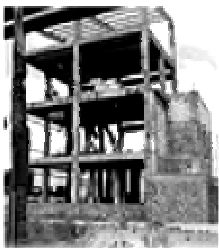




# Governing Sustainable Development



A co-evolutionary perspective on  
transitions and change



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## Abstract

Socio-economic development cannot be sustainable without some kind of “good governance”. The challenge for governing sustainable development lies in the heard of open processes and continuous learning rather than in determined outcomes. Sustainable transitions cannot be managed in a controlling sense as they are driven and caused by a dynamic interplay between various complex and co-evolving processes, many of them are far beyond any certainty, control or predictability. The co-evolutionary perspective outlined in this paper serves as heuristic device to clarify this complex dynamics inherent in societal change and transitions. Special attention is devoted to notions often ignored in the current debates on sustainability and governance such as adaptive change, co-evolutionary dynamics or the paradox between change and conservation. For this purpose we draw on ideas from evolutionary theory, anthropology, complex adaptive systems theory and adaptive management. An outlook of a future research agenda on transition management is given.

*Keywords:* Co-evolution, governance, transition management, sustainable development

## 1 Introduction

Sustainable development has emerged over the last two decades as a political goal with considerable support from NGOs, governments and the business community. It demands nothing less than a radical change in our current modes of production, consumption, innovation, technological applications and decision-making (Rammel, 2003, Ashford, 2002). How can this be achieved? As a multi-dimensional and dynamic concept sustainable development can neither be translated into the narrow terms of static optimisation nor is it adoptable to strategies based on direct control, fixed goals and predictability. Despite numerous attempts to „kidnap“ the idea of sustainability between issues such as the „ideology of efficiency“ (Bromley, 1990) or (technological) improvement of the status quo, sustainable development addresses system inherent failures and limitations and consequently calls for new visions, new development trajectories and transitions of unsustainable systems.

Dealing with uncertainties, qualitative change and non-linearities, sustainable development refers to an open process and not to any kind of optimum or end-state (Cary, 1998, Meadowcroft, 1997, Rammel and van den Bergh, 2003). Moreover, due to inevitable change, the world of tomorrow is not the world of today. What seems to be a sustainable solution for present conditions bears the risk to become unsustainable when confronted by the tasks and conditions of our future. What we know now will evolve and change with new emerging properties, new experience and new information. Thus, we face a dynamic process where the starting point can not be a fixed idea of sustainability rather it must be a social consensus what we consider to be unsustainable (Wilkinson and Cary, 2002).

However, socio-economic development cannot be sustainable without some kind of “good governance”. In the European context, governance incorporates rules and regulations that affect the way in which power is exercised at the European level (EC 2001) and in Member States. The European Commission emphasises that democratic institutions and representatives of the public must try to connect EU decision-making bodies with its citizens in order to assure effective and relevant policies. The challenge to the EU is to renew and open up the European political process while fully respecting individual and national identities. At the same time, Europe does not live in an empty world. World population is growing, the gap between rich and poor is widening, and increasing resource demand leads to a dramatic challenge on the global scale with growing population, growing per capita consumption, and limited natural capital. Therefore, sustainable solutions must lie in solidarity and tolerance of cultural differences and in a new partnership for development around the world.

Emphasising the evolutionary aspects of such solutions, we go along with Roger Wilkinson's and John Cary's description of sustainable development as „ not a fixed ideal, but an evolutionary process of attempting to improve the management of systems, through improved understanding and knowledge. The process is non-deterministic: the end point not known in advance.” (Wilkinson and Cary, 2002:381). However, recalling that sustainable development is driven by cross-scale interactions and reciprocal change caused by the interdependencies between ecological, technological, socio-economical, institutional and cultural aspects, we state that the very nature of sustainable change and transitions is best to describe by a co-evolutionary perspective in general and by a co-evolutionary<sup>1</sup> focus on transitions and change in particular.

At first glance, there seems to be a contradiction between the statement that co-evolution cannot be steered to a determined target and the notion made by many sustainability activists that objectives, targets and time-tables are necessary for sustainability governance. The tension between these two points of view is the challenge for governing sustainable development. Hinterberger and Wegner (1997) have dealt with this contradiction by using the notion of “ephemeral policies” (coming from the German so-called “ordo-liberal tradition of economic policy “), which means that interventions into markets are often characterized by short-term revisions and therefore become themselves a source of destabilisation of market allocation. This is especially the case for a great part of environmental policies and a conventional look at sustainable development is also endangered. From this, the conclusion was drawn that: “guiding principles directed to a long-term goal have to be developed according to a precautionary policy” (p. 356). As formulated in the GoSD proposal ([www.gosd.net](http://www.gosd.net)): the objective is to explore the development of a resource-optimised knowledge-based service society in relation to all dimensions of sustainability by way of applying a backcasting methodology to identify (1) gaps between desired futures and current trends, and (2) policy requirements.

However, a closer look at the foundations of transition management raise the question if there is any contradiction at all. Like the overall goal of sustainable development, transitions cannot be managed in a controlling sense as they are driven and caused by a dynamic interplay between various complex and co-evolving processes, many of them are far beyond any certainty, control or predictability (Kemp and Lorbach, 2003). Moreover, visions can change and indeed must change as we learn by every day experience and face

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<sup>1</sup> We define co-evolution at the general level as the evolutionary process between two or more systems driven by reciprocal selective pressure and adaptations between these systems. Thus, a co-evolutionary system can be defined by the totality of all the interacting sub-systems.

emerging properties and new challenges. Thus, co-evolutionary insights as well as the idea of transition management tells us to use the dynamics underpinning societal change and preserve the capacity to maintain, create and test our opportunities in order to comply with our (transition) visions and to establish new ones. Emphasising this inevitable dynamics of societal change, the challenge for governance lies in the heart of open processes and continuous learning rather than in determined outcomes.

