and spin it further.

Reflexive governance is a new concept. Before defining it, it is useful to discuss the preconceptions behind it. A characteristic of reflexive governance is that it is concerned with itself – its working within the context of societal development and the specific potential and limitations that result from it. *It understands itself to be part of the dynamics which are governed.* This means that also governance processes themselves can become the object of shaping strategies. Broader dynamics, which are not usually considered to be part of governance, are acknowledged to play an important role in shaping societal development. They therefore become part of governing. Science and public discourse contribute to the way in which problems are perceived. Informal institutions and networking, as well as technological development contribute to the development of particular options for action. Reflexive governance acknowledges that governing activities are entangled in wider societal feedback loops and are partly shaped by the (side-) effects of its own working (see Figure 1).

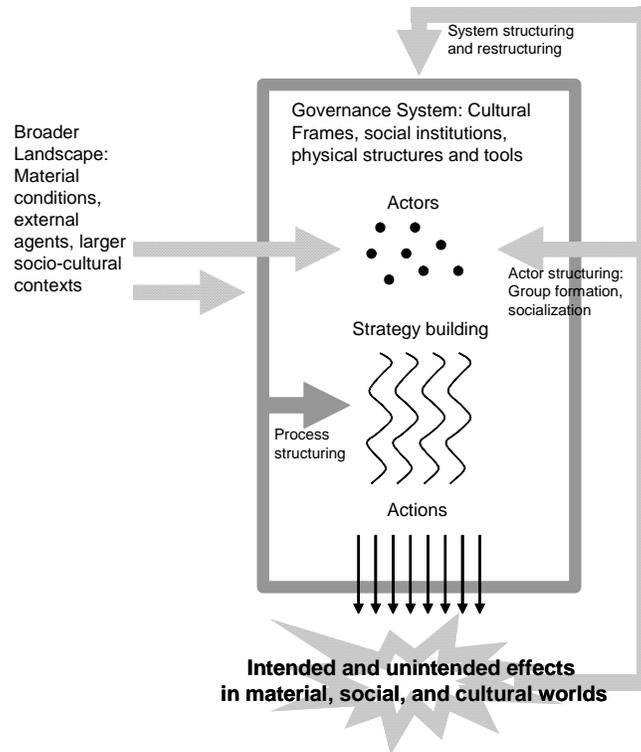


Figure 1: Embedded governance, adapted from Burns and Flam (1987:4)

Reflexive governance incorporates such feedback by opening problem-handling processes for diverse knowledge, values and resources of influence in order to learn about appropriate problem-definitions, targets and strategies of governance for sustainable development. By crossing conceptual and institutional boundaries in drawing together information, opinion and resources for steering, new reflexive forms of governance aim at incorporating possible feedback from steering activities already in the process of strategy development. Examples for such feedback can be climatic change due to a modification of the atmosphere, it can be public resistance towards policies or technology because they breach certain values, or it can be failure in implementation because support cannot be gained by actors who hold important resources. Incorporating feedback by opening up the process of governance for the various actors and factors that may be concerned is to avoid “steering externalities” (i.e. effects which are not taken account of by any particular rationality that guides steering efforts). As such reflexive governance is about the organisation (modulation) of recursive feedback relations between distributed steering activities.<sup>1</sup> In this paper we make first steps to articulate the

concept by elaborating some theoretical aspects and pointing out practical ways of how it can be put in practice.

### **3.1 Rational problem-solving as a problem**

With reference to the notion of reflexive modernisation as developed by Beck (1994) the reflexivity of governance includes the possibility that certain governance patterns undermine themselves by inducing changes in the world which affect their own working. Rational problem-solving as a guiding orientation for governance in modern societies is becoming a problem. The idea of rationalist problem-solving rests on the assumption that the analysis of system dynamics yields predictions about the effects of alternative options, that weighting of values allows for a precise definition of goals and assessment of options, and that thoughtful leadership makes it possible to implement chosen strategies through powerful interventions and sophisticated control systems. A central feature of this kind of problem-solving is to eliminate uncertainty, ambivalence and interference of uncontrolled influence. On the basis of this problem-solving approach it was possible to achieve tremendous technological developments, sophisticated patterns of social regulation and a high economic efficiency of production. The trick is simple: In order to decide and act rationally one needs to single out, to blend away, to concentrate the perception on a specific slice or dimension of complex reality, i.e. to select relevant elements, linearise cause-effect chains, put goals in hierarchical order, and divide responsibilities. This is a pattern of productive reduction of complexity which is behind modern science, technology development, bureaucratic organisation, project management, policy making and broader patterns of social organisation such as the differentiation of functional subsystems for economics, law, science, politics etc. (cf. Luhmann 1990; Schimank 1996; Mayntz 1999). This problem-solving approach yields tremendous powers because it constructs a multitude of specialised world views which allows for the generation of pointed purpose, concentration of action capacities, and control over processes within the system boundaries thus defined (Schimank 1988). At the same time, however, this kind of problem-solving goes hand in hand with the causation of unintended consequences (Dörner 1989; Böhret 1990). The more the process of problem-solving is disengaged with the full messy intermingled natural reality, but oriented towards the worlds of specialists, the larger is the share of interdependencies and dimensions of context, which are ignored in developing and implementing of what appears as solutions. The more evasive

such kind of ‘problem-solving’, the more effective it becomes with respect to particular instrumental purposes, the stronger become the impacts of unintended consequences.

### **3.2 Second-order problems**

These impacts are perceived, either from the perspective of other specialised problem orientations (as “externalities”) or from within the problem-solver perspective (as “side effects” or “repercussions”). Interference between different policy departments such as transport and environment or corporate departments such as R&D and marketing are examples in case, as well as traffic congestion, technological risks, environmental problems and individualisation as results of industrialisation. In any case these unintended consequences cause new problems and often more severe problems which are more difficult to handle, because they require leaving the straightforward problem-solving according to specialised purpose, world view and skill. These problems can be called problems of a second order (Jahn, Wehling 1998). Sustainability is one, if not *the* second-order problem of modernist problem-solving. Second-order problems successively work to disrupt the structure of modernist problem-solving, because in order to get a hold of them – to reconstruct them cognitively, to assess them and to get competences together to act on them - they require to leave the isolation of instrumental specialisation, to widen filters of relevance, trade off values, engage in interaction with other specialists, in short, to transgress cognitive, evaluative and institutional boundaries. In this way, the modernist problem-solving approach becomes undermined, it becomes dilemmatic in so far as it is essentially oriented towards constriction and selection to reduce complexity, but is forced into expansion and amalgamation in order get a hold of the problems itself produces. This is what we call the constellation of reflexive problem handling or, on the societal level, reflexive governance (cf. Beck 1993).

### **3.3 Reflexivity and second-order governance**

Reflexivity here has two meanings which are related but different. In accounts of reflexive modernisation they are often mixed up. The first meaning of reflexivity is the dealing of modernity with its own implications and side-effects, the mechanism by which modern societies grow in cycles of producing problems and solutions to these problems which produce new problems. The reality of modern society is thus a result of self-confrontation.

This can be called *first-order reflexivity*. A different phenomenon of reflexive modernisation is the reflection, the cognitive reconstruction of this reflexive mechanism of problem production. Technology impact, scientific knowledge production, democratic legitimacy are examples of problem areas where such reflection has brought up critical reassessments of rational problem-solving methods and led into the development of alternative methods and processes of problem handling which are more open, experimental and learning oriented. Often these approaches aim to bring differentiated perspectives in interaction and actively explore the uncertainties, ambivalences and control problems which become articulated in such confrontation of rationalities. Constructive technology assessment, transdisciplinary research, and deliberative policy-making are alternative concepts to the rational problem-solving approaches which are established within these different areas of practice. The phenomenon of such new problem handling paradigms and institutional arrangements which emerge from a critical assessment of modern problem solving (and its reflexivity) has itself become a characteristic feature of reflexive modernisation. But these phenomena are in another way reflexive than the self-confrontation of modernisation through its side-effects. They represent a *second-order reflexivity* which entails the application of modern rational analysis not only to the problems which are self-induced, but to its very own working, conditions and effects.<sup>2</sup> By this they interrupt the automatism of executing problem-solving routines, transcend particular rationalities and break the vicious circle of first-order reflexivity. Reflexive modernisation, also reflexive governance, comprises both, side-effects and their anticipatory incorporation in adapted practices. It is shaped by the interplay of first-order and second-order reflexivity. The interest of this paper is mainly in second-order reflexivity. In particular, the emergence of an additional level of integrative, unrestrained, open-ended “second-order” governance which reflects, orients and supervises diverse specialised problem-solving processes. Like this, both the powers of specialisation and integration can check and balance each other; benefits of rational problem-solving can be used while its embeddedness in more complex contexts and their dynamics is accepted as a constraining condition. Such second-order governance, however, can hardly be called problem-solving anymore. Only unambiguousness and confined problems can be “solved” in a deliberative manner. Second-order governance consists of *a procedural approach towards reflecting the interdependencies, understanding aggregate effects of specialised concepts and strategies, and engaging in the modulation of ongoing societal developments by establishing links, organising problem-oriented communication and interaction among distributed*

*steering activities* (for related ideas about steering see e.g. Rip 1998; Beck 1993; Dobuzinskis 1992; Rotmans et al 2001; Kemp et al 2005).

Examples of second-order governance approaches are: constructive technology assessment, foresight exercises, transdisciplinary research, participatory decision-making, cooperative policy making. They have to do with analysis, goal definition and assessment or strategy development and implementation.<sup>3</sup> Some second-order governance approaches are more comprehensive and cover these various dimensions (for example transition management, adaptive management, strategic foresight exercises). They all share a general understanding, however, which is related to the concept of reflexivity as outlined above. By creating interaction between various rationalities they take account of the complexity of interlinked social, technological and ecological development, fundamental uncertainty with respect to system dynamics, ambiguity of sustainability criteria and assessment and contingency of the effect of human action in the context of long-term system change. Reflexive governance modes are therefore geared towards continued learning in course of modulating ongoing developments, rather than towards complete knowledge and maximization of control.

Practical instances of reflexive governance can be found in different parts of society, in knowledge production and policy-making, and functional systems such as energy and agriculture. They can also be found on different levels of problem treatment, from the management of an individual organization, over networks and sectors up to the global level. Examples are described in the book “Reflexive governance for sustainable development” (Voß et al., 2005). In this paper we approach the topic of reflexive governance for sustainable development from a theoretical angle by elaborating some strategic cornerstones of the concept of reflexive governance. We do this by discussing the specific problems of governance for sustainable development along the dimensions of system analysis in light of complexity, goal formulation and assessment in light of ambiguity of sustainability and strategy development and implementation in light of distributed control. In the course of this discussion we derive strategy elements which help to find adequate ways to handle governance problems of sustainable development.

## **3.4 Producing strategic knowledge under conditions of complexity, uncertainty, and path-dependence**

### **3.4.1 Complexity**

With sustainability problems it is difficult to determine a singular cause and to predict the effect of certain options of intervention – not only the effects that are intended but also a range of adverse side-effects (Funtowicz et al. 1998). The understanding of long term transformations socio-ecological systems (e.g. for energy production and use, transport, agriculture) requires knowledge about the very heterogeneous elements of these systems. Such elements are, for example, technological artefacts and networks, chemical substances in soil, water and atmosphere, companies and market organisation, political institutions, scientific theories, cultural values and attitudes. Knowledge is needed about the processes in which they each change shape and about how they relate and interact with each other. Conventional disciplinary science does not deliver this kind of knowledge about the “interlinked and complex nature of reality” (Gallopín et al. 2001, p.228). Instead, it concentrates on a very specific selection of elements and interactions, analytical “slices” of reality. In real world entanglements, however, there is no clear borderline between these categories and networks of cause and effect which go across them. Each specialised perspective defines away the systemic embedding of the particular analytical abstraction with which it is concerned. In specific cases this may be methodologically justifiable because linkages have been found to be insignificantly weak so that parts of reality can be looked at in isolation without losing important effects in reality. In most cases, however, especially in the area of sustainability problems, linkages will reach well beyond the scope of disciplinary defined problems and the cognitive models to understand them.

The knowledge restrictions of specialised perspectives do not only relate to scientific disciplines, but also to the scientific method of knowledge production more generally. The full set of factors and interactions that are relevant in real world problem-settings cannot be handled through systematic modelling and laboratory constructions alone, more synthetic kinds of knowledge as gained from practical experiences are an important complementary source. Knowledge production for sustainable development can therefore not only rely on scientific knowledge that is produced within the institutions and along the methodological

guardrails of the science systems. It needs to integrate the knowledge of societal actors outside of the science system. This kind of knowledge is often tacit and cannot be used by conventional methods of scientific enquiry. It can only be generated in interactive settings, in which knowledge is co-produced by scientists and actors from respective fields of societal practice. But also with respect to practice it is important to integrate a diversity of perspectives, because also professional roles entail selective perspectives.