As co-evolutionary theories are highly interdisciplinary we hope to outline an integrative perspective which combine disciplinary strength while filling the disciplinary gaps which threaten comprehensive approaches to sustainable development. In a general sense our co-evolutionary perspective on governing sustainable development contains three major assumptions:

- Policies are endogenous parts of the socio-economical evolution (Hinterberger, 1994). As such, they are integrative elements of the mutual yet non-deterministic change between institutional, social, cultural, economical, environmental and technical features.
- Due to its integration into co-evolutionary developments, where various elements modify one another permanently by mutual feedback, policies unfold as dynamic and open processes shaped by qualitative change, error making, ignorance, learning and adaptation.
- Governance towards a sustainable society is settled within the reciprocal interactions between hierarchical multi-level systems which are expressed at different temporal, spatial and social scales.

Co-evolutionary theorising as well as related code words such as complex adaptive systems or non-linear system behaviour are still evolving new concepts, which nevertheless could contribute a lot to recent attempts towards sustainable transitions. In this paper we will try to draw a first glance on such possible contributions which hopefully enrich the recent debate concerning governance, transition management and sustainable development.

The paper is structured as follows. Section 2 outlines a brief overview about a co-evolutionary perspective on sustainable development and transition management. In Section 3 an interdisciplinary focus on transitions is elaborated. Here, special attention is devoted to historical cases of transitions and the co-evolutionary dynamics which drove them. Section 4 presents a short overview about recent debate on governance. Section 5 emphasise the tension between change and conservation which is expressed in the “paradoxon of sustainable development”. In Section 6 possible new areas within a future research agenda

on governing sustainable development and transition management are highlighted. Section 7 presents final conclusions.

## **2 Brief glances of a co-evolutionary perspective to sustainable development and transition management**

### **2.1 Complexity and co-evolution**

Emerging novelty and complexity that create unpredictable opportunities and non-linear dynamics are at the heart of sustainable development (Holling, 1994). Contrasting static approaches of Newtonian simplicity and mechanical representations of interacting socio-ecological systems, there is an increasing awareness, that sustainable development should be analysed in regard to complex adaptive systems containing issues of reflexive overlapping hierarchies, uncertainty, non-linear behaviour and multistable states (Jeffrey and McIntosh, 2002; Funtowisz and O'Connor, 1998; Giampietro, 1999; Gunderson and Holling, 2002). Nevertheless, conventional sustainable development policies still rely on static, linear analysis as „such simple prescriptions, based on bad or insufficient theory, are attractive because they seem to replace inherent uncertainty with the spurious certainty of ideology, precise numbers, or action“ (Gunderson and Holling, 2002: XXII).

However, new dynamic approaches such as the emergence of complex system theory (Prigogine and Stengers, 1987) and the work of John Holland (1995) in his application of genetic algorithms and development of complex adaptive system theory have generated numerous innovative inputs for interdisciplinary research on sustainable development. Recalling to the reciprocal interactions between complex systems inevitable inherent in human development, Richard Norgaard (1994) emphasises expressively the co-evolutionary dimension of these interdependencies. In fact, co-evolutionary dynamics is described as an inherent feature of many complex systems (Tainter, 1988) which to a far extend proved rather useful in addressing complex multi-disciplinary issues (Gowdy, 1994).

Recently, promising advances in the applications of a co-evolutionary framework were established in the field of natural resource management (Aquiliera-Klinck, 2001; Rammel et al, 2003; Jeffrey and McIntosh, 2002). Insights from these studies provide also well-founded arguments that management facing the high complexity of co-evolving socio-ecological systems is best to be described within the framework of complex adaptive systems where learning and governance require dynamic non-equilibrium approaches. Within this framework of cross-scale interactions, the classical focus on sectoral policies and centralised

institutions must shift towards dynamic systems of multi-level governance which operate at multiple levels driven by diversified decision-making structures. To some degree these structures must exhibit autonomy complemented by overlaps in authority, vision finding and management capabilities (Kasperson and Kasperson, 2001).

Given the challenges of non-linear dynamics and unpredictability, policies towards sustainability have to cope with adaptive flexibility through out different spatial, temporal and social scales (Rammel and van den Bergh, 2003). Hence, in circumstances of complexity and non-linearities, attempts of adapting to and proposefully shaping change need new mind maps of reality and new forms of learning capable with uncertainty and surprise. Along these lines, Carl Folke et al. (2002) emphasise that interlinked socio-ecological systems behave as complex adaptive systems (see also Levin 1999), concluding that „transition to sustainability derives from fundamental change in the way people think about complex systems upon which they depend“ (ibd.: 4).

## 2.2 Production and consumption, technologies and preferences

Production and consumption processes are constituting elements of every economy and they are seen as central elements for the (un)sustainability of development. Every fundamental economic textbook deals with the (circular) flows of money and goods between households, companies (and other organisations), while from a sustainability point of view it is mainly the resource and waste flows (the societal/economic metabolism; Ayres/Simonis 1992) set in motion by production and consumption activities (see e.g. the 10 years programme on sustainable production and consumption issued by the European Union at the Johannesburg World Summit on Sustainable Development).

Hence, the production and consumption system can be described as the interrelation of producers (companies) and consumers (households) through their activities in terms of monetary and physical exchange on the one hand and their environmental consequences on the other. The latter can be best described as human interventions into the dynamic ecological equilibria (Schmidt-Bleek 1994). Resource depletion, exhaustion of natural buffer capacities, climate change are some of the most prominent consequences.

Evolutionary economics started with a more careful look at technological change, which was usually looked at as exogenously given and could now be *explained* by the new approaches developed (Dosi, 1988; Nelson and Winter, 1982). In such a view, technologies depend on market results: they are path dependent and therefore endogenous. Witt (1987) expanded this perspective to an evolutionary view on market mechanisms. Hinterberger (1994) drew co-evolutionary analogies from technological change to changes in preferences.

In this view, consumers' wants are based on their reflections of what they experienced in the past. Hence, both supply (depending on technologies) and demand (depending on consumers' wants) are not just the result of quantity-price relations but of a complex co-evolutionary feed-back structure between the actors' decisions and behaviour. The relevance of feed-back structures is also supported by Janssen and Jager (2002), who – referring to the introduction of green products (products with low environmental impacts) – presented a model which shed light on the the co-evolution of consumer and firm behaviour.