With respect to the heterogeneity of elements that play a part, a first process element of effective problem treatment for sustainable development therefore is to pursue ways of *integrated knowledge production* which transcend the boundaries between disciplines and between science and society. Practical and conceptual steps in this direction are being taken under the heading of transdisciplinary knowledge production (Nowotny et al. 2001; Hirsch Hadorn 2003; Thompson Klein et al. 2001, von Schomberg et al 2005).

### **3.4.2 Uncertainty**

The transformation of systems which are made up of social, technological and ecological elements comprises a compound of interdependent processes which can not analysed by linear models of cause and effect, because feedback is a common appearance. If the process of sustainable transformation, lets say of electricity provision or agriculture, is further understood as a process which takes place within a multi-level structure of nested subsystems (e.g. local, regional and global level) the interaction between dynamics on each level adds to the complexity of the overall dynamics of socio-ecological systems. The result is that socio-ecological transformation cannot be predicted, periods of gradual change are followed by brief periods of discontinuous change. In politics but also in food systems public distrust may appear, as with the BSE crisis, we have stock market crashes, and sudden changes of public opinion. Also eco-systems may change very suddenly. The thresholds for radical changes cannot be defined by a single parameter but by a confluence of many factors which cannot all be traced down in order to determine even corridors of safe levels of activity (as evidenced by ecological pressure causing a breakdown of ecosystem resilience, social injustice causing upheaval, tax level rises leading into an economic depression). This is a fundamental constraint because of the impossibility to measure all incremental factors (especially the human factor) that play together and because of non-linear system dynamics which may give

exactly those apparently minor factors a large say on where the system will go (compare the “butterfly effect” from chaos theory) .<sup>4</sup>

At the same time this is also the reason why it is not possible, for pragmatic reasons, to rely on simpler models of the causes which are behind sustainability problems. If complexity becomes externalised from cognitive models, the world will still stay as complex as it is and ignored linkages will still be effective (Dörner 1989). Inadequate problem constructions thus come back in form of unexpected consequences when strategies are implemented in the real world (Böhret 1990). That means that for processes of socio-ecological transformation we face fundamental uncertainty about the effects of deliberate interventions such as policies or management decisions (cf. Dobuzinskis 1992; Stacey 1996).

The only way out of this dilemma is to stay in it, but do it consciously: accept that there will always be a high degree of ignorance and uncertainty connected to societal action within socio-ecological systems. Unintended consequences will prevail, because no comprehensive and exact model for the prediction of socio-ecological dynamics can possibly exist. With growing impact through the scale and depth of human intervention a high probability of unintended consequences needs to be taken as an essential condition of problem-solving strategies. This would mean that ignorance and uncertainty are actively dealt with and are not blocked off by pretending complete knowledge and the existence of “best solutions” (Walker et al. 2001, Arentsen et al. 2000).

Based on this, a second requirement for the adequate treatment of sustainability problems can therefore be derived which is *adaptivity*: because of inherent uncertainty about long-term dynamics and systemic effects, strategies as well as cognitive, institutional and technological structures need to be adaptive in order to allow for error and learning (Lee 1993; Hjorth and Bagheri 2006). This entails the need for capacities to respond to unexpected effects and developments. Strategies should feature experimentation, monitoring and evaluation in order to systematically work with new experiences, altered interpretations and changed circumstances.

### **3.4.3 Path-dependence**

In this continuous development, the turmoil of events and more even processes of change, specific patterns emerge and stabilise in which social values and institutions, technology

and ecological systems are linked up with each other. Positive feedback may occur between specific developments in technology (e.g. central electricity stations and transmission networks), corporate organisation (e.g. large scale vertically integrated utilities), regulation (e.g. monopoly provision), consumption routines (e.g. unsuspecting commodity) and ecological factors (e.g. domestic coal reserves, invisibility of emissions). This brings about a mutual stabilisation of different elements within a specific socio-ecological system structure (cf. the notion of regime in Kemp 1994). Positive feedback can also give rise to self-organisation and structural development dynamics which give sectors like electricity provision or mobility or regional developments a “life of their own” which is beyond the control of any single actor. Minor changes and marginal developments may grow into massive structural configurations which then restrict the variety of directions for further changes. Established cognitive, institutional, technical and economic patterns work as a selection environment for innovations and future change. This means that not only history matters but that socio-ecological transformation is path-dependent, i.e. future developments are influenced, enabled and constrained, by structures which have grown out of specific historical developments.

For transformations towards sustainability, path dependency poses severe restrictions. Since the functional qualities of given regime structures, e.g. electricity, water, mobility services or food provision, need to be kept up, revolutionary disruptions are to be avoided. That means, if problems of certain regime structures become apparent, as it is now the case with greenhouse gas emissions from fossil electricity generation, it will take strong efforts, a long time and entail high costs to work against the own dynamics of system development and move it over to a different trajectory. Even though some sophisticated strategies are being developed to deal with these rigidities and systematically induce and modulate system innovations or regime shifts, the possibilities for success remain uncertain. And for some problems long lead times of about 50 years to induce change may simply be too long. This underlines the importance for shaping structural developments, e.g. new technologies, social practices, institutional arrangements, already at an early stage of their development while they are still mouldable, because later on they are stabilised through manifold interconnections with their contexts. There is the dilemma, though, that impacts are not known at this stage and cannot be predicted (Collingridge 1980). However, some alternative paths of future development and possible impacts can usually be anticipated with scenario foresight methods.

Sustainable development therefore requires careful *anticipation* of the long-term systemic effects of ongoing actions and developments and *assessment* of the resulting paths – being the third strategy element. Anticipation refers to an explorative evaluation of alternative development paths that may be spurred by the actions that are taken today. Such processes can, for example, be based on scenario construction, participatory modelling or policy exercises.