From a general evolutionary point of view, we can describe production/consumption systems via the mutual influence of companies'/households' on each other (Hinterberger 1997): supply creates demand and demand creates supply. In a more complex picture, other organisations and institutions (such as governments, value systems, education, etc.) play a significant role. While in more traditional economic thinking, preferences and technologies are mainly exogenous, technologies can now be viewed as influenced by the experience companies made on the markets, which means that technology development (technical progress) is influenced by consumption activities, while technologies found on the market are also influencing consumers' preferences, which in turn are the main driving force for the effective demand in both quantitative and qualitative terms.<sup>2</sup>

In a further step, not only the behaviour of individual agents (firms and households) is subject to co-evolutionary theorising, but also institutional change (see Wegner 1996, Hinterberger 1997). Hence, individual behaviour and institutions modify one another permanently by mutual feedback creating a dynamic process shaped by qualitative change and learning processes (Van den Bergh and Stagl, 2002; Bowles et al., 2003). Supply, demand, emerging preferences and institutional change are crucial for understanding the development of societies and therefore also the underlying reasons for the (un)sustainability of developments. Such an understanding is crucial for a theoretical underpinning of change and transition of current development paths to more sustainable ones. In methodological terms, such a view on policies requires an co-evolutionary perspective, in which supply and demand, preferences as well as institutional change are subject to "societal selection" and adaptation: technologies, preferences and institutional settings are selected in an evolutionary process in which advantageous traits prevail and others are "extincted" by the socio-economic development.

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<sup>2</sup> Some scholars of sustainability science have pointed out that in (post) modern economies, production and consumption activities are even closer connected than they used to be in classical industrial times. In this view (Bierter 1995), households "co-produce" products and services (they are even termed "pro-sumers").

### 2.3 Co-evolution in the concept of transition management

The concept of transition management addresses the notion of sustainable transformations, meaning the capability to adapt to and shape change towards social visions of sustainability. Notably, transition management integrates a dynamic co-evolutionary understanding opposing traditional approaches of strong planning and fixed policy outcomes. As Kemp and Rotmans (2001: 4) emphasise „a transition consists of a set of connected changes in technology, the economy, institutions, behavior, culture, ecology, and belief systems that reinforce each other. Within a transition there is multiple causality and co-evolution of independent developments“ (see also Rotmans et al., 2001).

Addressing fundamental change, transition management refers to system innovation in order to highlight the policy options of essential change in functional systems and product chains, extending the focus of system improvement by new visions and new development trajectories. Moreover, it is stated that policies are the outcome of processes of co-evolution emerging through out different levels and scales. (Kemp and Rotmans, 2001). In particular this holistic focus on policies, shared by co-evolutionary theorists and transition management transcends the classical dichotomy between exogenous and endogenous factors into an open approach which has the potential to deal with various aspects – insufficiently considered by standard policy approaches – such as endogen preferences, institutional change and evolving policies.

This co-evolutionary dimension of transitions means, that we have to deal with complexity, multiple levels and different spatial, temporal and social scales which are far beyond any exact calculation or any predictability. Thus, we are facing inevitably incomplete knowledge, selective perception, intolerance and a high degree of uncertainty (Funtowicz et al., 1998; Funtowicz and Ravetz, 1990). However, to understand how societies respond to and trigger transitions, how societies reorganise and shape change are key questions of sustainable development and require a deeper understanding, which, so far is still very limited and still evolving (for outstanding exceptions see Levin, 1999; Gunderson and Holling, 2002, Berkes et al, 2003). Possible new research areas within transition management and governance which deal with this understanding are briefly introduced in Section 6.

### 2.4 Adaptive change in transitions

Transition management contains deliberated attempts to trigger change and system innovation towards social visions, as well as it includes the ability to deal with emerging transitions „coming out of the blue“. Hereby, a crucial point is the issue of adaptive capacity,

which, in the general sense of transitions, is the design and potential of socio-economic processes and institutions to change and adapt in response to altered conditions and unpredictable effects of (co)evolutionary dynamics. Given that there is neither a linear path towards any transitions vision, nor a possibility to eliminate surprise, we must ask for the elements and functions that maintain adaptive capacity of socio-ecological systems, which involves identification of critical thresholds, and the nature of interlinkages between transition subsystems.

Referring to sustainable development, adaptive capacity must express the duality of *adapting to change* (responding adaptively to trigger signals and disturbances expressed by conflicts) and *shaping change* (to initiate sustainable transitions towards consensual visions of sustainability to avoid conflicts).

The capability to adapt to change is implicitly expressed in the notion of “co-evolutionary potential” coined by Richard Norgaard (1984) who highlights the importance of keeping a broad spectrum of options and a related diversity of different historically evolved knowledge (for the importance of combining different knowledge systems to enhance socio-ecological resilience see also McClade, 2000; McIntosh, 2000 and Olsson et al, 2003). Referring to societal change and transitions, we understand the term ‘co-evolutionary potential’ as the capacity of systems to establish new evolutionary interactions which open the way for future development trajectories and new innovations. It can be seen as the capacity to perceive and respond to feedback and change in terms of establishing mutual dynamic interactions between the particular systems such institutions, norms, preferences, technologies or policies. In socio-economic systems, ‘co-evolutionary potential’ enhances reciprocal adaptations between different subsystems, such as institutions, technologies or consumer behaviour, with adaptations often driven by crisis, conflicts, learning and redesign. Hence, we speak about the potential to initiate a ‘co-evolutionary dialogue’ where a steady state of change is driven by the mutual and reciprocal interactions among the interlinked systems. Within this dialogue, the ability to form new combinations and new emerging properties support the chances of adaptive change.