### **3.5 Appraising options against the background of ambivalent goals**

Sustainable development is often referred to as a normative orientation: development should not erode its own fundamentals and lead to human betterment. On this level of abstraction, not surprisingly, there is overwhelming consensus. But the crucial question is: How can societal development be sustained? Which kind of practices or production, consumption and governance are needed to sustain societal development? A prerequisite to answer this question would be to know and assess the full systemic consequences of alternative practices and the steps which would need to be taken to get there. This would require the ability to produce certain knowledge about complex social and ecological systems, the ways in which they are coupled, dynamics of their development and the factors that influence it. Viewed like this, it could therefore be argued that the definition of sustainability targets is not a matter of ethical discourse or politics, but of science. But given the earlier noted uncertainties that are connected with socio-ecological development, different evaluations of risks, weighting of values and perspectives of interpretation come into play. Risk assessment is value-laden and world-view dependent (Douglas, Wildavsky 1982). Evaluations of what is an acceptable risk differ greatly between actors and contexts. Several values come into play and may need to be traded-off against each other. These disputes, about risks and evaluation, especially complex problems such as genetically modified food, can not be solved scientifically but need to be treated by social discourse or political decision.

Taken together, this means that sustainable development necessarily remains a contested concept. Its substantial content (i.e. definition of the structure and parameters of socio-ecological systems which can sustain their development) cannot be scientifically determined as “objective knowledge” but will always incorporate normative valuations which only

become ascertained in processes of social interaction. Sustainability as an orientation for societal development therefore delivers ambiguous goals. It may not be possible to eliminate the inherent discrepancies that exist between different goals or to define a clear ranking order by way of rational argumentation and empirical evidence. Social conflicts are inherent to the concept and need to be carried out with it.

Sustainability goals and assessments cannot be determined by principle once and for all, but only through participatory processes which need to be carried out for specific assessment situations. The broad participation of affected societal actors in the process of goal formulation is necessary because their values and respective problem perceptions constitute a basic condition of sustainable social development (Roe E. 1998). *Participatory assessment* is the fourth strategy of reflexive governance.

### **3.6 Implementing strategies in a world of distributed control**

Even if certain knowledge about socio-ecological systems, clear goals and defined criteria for sustainability could be taken as given, specific difficulties with implementation still had to be dealt with. These refer to the distribution of capacities to influence the direction of socio-ecological transformation. They rest with a broad range of diverse actors. Societal development is not being steered from a single point, but in interaction of state actors and interest groups, producers and consumers, scientists and the media, just to name a few. In order to take influence on long-term societal change it is necessary to coordinate the action of various actors at different places along the lines of collective strategies.

The distribution of influence is not an exclusive property of sustainability problems. It is a general characteristic of governance in modern societies. Capacities to take influence on societal change are distributed between different governance levels (e.g. nation states and the EU) as well as between functional domains, such as production, consumption and political regulation, and between different actors within these domains (Schneider, Kenis 1996; Kooiman 1993; Mayntz 1998; Kohler-Koch, Eising 1999). Public actors are but one type of actors among others, albeit equipped with democratic legitimacy as a special source of power. Moreover, the competencies of the state are fragmented into several agencies such as governmental departments, regulatory agencies, parliamentary fractions etc. On issues of sustainable development they often have different positions. These conditions have to be

taken as a starting point for strategy formulation and implementation. Of course, there are differences among governance situations with respect to how dispersed resources for control are and whether one actor (e.g. the head of government) or a small coalition of actors disposes over sufficient power to make other actors follow a collective strategy. Generally, however the coordination of different actors' strategies cannot be taken for granted, but it needs to be asserted for any specific problem anew.

Problems of sustainable development are a specific class of problems for which control capacities are generally very highly distributed. The reason is that they touch upon fundamental institutional and technological structures of modern society. Overarching competencies and procedures for shaping structural change, i.e. the governance of governance change, are not established. Transformation thus appears to happen as a result of daily interactions between consumers, producers, policy-makers, researchers, journalists, and various other actors – without anyone controlling it. Distributed control capacities thus have to be taken into account in strategy development for sustainable development. For the shaping of socio-ecological transformation it is necessary to coordinate heterogeneous actors. Such coordination cannot rely on institutionalized hierarchies, but must take place in networks in which problem perceptions, interests and practical knowledge of the various stakeholders become linked together in processes of *interactive strategy development*, the fifth strategy of reflexive governance.

### **3.7 Strategies of reflexive governance**

In the foregoing we enunciated five strategies of reflexive governance, derived from specific features of societal transformation and sustainable development. A schematised overview of the strategies is given in Table 1. With their help the notion of reflexive governance becomes operational - something which has not been done by others, allowing for discussion.

Aspect of Problem treatment	System analysis			Goal formulation	Strategy implementation
Specific problem features	Co-evolution of heterogenous elements across multiple scales (society, technology, ecology)	Uncertainty and ignorance about transformation dynamics and effects of intervention	Path-dependency of structural change, high societal impact	Sustainability goals involve value trade-offs, are endogenous to transformation	Capacities to influence transformation are distributed among actors
Strategy requirement	<b>Trans-disciplinary knowledge production</b>	<b>Experiments and adaptivity of strategies and institutions</b>	<b>Anticipation of long-term systemic effects of measures</b>	<b>Iterative participatory goal formulation</b>	<b>Interactive strategy development</b>

*Table 1: Strategies of reflexive governance*

Coming back to the general perspective on governance as embedded in system contexts (Figure 1) we can now add the strategies of reflexive governance in order to show how they reflect the condition of governing action as being embedded (Figure 2).

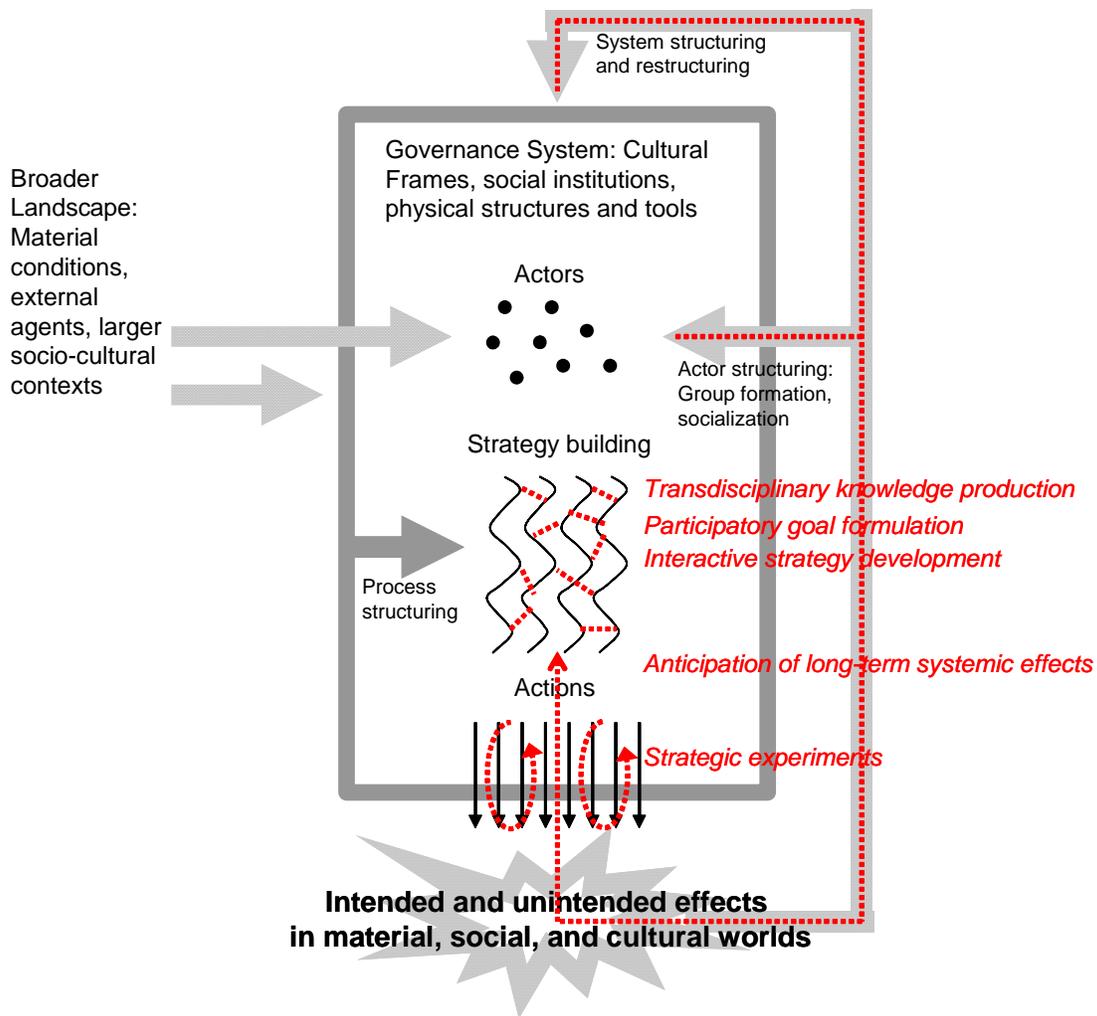


Figure 2: Reflexive strategies that take up the embedding of governance

We have tried to position the five strategies in a figure about actor-system dynamics of Burns and Flam (1986, p. 4). This gives an approximate idea of how the strategies influence actor-system dynamics and wider transformations. Integrated knowledge production should lead to changed perspectives and knowledge of the actors concerned, having implication for their actions. Interactive strategy development and participatory goal formulation affect actor structuring and may contribute to system (re)structuring, depending also on exogenous developments. Anticipation occurs at multiple points. There is anticipation of possible outcomes from actions and assessment of ongoing developments. All the strategies *inject recursive feed-back in the actor-system dynamics, beyond those that already exist*. They contribute to what we have called second-order reflexivity – the consideration of

interdependencies, understanding of aggregate effects of specialised concepts and strategies, with actors collectively engaging in the modulation of ongoing societal developments by establishing links, organising problem-oriented communication and aligning diffused capacities to common goals.

#### **4 Reflexive governance – how does it work?**

The concept of reflexive governance is based on procedural requirements which can provide for more adequate problem treatment. The reflexive strategy elements that were presented refer to particular ways of organising governance processes. But they do not prescribe any particular substantial results which are to be achieved in order to be adequate for sustainable development (e.g. emission targets or income indices). This is due to a fundamental argument about the uncertainty and ambivalence which is connected to the operationalisation of sustainability. What, for example, is the right trade-off between emission reduction, social equality and economic stability? If we cannot define these aspects of the outcome of reflexive governance how can we then know if reflexive governance works? One could refer to criteria from current political discourse such as the Kyoto targets for greenhouse gas emission reductions. But this leaves open, if not more substantial reductions are necessary, as argued by many scientists. After all, it is the further development of political discourse itself which reflexive governance attempts to shape. To take current political goals, concepts and measures as a reference for evaluating its outcome would therefore establish a closed circuit in which the potential of reflexive governance for open-ended learning would be blocked. That means we have to look out for criteria to evaluate the actual working of reflexive governance arrangements, rather than measuring predefined outcomes.

A concern for evaluation is important, because reflexive governance arrangements can be misused. As noted by Rip, Stirling, Smith, Wolff in Voß et al (2005), the reality of reflexive governance includes opportunistic behaviour, politics and struggle over power as much as an orientation towards problem handling, argumentation and cooperation. This entails the danger of reflexive governance being undermined by the domination of interaction processes by the views and interests of particular actors.

The mutual adaptation which takes place when actors contest each others problem-handling approaches and are thereby forced to articulate and defend their problem analysis, goals, and strategies brings about patterns of governance which are more robust than individual

steering approaches which are dreamed up within separate actor worlds. Strategies are tempered in anticipatory interaction, rather than in real-time trial and error. This is one of the basic mechanisms behind reflexive governance (cf. Rip 1986).<sup>5</sup> For this mechanism to work, however, reflexive governance must confirm with two criteria: a) a diversity of perspectives must be involved in the interaction process and b) interaction must not be dominated by one or a group of actors which allows them to suppress or ignore contestations of their problem definition and strategies. This is what has to be taken care of by procedural rules and moderation of searching and learning processes in reflexive governance. This is also what can be taken as criteria for process evaluations of reflexive governance. In order to monitor relevant changes with respect to sustainable development change indicators should therefore be able to track adaptations in processes, concepts and institutions in which societal problem treatment is being carried out. Even if these changes are only early precursors of improvements with respect to substantial outcomes, they are necessary in order to not lose direction over long and ramified projects of transformation. Without such indicators attempts at system innovation may become frustrated after an enthusiastic starting phase, because the results are not immediately visible. This might happen just when important changes have been set in motion in the institutional foundations of a system which are below the surface movements that are gauged by output indicators. The strategy requirements of reflexive governance may be taken as criteria that apply to the inner working of society in order to form a starting point for thinking about indicators.

## **5 Opening up and closing down: working with the efficacy paradox<sup>6</sup>**

There is an inherent problem connected to the opening up of governance processes for comprehensive problem appraisal and robust strategies: Too much complexity, ambivalence and interaction, although necessary to adequately respond to the problem of sustainable development, severely reduces action capacities and may block deliberate attempts at shaping societal development. Appraisal of this opens the view on a paradox of reflexive governance. This consists of the contradicting requirements of opening-up and closing-down: Opening up is necessary to adequately grasp the factual embedding of decision-making and problem-solving in systemic contexts which comprise complex dynamics, heterogeneous values and distributed power. Closing down is necessary to reduce complexity in order to avoid anomy

and keep up the ability to act – even if it is revealed as illusionary in its modernist form (Rip 2006).