Moreover, the co-evolutionary potential is highly related to adaptive flexibility (Rammel and Staudinger, 2002) and relies strongly on a diversity of options which increases the chances to cope with change and surprise<sup>3</sup>. Nevertheless, diversity can only foster

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<sup>3</sup> From one perspective diversity is a kind of insurance against surprise and uncertainty. But above all, as it is stressed in Folke et al., (2002b: 7) “it also provides a mix of components whose history and accumulated experience helps cope with change, and facilitate redevelopment and innovation following disturbance and crisis. (...) Diversity and apparent redundancy of institutions (in the sense of overlapping functions) appears to play a

adaptive change and sustainable transitions, if it is interlinked with the necessary pre-conditions of comprehensive perception systems which receive trigger signals and flexible reponse mechanisms to apply adaptive options. In this context perception also includes internal monitoring to check if current regulation mechanisms are able to cope with change and emerging crisis. Here, a co-evolutionary perspective emphasise reciprocal interactions between societal perception of reality and nature (Norgaard, 1994). In general, the driving force behind institutional change and learning is the perceptual system which emerges out of a co-evolutionary process between environmental triggers, accumulated knowledge, political objectives, and the controversial and mutual communication between individual and aggregate appreciative systems (Hadfield and Seaton, 1999).

However, for human societies (and cultural evolution), adaptive capacity must mean more than adapting to change. Even facing an uncertain and complex world, we are able to and we must make conscious choices, which is even more true for the normative concept of sustainable development which head for particular social visions to be achieved actively. Thus, we must head for strategies to shape change towards reachable goals of sustainability albeit we must not forget to consider uncertainty and the actual limitations of foresight. Subsequently, sustainability indicators, sustainability requirements or key-principles of sustainable development are necessary quideposts and milestones to shape and influence transitions towards social visions of ecological and social sond developments (Gibson, 2001).

Shaping change also is concerned with notions such as multi-level governance, participatory procedures of decision making or flexible community-based systems of resource management, to list only a few, which rely on (1) the co-evolution of stakeholder preferences (2) open policies process which are the outcomes of co-evolutionary interactions throughout different levels and scales (3) using the co-evolutionary dynamics between interacting actors rather than planning fixed outcomes of these interactions. These three aspects are also implicitly addressed through the approach of adaptive co-management which can be seen “as a process by which institutional arrangements and ecological knowledge are tested and revised in a dynamic, ongoing, self-organised process of learning-by-doing” (Folke et al., 2002c: 20). Co-adaptive management means also to share

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central role in absorbing disturbances, spreading risks, creating novelty and reorganizing following disturbances.” (for the importance of diversity for sustainable development see also Rammel and Staudinger, 2002; Rammel and Van den Bergh, 2003; Matutinovic, 2001; Schütz, 1999).

responsibility and the power over management decisions which involves multiple institutional linkages among users, communities, NGOs and government agencies (Olsson et al., 2003).

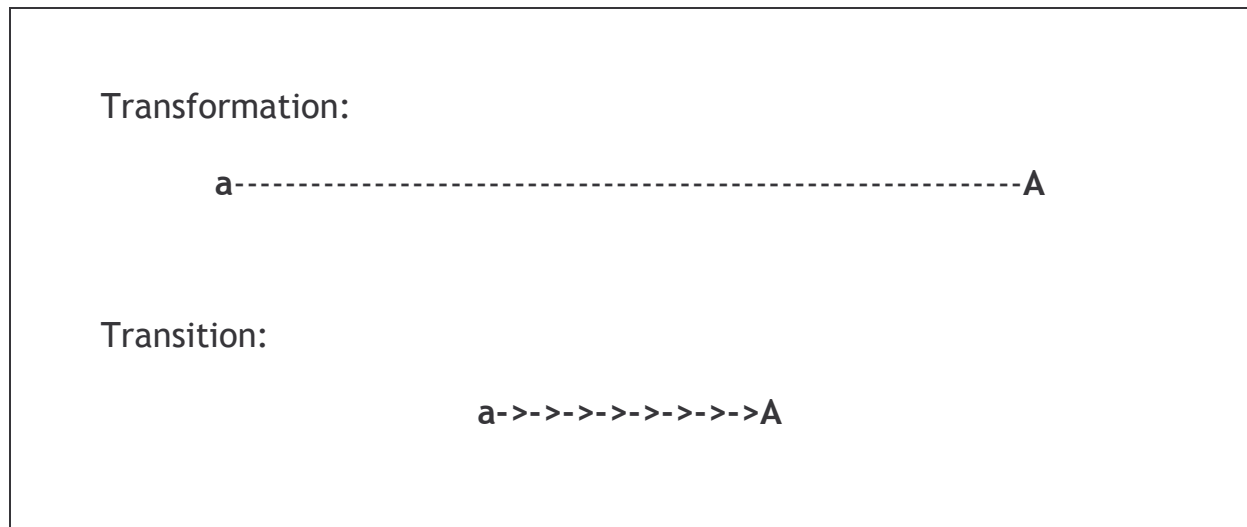
If we assume co-evolutionary processes as driving forces of transitions and unpredictable change, then they provide a promising research framework for identifying particular conditions of adaptive change across different scales (Jeffrey and McIntosh, 2002). To sustain the adaptive capacity during periods of change and transitions we stress the following key-notions:

- Nurturing a diversity of options to foster resilience and risk minimising (Rammel and Van den Bergh, 2003)
- Combining different types of knowledge systems for learning (McClade 2002)
- Provide institutional flexibility to cope with surprise and uncertainty (Becker and Ostrom, 1995)
- Maintaining a social memory reflecting both local practice and theory (Berkes and Folke, 1998)
- Supporting self-organisation across multiple levels towards sustainable development (Folke et al. 2002b)
- Fostering small-scale management experiments (Olsson, et al, 2003)
- Investing in open institutions capable for monitoring, permanent learning and redefining their understanding, management and future actions (Kasperson and Kasperson, 2001)
- To apply the precautionary principle in planning, management and decision-making (Ciriacy-Wantrup, 1968)

### 3 The nature of transitions

The term “transition” derives from the Latin verb “transire” which could literally be translated as ‘crossover’. It seems appropriate to clarify the term transition in order to show its difference to the term transformation. So far the use of transition-bound terminology lacks clear definitions and separation and therefore coherent use of the terms is rather difficult. Referring to Figure 1 transition concerns the steps, processes and dynamics within a and A and the stages a, A are rather informal endpoints of the process itself. Hence this view allows embracing emerging properties of a system that moves towards i.e. sustainability and avoids

goal-oriented steering. Transformation on the other hand is referring to the mere description of the starting point a and the endpoint A. The knowledge of the internal dynamics between the two stages is not so important.