The issue of the erosion of action capacities as a possible detrimental effect and a limit to the opening up of governance processes is important. It qualifies the basic concept of reflexive governance as outlined above by a meta-requirement of keeping the balance between two extremes. Instead of proposing “opening up” as a unidirectional orientation of “the more the better” it helps us refine our set of reflexive strategies through the introduction of a counter image of complete fluidity and openness in which any kind of strategic action must suffocate. Reflexive governance thus becomes an as-well-as concept in itself (cf. Beck 1993, p.9). It is not a question of *either* keeping up action capacity *or* opening problem handling for contextualisation, but it is *both*. Against the background of the above discussion this sounds like a paradox. We believe that it is one. It can be called the “efficacy paradox of complexity”: In order to assure efficacy of strategies in complex context settings it is necessary to consider a wide variety of aspects and keep flexible to adapt to unexpected events. At the same time it is necessary to reduce the number of aspects considered and decide for certain options in order to produce output. By definition it cannot be resolved without losing out on either side. With respect to action strategy, reflexive governance thus implies a dilemma.

We think that it is fruitful to recognise the paradox, not to resolve it, but to work with it as suggested by Ravetz: “Another approach to paradoxes, characteristic of other cultural traditions, is to accept them and attempt to learn from them about the limitations of one’s existing intellectual structures” (2003:819). In this sense it can work like the strategic use of “ironies” in thinking about steering as suggested by Rip (2006).

We propose to qualify the concept of reflexive strategy elements which was proposed in the introduction by an explicit requirement to balance the opening-up of governance processes for incorporating uncertainty, ambivalence and distributed control with closing-down governance processes in order to be able to decide and take action. This task of balancing two contradicting requirements in order to handle fruitfully the efficacy paradox is more art than science. We cannot offer any precise method for diagnosis or tool kit by which a specific adequate combination of opening-up and closing-down for each real world governance situation could be determined. Instead, what we can do is to sketch out, in a very schematic manner, some generic forms in which opening-up and closing down can be combined. This

is based on the review of empirical governance practices and theoretical discussions in the literature and the chapters in Voß et al. (2005) and may be helpful to consider a spectrum of possibilities when designing governance strategies and institutional arrangements.

First, a differentiated look is needed on *what* it is that is going to be opened-up or closed-down. Here, we can refer to the three dimensions of problem solving along which reflexive governance was discussed in the introduction to this book: Problem analysis, goal formulation and strategy implementation. Opening-up can take place in all these dimensions or only in one or two of them. For problem analysis, opening-up would mean to extend the system boundaries and increase the range and diversity of factors and interactions that is considered in analyzing problem causes, dynamics and effects of interventions. For energy forecasting this could, for example, entail an opening-up of economic models to include strategic behaviour of market actors, political processes which influence regulation, public opinion or resource exploitation and climate change. In the dimension of goal formulation, opening-up refers to the revisioning of given targets by taking into account a broader spectrum of values and facing trade-offs that have to be made. For the energy example, this could mean to just take into account the established goals of economic efficiency, security of supply and environmental soundness for each policy decision and not let each ministry follow its own preferred goal. But it could also mean to broaden the goal catalogue by values such as aesthetical acceptability and democratic participation in energy provision. In the dimension of strategy development, opening-up finally refers to a widening of the range of measures and options which are considered and implemented for problem handling. In the energy example this would entail to develop and experiment with a diversity of also radically new policy instruments such as tradable energy efficiency obligations or participatory technology development and technologies such as solar electricity import or micro co-generation.

In principle it is possible that governance processes are opened-up in all of these dimensions at once: problem definitions are called into question, goals are scrutinized and the set of assumed solutions is revised. One possibility to reduce the overthrowing effect of opening-up on strategic capabilities, however, is to selectively focus on each of these dimensions, not on all at once. Because of the interdependencies e.g. between goals and problem definitions and problem definitions and measures, opening-up in one dimension will most likely induce similar processes in other dimensions, anyways.

Across all these three dimension of problem solving an important aspect of opening-up refers to the number and heterogeneity of actors which are involved in problem analysis, goal formulation or strategy development. Eventually, opening-up must be linked in one way or the other with extended participation, since knowledge about different problem aspects and values as well as resources for making measures and options work are distributed among different actors. In the end it is the diversity of worldviews and problem perceptions hold by different actors which is the key trigger for opening-up governance processes. At the same time, however, it is also the key trigger for controversy and misunderstanding which makes governance difficult and seemingly ineffective. In principle, there are very many different ways of combining opening-up and closing-down in governance and problem handling, more general. One could therefore develop a highly differentiated typology. Here, we restrict ourselves to the presentation of four types: problem-solving with blinders, erosion of strategic capabilities, sequential opening and closing, and exploring experiments.

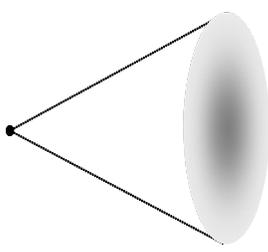
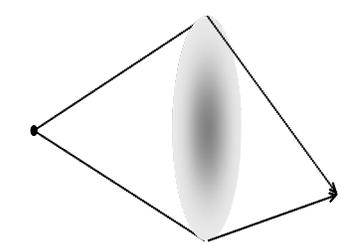
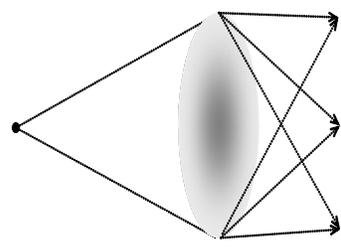
Type	Graphical Illustration	Description	Example
<b>Problem-solving with blinders</b>		No opening takes place. Problem-solving is pursued in the framework of given problem definitions, goals, and options with restrictive participation. Unintended consequences are likely to cause second-order-problems.	Car-based mobility, where problem-solving is very much oriented towards improving accessibility for cars through building extra road infrastructure and reducing emissions and nuisance from cars through technical fixes. The need for cars is taken for granted.
<b>Erosion of strategic capabilities</b>		Governance process is opened-up in all dimensions by participation of a large number of heterogeneous actors. Uncertainty about problem dynamics, ambivalence about sustainability goals and diversity of options erode the capacity for collective action.	This is an extreme case. Nothing is ever totally opened up. There are always specific ways of interacting, favoured solutions and specific problem definitions. Prior to the Kyoto protocol and EU emission trading system for GHG a situation like this existed. Various response strategies were explored, including climatic engineering.
<b>Sequential opening and closing</b>		Governance process is opened-up (in one or more dimensions), diverse perspectives are explored in interaction. In a second phase selection and priority setting leads into a new strategy for problem handling. Adapted strategy can be probed and further revised.	Before the Kyoto protocol aimed at reducing GHG emissions there was much disagreement about climate change. A closure occurred thanks to scientists through the IPCC process. Mitigation became selected as the policy response to be followed.
<b>Exploring experiments</b>		Governance process is opened-up (in one or more dimensions), diverse perspectives are explored in interaction. A set of strategies is developed according to alternative selection criteria and priorities for closing-down. Experiments with different strategies support learning.	This is happening in the Netherlands as part of sustainable energy policy where different different experiments are done with alternative energy technology as part of transition management by the Dutch government (for a description, see Kemp and Loorbach, 2004).