**Fig. 1: Transformation and Transition from a to A**

Of course any transition includes a transformation – Kemp and Loorbach (2003) describes transition as a societal transformation - but examining only the transformation does not sufficiently explain societal changing processes. The two terms different meaning can also be compared to what is described by Kemp and Rotmans (2002:3) as a “typology of transitions” in which “evolutionary transitions, when the outcome is not planned in an important way” are opposed to “goal-oriented (teleological) transitions, when a (diffuse) goal or vision of the end state is guiding decision makers...”.

Referring to the concept of Co-evolution the need for distinct the two terms gets really obvious. As seen in the footnote below also biological terminology makes use of these different meanings<sup>4</sup>. Co-Evolution seen under the focus of transformation is pure description of organism/species /population before and after. The focus of transition on the other hand pays attention to the process itself. This means the dynamic interdependencies between at least two organisms/populations/species are important.

<sup>4</sup> **Transition:** (Biol.) Change from one form to another. (<http://www.hyperdictionary.com/>)

**Transformation:** (Biol.) Any change in an organism which alters its general character and mode of life, as in the development of the germ into the embryo, the egg into the animal, the larva into the insect (metamorphosis), etc.; also, the change which the histological units of a tissue are prone to undergo (<http://www.hyperdictionary.com/>).

Following Kemp und Rotmans (2001:4) every transition includes „*a set of connected changes in technology, the economy, institutions, behaviour, culture, ecology and belief systems that reinforce each other. Within a transition there is a multiple causality and co-evolution of independent developments*”. Human history is steeped in processes fitting in this framework.

Taking a closer look at such transitions from an anthropological point of view it seems appropriate to split the main aspects in two different sections. On the one hand dominance lies upon a mere phenomenological meaning of transition such as pre-historic macro-happenings (Foley, 1984, 1987) or the ‘Neolithic transition’ (see also Bender, 1978; Ammermann & Cavalli-Sforza, 1984; Diamond, 1998).

For periods after Neolithic transition, the main focus of observing transition shifts from mere phenomenological descriptions to the observation of its internal dynamics. One of the reasons therefore may be seen in the increase of the sources and data that can be referred to. Taking system dynamics into account actually all levels and dimensions of human societies are affected: post Neolithic societies can be characterized by division of labour, social stratification and thus institutionalisation – including the development and diversification of appropriation of natural resources (v.Foerster, 1981 & 1984; Luhmann 1984; Willke, 1993). These different aspects of societies are also perceived and reflected from the societies themselves. Therefore since early civilisations increasing complexity of rules and norms and especially their institutional enforcement shed light to different aspects of societal transition processes (Godelier, 1990; Sieferle, 1997; Groh, 1998). This self reflection is even of greater importance as in section 2.2 the dynamic process between individual behaviour and institutions is identified to have mutual character. Hence this analytical process may also be regarded as a shift towards overcoming mere teleological interpretation (goal-directed transition) of transitions.

Accepting that Neolithic transition can be seen as first fundamental transition of the human story the industrial revolution must consequently be seen as a second one (Hobsbawm, 1999) and the globalisation of worlds economy by the end of the 20<sup>th</sup> century has to represent the third one.

The ‘*Essay on principles of Population as it affects the future Improvement of Society*’ by Thomas Malthus (1798) can be seen as a first attempt of a (partial) analysis of societal structures (demography) and their consequences upon other societal subsystems. One significance of the modern Demographic Transition Theory (Chesnais & Kraeger, 2001) lies upon the fact that its descriptive approach derives from observations of population processes during the European 19<sup>th</sup> century. Because of the temporal coincidence with the industrial revolution demographic transition is often linked to modernisation in a causal way. This

rather hasty conclusion led to simplifications (Hauser, 1991; Crook & Timligus, 1997; Kottak 1991) a required a complete paradigm shift concerning society transition in Anthropology. New aspects were brought in by using more holistic and systems-theoretic approaches (Steward, 1972; Bennett, 1993). Currently these tendencies are ongoing and lead to complex, interdisciplinary theoretical outcomes such as published by Holling & Gunderson (2002) or Berkes, Colding & Folke (2003).

## 4 The concept of governance

### 4.1 Some definitions

Governance tends to be used as a slightly blurry term, therefore it is necessary to give a short overview about current/common definitions. Even though 'to govern', 'governance' and 'government' are closely related terms in the English language, their meanings are different. All terms describe the interplay of political administrative regulation and self-regulation of society. (Botzem, 2002) Hence, Botzem defines governance "not only as regulations, but as an interplay of political-administrative steering and societal self-regulation"(2002:6, own translation).

The World Bank's defines governance as "the traditions and institutions by which authority in a country is exercised" (World Bank, 1992) or "the manner in which power is exercised in the management of a country's economic and social resources for development" (World Bank, 1992). It can also be "the framework of rules, institutions, and practices that set limits and provide incentives for the behavior of individuals and organizations" (UNDP, 1999).

Pierre (2000) notes that governance has two meanings: "On the one hand it refers to the empirical manifestations of state adaptation to its external environment as it emerges in the late twentieth century. On the other hand, governance also denotes a conceptual or theoretical representation of co-ordination of social systems and, for the most part, the role of the state in that process." (Pierre in Botzem, 2002:3)

Rhodes (2000) sees three dimensions of governance: He distinguishes governance as a metaphor for the transition of the relation of private and public authority, as "a *new* process of governing", "a *changed* condition of ordered rule", or "a new method by which society is governed" (Rhodes, 2000:55).

Bleischwitz (2003:2) defines governance „as the capacity of a country's institutional matrix (in which individual actors firms, social groups, civic organisations and policy makers interact with each other) to implement and see also Ahrens, 2002). Notably, Bleischwitz

(2003) mentions the “need for governance” as a new answer to “government failures” and defines it as “regulated self-regulation” which express the aspects of a learning, self-evolving system.

“Governance means rules, processes and behavior that affect the way in which powers are exercised at European level, particularly as regards openness, participation, accountability, effectiveness and coherence.”<sup>5</sup> states the White Paper on Governance in the European Union with the title ‘Enhancing democracy. For the context of transitions, it is worth to mention, that its key “proposals for change” include: 1) better involvement of the public in decisions at all levels, 2) greater flexibility of the instruments applied and 3) an overall coherence of policy.

A major step to link governance with the concept of transition management is made by Loorbach (2002). Referring to sustainable development, Loorbach (2002: 12) states that “transition management has to be regarded as a governance-strategy that tries to combine long-term envisioning, multi-actor interaction and short-term actions based on innovations.” In fact, he proposes transition arenas as innovation-networks where actors outside the traditional policy frame will develop new forms of governance, which will chance current institutions from the outside. Over time government will have to include societal actors. This means a transition itself from government to governance.

Beside these different views on the notion of governance, it seems obvious, that governance is different from government. Governance is a process and a question of authority. For global governance, Rosenau compares the distribution of authority to a mobius web. “A mobius web is top-down, bottom-up and side-by-side all at once.” (Rosenau, 2003:26) This means that the interactions on the different levels among all stakeholders – states, NGOs, mass public, corporations, etc. – start to overlap and form a single web-like process.

For sustainable development this means a further challenge. At the moment the EU grounds its understanding of governance on the principle of subsidiarity. But the more different actors get involved in global decisions, the more individuals likely hinder the decision-process due to short-term interests. From a similar point of view, Rosenau stresses the risk to fail the goals of sustainable development upon these dynamics of disaggregating of global governance, as inaction seems “to be inherent in the structural constraints and conceptual blocks that currently prevail the global system..” (Rosenau, 2003:29).

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<sup>5</sup> [http://europa.eu.int/comm/governance/index\\_en.htm](http://europa.eu.int/comm/governance/index_en.htm) (23.9.2003), p. 8

## 4.2 Different levels of governance

In general, we can distinguish between empirical-analytical and normative approaches of governance (Rosenau, 2002; Botzem, 2002). Normative concepts build upon the empirical analysis of the status quo the idea of a nominal condition, with the final focus on politics recommendations. To apply the concept of governance in the debate about sustainable development some normative criteria have to be assessed. Moreover, “governance of sustainable development goes well beyond traditional, state-centered policy-making because it aims at pro-active changes of individual actors’ and firms’ behaviors at different levels.”(Bleischwitz, 2003:5).

Referring to the behavior of firms, the term “corporate governance” addresses the various kinds of management tools which have the potential to lead companies through uncertain markets, dynamic stakeholder relations and legal principles. Moreover, corporate governance tries to embed the profit seeking behavior in emerging markets for eco-efficiency into proper rules and adequate institutions. In particular, markets and firms need governance, guidance and rules in order to improve efficiency and to rebalance myopic processes arising in short-term profit seeking (Bleischwitz, 2003).

A different level is addressed by “global governance” which underlines the strong role of nation states in sustainable development and governance. Referring to environmental policies, Jänicke (2002) emphasises the unique importance of national governments, which have the resources, competence and legitimacy to regulate the actions of disparate individual actors. He also distinguishes between two approaches to achieve global environmental policy: One is driven by seeking consensus: “Governance by international regulations” is a vertical perspective, often on a low level. The other is characterized by competition: “Governance by national pioneer policy” means that demonstration effects and best practice come into play as well as pressure by political and technological competition. The latter might be a more useful approach to achieve further steps in environmental sustainability than waiting for weak consensus treaties to be signed. It’s in the responsibility of the nation states to provide role models and innovative approaches. “Global environmental governance strongly depends on both the competence and creativity of national governments and the international system as a complex mechanism of policy diffusion and coordination.” (Jänicke, 2002:6)

## 4.3 Approaches to governance

One way to apply the concept of governance is reflected by the “participatory governance approach” among corporate and governmental actors in order to overcome government

failures due to i.e. insufficient knowledge and to market failures such as insufficient provision with public goods (Bleischwitz, 2003). Aiming at a continuous process rather than a “one-time shot”, the participatory governance approach goes hand in hand with a dynamic understanding of sustainable development and transition management that objectives and targets need to be set, but they might also change over time as knowledge and preferences may change. Along these lines, the World Resource Institute (2002: 14) points out the “there is accumulating evidence that transparent, participatory, and accountable governance is essential to governance”.

The term “good governance” emerged of the discussion triggered by the publication of the World Bank in 1989. The World Bank derived its definition of governance from an analysis of negative influences on economic development, to a positive concept of governing: good governance. After that in particular the OECD used this concept with a narrow focus on privatisation and liberalisation. Based on this perspective the UNDP developed a broader concept including all interaction and decision-making processes in state, market and civil society (Botzem, 2002).

The EU follows the concept of “good governance”, consisting mainly of five principles: openness, participation, accountability, effectiveness and coherence. Although, the approach in the White Paper is a non-visionary: “good governance is merely a question of delivering the goods and of enhancing the knowledge of the (ignorant) people of the Union” (see Eriksen, 2001<sup>6</sup>). So, governance in the White Paper is understood as a negotiation method to solve controversial problems among political and non-political actors. “Governance is based on a variety of different processes with different authority bases, and highlights the role of voluntary and non-profit organisations in joint decision-making and implementation and the semi-public character of modern political enterprise.” (Eriksen, 2001<sup>7</sup>).

## **5 Managing transitions - The paradox of change and conservation**

Clearly, as shown in the previous sections, governance and transition management are highly interrelated concepts which deal with the dynamic aspects of societal change, multi-level stakeholder integration and pro-active changes of individual actors, firms and institutions. Subsequently, both concepts address implicitly and explicitly co-evolutionary

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<sup>6</sup> Jean Monnet Working Paper No.6/01, [http://www.jeanmonnetprogram.org/papers/01/011201-04.html#P42\\_8053](http://www.jeanmonnetprogram.org/papers/01/011201-04.html#P42_8053)

<sup>7</sup> Jean Monnet Working Paper No.6/01, <http://www.jeanmonnetprogram.org/papers/01/011201-05.html#TopOfPage>

interactions and shift the focus from traditional approaches towards fixed outcomes toward dynamic policies aiming at open learning processes and dynamic concepts of managing change.