Figure 3: Combinations of opening-up and closing-down in governance

Two of them are the extreme types of totally closed (“problem-solving with blinders”) and totally opened governance processes (“erosion of strategic capabilities”). These serve to

delimit the spectrum of possibilities. The other two types are combinations in which a phase of opening-up is followed by a phase of closing-down.

In the strategy of “sequential opening and closing” a variety of perspectives has been explored, and a context-oriented and situational adaptation of the problem-handling framework has taken place. This befits our model of reflexive governance. Nevertheless, the selection and priority setting which has taken place in closing-down the governance process towards one consistent strategy is connected to a high probability of still some unexpected side-effects. Only probing of the strategy under real world conditions will show its effects and hint at requirements for a further revisioning.<sup>7</sup>

The strategy “exploring experiments” is similar to the prior one in so far as a phase of opening-up the problem space is followed by a phase of closing-down towards action strategies. The difference is that not one consistent problem-handling framework is headed for, but a variety of different frameworks is developed into a portfolio of strategy experiments. Like this, closing-down does not have to end up with one best possible strategy. Instead, the uncertainty, ambivalence and diversity of options which was thrown up in the first phase of opening-up can be translated into a set of alternative frameworks of problem definition, goals and options. For strategy experiments based on each of these frameworks it is not possible to decide a priori which one is better adapted to sustainable development. Instead, they induce variation and offer experience from which society can learn what sustainable development is. The unintended side-effects from each experiment can be compared with each other. If one strategy appears impractical or too risky, there are others to be followed and further developed.

The crucial issue for furthering the practice of reflexive governance, however, is not only how to combine opening up and closing down, but also the very practical ways of achieving closure of a strategy process. The problem is that, even if there was a phase of opening-up before closing down, there are many different ways to close a process and very different strategies with which one can finally end up for implementation. But these different strategies are not necessarily all of the same quality. There may be better and worse ways to close down. We have amply discussed the limitations to methods of rationalist problem-solving which are conventionally used for this purpose. Up to now we can only say that it remains an issue for further learning, via theoretical discussion and practical experiments, how the richness of perspectives can be taken into account. Concrete process design and moderation of such

processes is surely more art and craft than science, it is a matter of bringing collective phronesis to life (Grin 2000; Loeber 2004). However, there will probably not be a standard method for doing so. In particular situational settings concrete methods of opening and closing need to be developed. This entails

- to decide what to open up and what to keep close and in what order.
- to arrive at the right problem definition which is open enough to grasp relevant interactions and close enough to identify loci of influence within the myriad of entangled and interaction factors that drive development,
- to arrive at visions as goals and criteria for the appraisal of options which are open enough to allow for learning and closed enough to guide action (Grin, Weterings 2005:10),
- to make strategic alliances work (Grin, Weterings 2005:10), open enough to bind together important resources, closed enough to be able to achieve coordinated strategies
- to find appropriate modes to combine strategies on different governance levels, open enough to capture overarching structures and local specifics, closed enough to not get blocked by evasive entanglement (compare the issue of "multiplication" highlighted by Grin, Weterings 2005:11)

Partly, these methods do already exist in form of practical skills, sometimes as articulated methods for transdisciplinary research, participatory policy analysis, interactive technology assessment, multi-level governance. It is the purpose of this paper and the concept of reflexive governance to highlight the linkages of these new forms of governing and bring them in interaction with each other in order to allow for mutual learning. It is clear, however, that no general method will be found, but that adapted methods and skills have to be developed for specific problem contexts.

## **6 Summary and discussion**

Sustainable development requires governance to incorporate feedback in social problem-solving. Under the heading of reflexive governance we explored strategies to do so, which are:

- 1) Integrated knowledge production on problems and their dynamics, including different scientific disciplines and practice perspectives
- 2) Adaptive strategies and strategic experiments to actively deal with uncertainty
- 3) Systematic anticipation of long-term and indirect effects and possible lock-in to problematic development paths e.g. through explorative foresight exercises
- 4) Iterative, participatory formulation of governance objectives, taking account of diverse and changing social values
- 5) Interactive strategy development by actors with various sources of influence

A cross-cutting issue investigated in the paper is the issue of *opening up* (of the problem space and solution space through integrated problem analysis and interactive processes of governance) needed for learning and *closing down* needed for action. Governance has to be concerned with both but in so doing it confronts a paradox: in order to act you must reduce complexity, which easily leads to the neglect of long-term system effects, whereas consideration of all possible effects reduces the capacity to act. As we argued, what is needed is to combine both. One way to do this is to foresee a phase of opening up *before* closing down. A re-opening up again is needed when the results of closing down are viewed inadequate. Another way is to selectively open up, for example only one dimension such as problem definition, goals, coalitions or levels.

The five strategies of reflexive governance inject feedback in problem-solving processes and help to deal with problems of complexity, uncertainty and ambiguity that make policies for sustainable development difficult to pursue. By way of concluding this paper we shall critically discuss the concept of reflexive governance in order to arrive at a realistic appraisal of its potential for shaping sustainable development. There are objections which deserve to be taken serious. These refer to the desirability as well as to the feasibility of reflexive governance.

One immediate objection refers to the intention to free different social actors from their particular narrow perspectives and integrate them with respect to a broader system view and overarching problems. It is all too well known from several practical experiences that such intentions can often only be called naive. Actors may lack motivation to participate in such

procedures, or engage in strategic communication instead of open discourse. On top of that, such processes incur very high deliberation costs in dealing with problems.