Dealing with the tension between socio-economic stability and the quest for social visions governance and transition management highlight a crucial paradox which is revealed by sustainable development: the paradox between creative change and conservation, between innovative experiments and maintaining the integrity and stability of functions. It is the paradox that stabilised, non changing systems become brittle and changing systems become unstable. Hence, governance for sustainable development must reflect a balanced and multi-dimensional process in which socio-economical systems can experiment and invent, benefiting from creating innovations and future opportunities while keeping safe from those which destabilise the systems and putting high risks to a stable development (see also Holling, 2001). In short, sustainable development is therefore inevitable double sided, it is both creative and conserving. Consequently, both dimensions must be reflected in transition management as well as in the concept of governance.

### Innovations and Change

Referring to the first side, an increasing body of literature has expressively shown that innovations and adaptive change are hallmarks of sustainable development (Rammel, 2003; Ashford, 2002). Notably, within the field of technological studies, issues related to co-evolutionary potential such as adaptive flexibility, pathdependencies, lock-ins or adaptive niche management (diversity of niches) are at the core of recent research (Rammel and Van den Bergh, 2003; Arthur et al., 1997; Kemp, 1998). Additionally, due to the co-evolutionary characteristics of technological systems authors such as Kemp and Rottmans (2001) and Minsch (1997) emphasise the essential role of flexible governmental intervention which adapts to the momentary phase of the technological development while supporting the necessary institutional setting which is key to a successful and sustainable enfolding of technological applications.

Hence, technological development and creative innovation can not be dealt as isolated phenomena of pure efficiency rather as evolutionary processes which consist of various mutual interactions across different levels and co-evolutionary domains (values, interests, knowledge systems, resources, institutional arrangements). Given that governance is inherently multi-dimensional, it must cope with this co-evolutionary dynamics which involves a spectrum from the technological invention to the agent of the actual application (von Tunzelmann, 2001).

### Conservation and Stability

In a permanently changing and evolving world the conservation and stability related aspect of sustainable development bears the risk of misunderstanding and controversy. Conserving the elements and function of our socio-ecological systems (even particular eco-systems or even species) cannot be the overall goal of sustainable development (otherwise our objectives would be a-historic and would ignore the nature of evolutionary change and related variability). Rather it must be to maintain and conserve the ability to adapt to changing conditions and to be able to respond flexible to surprise and future opportunities (Gunderson and Holling, 2002). Consequently, transition management is based on gradual rather than on disruptive change, which includes maintained structures as well as intermediate elements to foster stable transitions.

Regarding to research on resilience, one can distinct two different aspects of stability, which once more reflects the paradoxical dimension of sustainability. The first aspect focuses on maintaining the *efficiency* of function the other aims at maintaining the *existence* and *diversity* of functions (see also Gunderson and Holling, 2002). Increases in efficiency drive incremental change tending to create improvements *within* current development trajectories (or technologies) and foster resilience through higher connectivity. But this kind of resilience could easily be a risky corset for adaptive flexibility, opposing the necessity to adapt and change through possible lock-ins and narrow opportunities. In contrast maintaining the existence and diversity of functions is the fundamental base for long-term adaptivity, expressing a more dynamic aspect of resilience and change as it expands stability domains by pre-adaptive opportunities (Folke, et al. 2002a; Mayumi and Giampietro, 2001).

As we can observe in the arena of myopic market selection, there is a fundamental trade-off between gains in efficiency and diversity providing long-term adaptivity. Nevertheless, as complex adaptive theory shows, successful (long-term surviving) systems cope with this trade-off in terms that improvements in efficiency are obtained *without* eliminating completely the sub-optimal and obsolete ones (Mayumi and Giampietro; 2001; Rammel and Staudinger, 2004). As alternative elements are preserved as „system memory“ in the repertoire of possible opportunities, a dynamic but sound balance is supported between efficiency and adaptability (for similarities to adaptive cycles see also Holling, 2001, Gunderson and Holling, 2002). From a systemic point of view this sound balance means that systems with high adaptive capacity are able to improve, change and re-configure themselves without radical declines or eliminations of essential function in relation to key features such as economic prosperity, social stability, hydrological cycles, etc. (Folke et al., 2002). Obviously, this sound balance must be at the heard of transition management, as it is

already expressed by the integration of partly divergent issues such as real system innovation (opening up the possibility of new adaptive opportunities) and gradual improvement (efficiency gains at the margin).

## 6 Contributions to the current debate on transition management

Finally, recalling the recent advances in the literature of transition management, we see a disciplinary gap between existing approaches based on social sciences and the possible contribution coming from disciplines concerned with (co-)evolutionary theory, and dynamics in complex socio-ecological systems. We believe, that the multi-dimensional and systemic nature of change and transitions calls for interdisciplinary bridges and communication about general phenomena such complexity and co-evolution. To enrich the current debate (presented in the previous sections) and close the disciplinary gap, we offer a brief glance on complementary approaches, which, in our opinion, reflect promising areas within a future research agenda on governing sustainable development and transition management.

### Modelling co-evolution

A new attempt to improve our understanding of complex change in human-nature systems is provided by co-evolutionary modelling. Given the complexity of societal transitions, we have to go with Einstein and „make things as simple as possible, but not simpler“. Hence, attempts to model co-evolution in socio-economic systems tries to analyse and reflect the complex dynamics and interdependencies apart from reductionistic prescriptions and linear predictability. In opening the „black box“ of cross-scale interactions, it acts as basis for extended decision making and governmental intervention (Jeffrey and McIntosh, 2002; McClade, 2002; Rammel et al. 2003). Moreover, sustaining adaptive capacity as well as fostering sustainable transitions requires a deep understanding of co-evolutionary feedbacks, and interrelations between ecological, socio-economical and institutional components of our systems across different spatial, temporal and social scales (Folke et al., 2002). This knowledge about co-evolutionary processes is highly desirable, particularly with respect to the objectives of sustainable development (see also Jeffrey and McIntosh, 2002). Without an understanding of reciprocal co-evolutionary dynamics underlying socio-ecological development it might be impossible to provide adequate strategies to foster stable transitions and sustainable governance.