Let's consider one by one the three concrete objections referring to the feasibility of reflexive governance. First, the motivation of actors to participate in reflexive governance processes. Here, we would like to emphasize a point which has been made before: It is not only a collective interest of society to avoid side-effects of their strategies, but it is also in the very own interest of individual actors to look into the broader environment in which their actions are embedded. They seek to make their strategies robust. For this it is a welcome opportunity to test business strategies, plans for investments, policy designs, biographical layouts etc. in critical discussion with those other actors who know about or have influence on the conditions of realization. Practical experiences, thus often show that actors are interested. This is even more the case as globalization, liberalization, and social differentiation continues and increases uncertainty about developments of the future. Public debate about sustainable development does its own part by urging those actors who are not interested by themselves.

Another objection refers to the fact that simply putting actors in interaction with each other does not resolve conflicts. This means that interaction may be dominated by strategic communication. Before, we have already mentioned that it is the mutual adaptation of strategies out of the own interest of actors to make their strategies robust against interfering factors, not consensual agreements, through which reflexive governance arrangements become effective. Irrespectively, it is the case that the larger the time horizon against which problems and strategies are discussed, the more do individual interests move into the background. This is, because actors lose stakes in particular strategies when they have enough time to charge off investments and adapt to new circumstances. Moreover, ignorance about the own position and related advantages and disadvantages increases with time into the future (see "veil of ignorance" Rawl's "Theory of Justice").

A last objection refers to the costs of integration. Social actors get distracted from their "real problems", if they participate in reflexive governance arrangements. Problems become too complex, if they are viewed from all perspectives and all kinds of aspects are taken into account. Conflicts become visible. Additional transaction costs may occur because the productivity of specialized problem solving processes is reduced when they get entangled with each other. This may reduce output and performance – if measured in conventional ways. In the worst case, coordination may suffocate productive activity altogether. The fear

is justified. Integration carries substantial costs and reduces output. It is only appropriate, however, to compare these costs with the admittedly much more diffuse and long-term benefits that arise when unintended side-effects and second-order problems can effectively be reduced. In principle, it is a matter of internalizing external costs, i.e. costs that occur beyond the horizon of relevance of particular actors (as allocating monetary value to environmental damage). In the extreme case it may even be to the benefit of society, if certain activities or developments completely grind to halt. This may be an indication that interactions are too dense and potential side-effects too strong as to keep up strategies which have proven rational within a more narrow perspective. For the sake of sustainability one has to accept a slow-down of certain developments in science, technology, business, politics, here and there, as happened with nuclear fission in many countries and with the use of CFC and DDT across the world.

At the same time, however, it should be kept in mind that integration is not an end in itself. The dissolution of institutional boundaries and elimination of specialized competences is not the aim of reflexive governance. The idea is to supplement the former with a reflexive perspective and coordinated strategies (see "supervision" as part of "decentral context steering" in Willke 1996). Integration and differentiation are mutually dependent, one has to do both. In practice, this leads us back to the issue of combining opening up and closing down.

One issue remains, however. The introduction of reflexive governance itself is a problem of steering. As with any other steering strategy we have to be aware of the fundamental problems with respect to problem definition, goal formulation and implementation. Some of them have already explicitly been treated, such as the ambivalence of opening up and closing down as to guiding principles for effective governance. This throws up similar problems for the realization of reflexive governance as have been the starting point for the development of the concept in the first place. At the same time, however, that means that reflexive governance may be applied to itself.

In this direction lies a wide field for future research and practical experimentation. The task can be formulated as one of "governing governance change". Reflexive governance may serve as a vision for this endeavor. Concrete steering activities, however, will be embedded in existing contexts of governance. Future governance patterns and other outcomes will be a result of the interactions with other dynamic processes. It is therefore advisable to

formulate concrete goals in interaction with actors who can contribute diverse perspectives and to revise them regularly in light of new experience and changed circumstances. Knowledge about influential factors and dynamics of governance change should be developed in interaction of different disciplines and practical expertise. Particular strategy options should be appraised with respect to their long-term effects, also on other areas than governance itself. Several options should be probed in experiments. The general framework of reflexive governance should be kept adaptive in order to respond to new developments. For shaping governance change it is, finally, important to involve those who are actually making it, the diversity of actors from different sectors such as public administration, political parties, mass media, science, and civil society and on different levels such as local governments and single organizations and the European Union and transnational associations (compare

*Table 1*).

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<sup>1</sup> For now this is our working definition of reflexive governance.

<sup>2</sup> Andy Stirling (2006) introduces a finely elaborated notion of reflexivity that focuses exclusively on this aspect.

<sup>3</sup> On a societal level these aspects are assigned to differentiated social subsystems and types of organisation: science for knowledge production and democratic government for goal definition and strategy development.

<sup>4</sup> Examples of "butterfly effects" can be found in Gladwell (2000).

<sup>5</sup> The mutual adaptation of actor strategies can be conceptualised in more detail with the help of the theory of co-evolution. Adaptation works through the disturbance of expectations about the fitness of strategies. If actors are confronted with additional factors that may interfere with their strategies, but which were not visible from their own narrow professional perspective, it is in their own interest to adapt expectations and strategies

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accordingly. If the mixture of actors that come in interaction reflects the various aspects of the system as a whole, resulting strategies will be better adapted to real world contexts. This way, side-effects can be reduced (Voß 2006).

<sup>6</sup> Our thinking in this part of the paper is importantly inspired by Andy Stirling's (2004) discussion of opening-up and closing-down in the social appraisal of technology.

<sup>7</sup> Another example is the use of chlorinated as a bleaching agent for paper. In the 1980s in Sweden organo-chlorine releases into surface water were suspected of causing harm to reproductive capacities of fish. Pulp mill effluents were reassessed in a new toxicological and bioaccumulative light. Pulp mills began working with suppliers to either eliminate elemental chlorine from their bleaching processes (ECF) or to close chlorine cycles (TCF). Campaigns from environmental NGOs created a green market demand and put pressure on regulators to introduce standards limiting the release of organo-chlorine compounds. The policy interactions resulted in different outcomes in Sweden and Finland, with Finnish producer opting primarily for TCF solutions and Swedish pulp producers first for ECF and later for TCF. A scientific controversy about these options surfaced but was later „solved“ when ECF and TCF were viewed both adequate (based on Smith and Rajotte, 2000).