In generally models of co-evolution implicate a system-theory approach which allows to cope with dynamic interrelations, uncertainty and qualitative change (Jeffrey and

McIntosh, 2002; McClade, 2002; Norgaard, 1994). Showing the potential to combine different dynamic methods such as agent-based modeling (Abrami et al., 2002) or complex adaptive system theory (Holland, 1995; Levin, 1999), mapping co-evolutionary interactions transcends the classical dichotomy between exogenous and endogenous factors into one open and evolving model (Rammel et al, 2003). In particular, models of co-evolution aim at:

- Illustrating the co-evolutionary relationships and interactions by describing the characteristics of multidimensional processes of reciprocal influence
- Highlighting the co-evolutionary dynamics between general system properties such as resilience, adaptivity, stability, etc.
- Ascertaining the extent to which co-evolutionary interactions can be used to describe the conditions of societal change
- Identifying the ways in which co-evolutionary interactions could be modified and influenced to foster intervention and sustainable transitions
- Visualising the system behavior to foster stakeholder communication and helping decision makers to decide

### Adaptive management

Nevertheless, as methods to map co-evolution are still in their infancy and complete understanding of non-linear system behavior is far beyond any be it ever so sophisticated models, uncertainty will remain an inevitable aspect of transition management. In response to this problem we go along recent approaches aiming at adaptive management of complex and co-evolving socio-ecological systems (Gunderson et al, 2002, Abel, 2002). Proponents of this approach argue for forms of management and governance that should be adaptive and include a continuous learning process about the systems in questions from policy experiments (Dale et al., 2000; Walker, 2002). Multiple small-scale experience, focused at local conditions, followed by continuous monitoring and process revision are preferable in this respect (Lee, 1993).

Originally developed for natural resource management in socio-ecological systems, adaptive management means a institutional design that have the capability to simultaneously foster different ways of management, emphasising learning, monitoring and accumulating knowledge. Subsequently, adaptive management is followed by a permanent adjusting the rules that underpin our behavior in order to cope with uncertainties and fundamental change

(Folke et al, 2002)<sup>8</sup>. Therefore, policies and governance should be far from any control and planning, rather expressing particular hypotheses which enables experiments and expect surprise (Walters, 1986). Drawing on analogies with adaptive management, transition policies must shift the weight from command-and-control approaches and from pure market incentives to set the overall conditions to allow adaptive enterprises and sustainable change (Holling and Meffe, 1996).

As adaptive management is driven by cross-scale dynamics and flexibility, it is based on a diversified decision-making structure that allows for testing the rules and development trajectories at different scales. Instead of rigid social institutions heading for strong planning and fixed outcomes, this approach points at the need for flexible social networks, participating interest groups and open institutions across different scales that proceed through learning by doing and are more capable to deal with the ambiguity of multiple objectivities, surprising outcomes and the complexity inherent in coevolving socio-ecological systems and transitions (Kasperson and Kasperson, 2001; Folke et al. 2002). Therefore, the challenge of governing change is to develop such institutional arrangements that match social, technological and ecological processes emerging at different spatial, temporal and social scales.

Drawing on the outcomes of ecosystem managements (Shannon and Antypas, 1997; Folke et al. 2003), this arrangements mean also specific arenas for local stake holders to self-organise, redefine visions, and implement new rules for management and governance. As constant adjustment in this multi-governance setting requires innovation and experimentation it strongly needs a social memory and the adaptive capacity to deal with emerging change and disruptive innovations.

### Panarchies

Recent studies of transformations in human and natural systems place the debate about adaptive capability within the theoretical framework of “Panarchy” (Gundersson and Holling, 2002). In short, drawing on the work of Simon (1974), a Panarchy represents the patterns and structure in which elements of complex adaptive systems (such as ecosystems or socio-economic systems) nest in one another in a hierarchy. Notably, these hierarchies are far away from being static structures, rather their interconnected levels are “transitory structures

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<sup>8</sup> Transferred into the context of transition management the similarities to the prolonged role of governmental policies during predevelopment stages to support social experimentations seems to be obvious (see also Kemp and Loorbach, 2003)

maintained by interactions of changing processes across scales” (Holling et al, 2002). These transitory structures can be entities of ecosystems as well as particular elements in question of transition management and governance (industrial sectors, technologies, etc.).

As described by Holling (2001: 398): „The panarchy is a representation of the ways in which healthy social-ecological systems can invent, experiment, benefiting from inventions that create opportunity while kept safe from those that destabilize the system because of their nature or excessive exuberance. Each level is allowed to operate at its own pace, protected from above by slower, larger levels but invigorated from below by faster, smaller cycles of innovation. The whole panarchy is therefore both creative and conserving. The interactions in a panarchy combine learning with continuity“ (Holling, 2001).

Transferring the theory of panarchy to societies, we could describe fast variables, among others, as economic ones or for instance operational rules and individual preferences. Slow variables could be described educational or cultural ones such as constitutional rules or social institutions. Obviously, here the question for governance must be how to recognise and communicate the high importance of investing in the slow variables and how to balance the exploitation of fast variables without threatening the slow ones (Carpenter, 2003). Moreover, as we are heading for gradual sustainable transitions embedded in particular levels within the whole panarchy, future research has to focus on the interactions between different panarchical level in order to use the co-evolutionary dynamics to stimulate change towards societal visions.

## 7 Conclusions

Socio-economic systems are moving targets with multiple futures that are inevitable unpredictable and uncertain. Moreover, they express dynamic interactions between co-evolving domains such institutions, technologies, values or policies which emerge at different temporal, spatial and social scales. Thus, conventional policy approaches relying on control and static optimisation can not tackle the objective of sustainable transitions. Consequently, governance and policies for sustainable development are challenged to be adaptive, flexible and experimental at scales compatible with the scales of critical socio-economic functions. A co-evolutionary perspective on transitions and change addresses this challenge and shed light on the dynamics inherent in social transitions and sustainable change. Understanding policies as endogenous parts of the socio-economical evolution this perspective presents an interdisciplinary framework for further research on sustainable transitions including notions such as uncertainty, complexity and adaptive change.

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