

Sustainable Development and Collective Learning: Theory and a European Case Study

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Abstract

Network governance of collective learning processes is an essential approach to sustainable development. The first section of the article briefly refers to recent theories about both market and government failures that express scepticism about the way framework conditions for market actors are set. For this reason, the development of networks for collective learning processes seems advantageous if new solutions are to be developed in policy areas concerned with long-term changes and a stepwise internalisation of externalities. With regard to corporate actors' interests, the article shows recent insights from theories about the knowledge-based firm, where the creation of new knowledge is based on the absorption of societal views. This concept shifts the focus towards knowledge generation as an essential element in the evolution of sustainable markets. This involves at the same time the development of new policies. In this context innovation-inducing regulation is suggested and discussed.

The evolution of the Swedish, German and Dutch wind turbine industries are analysed based on the approach of governance put forward in this article. We conclude that these co-evolutionary mechanisms may take for granted some of the stabilising and orientating functions previously exercised by basic regulatory activities of the state. In this context, the main function of the governments is to facilitate learning processes that depart from the government functions suggested by welfare economics.

Keywords: knowledge creation, knowledge-based firm, networks, regulation, collective learning, sustainable development

JEL codes: Q01, Q56, D73, L51

1. Introduction

Our article proposes the following thesis: Governance of sustainable development goes well beyond traditional, state-centred policy-making because it aims at pro-active changes of the behaviour of private actors at different levels. It necessarily involves the lower levels of policy-making and the activities of private individuals in policy formulation and implementation. Innovations generate positive externalities, which enable corporate actors to play a public role while doing business on competitive markets. The notions of networks and collective learning we put forward in this article do accept profit seeking in emerging markets for sustainability. They further identify this behaviour as a driving force towards policy integration and the internalisation of externalities. Motivated by self-interest and soft incentives, corporate actors transform areas into markets for sustainable development that were previously a part of the public domain. However, the state retains the responsibility for structural conditions and innovation-inducing regulations.

To test this thesis the article discusses the following questions:

- What exactly is the function of networks and regulation?
- What are the characteristics of a system that develops synergies between political and corporate governance?
- If corporate players can play a public role, which conclusions can be drawn for policy makers?

Methodologically, this article refers to recent theories from both political science and economics. The analyses in the discipline of political science look at governance systems with less government activity (Héritier 2002; Majone 1998; Young 1999) while the economic analyses offer findings on firms, market failures and regulatory theories (Williamson 1999; Nelson 2002; Stiglitz 2000). This interdisciplinary approach is valuable because political science has a strong interest in administration and policy-making, especially in the field of institutionalism that is actor-centred. Within the economic analyses, the emerging branches of New Institutional Economics and Evolutionary Economics prove to be helpful. The analytical framework derived from these theories departs from models of rational choice, i.e. it does not assume a fully rational actor with perfect information (Ostrom 1998; Mantzavinos 2002). Recent literature on corporate governance is of special relevance here as it provides insights into the motivation and self-interest of firms. This in turn is helpful for the (new) design and reform of policies.

In section 2 we will give a short survey of theories on market and government failures. It is proposed that both types of failures can be compensated between private and public actors in the development of sustainable markets. Section 3 outlines a more evolutionary approach on firms and markets. Section 4 deals with the policy-level while in section 5 we describe a case

study on wind energy in three EU Member States. Section 6 draws conclusions on governance.

2. Network governance as a response to market and hierarchy failures

Markets are well known for being dynamic and powerful, yet imperfect. These imperfections also have been described as market failures. However, not only the market but also government failures are a field of research for political scientists and economists. Within the sustainability debate the hierarchical mode of failures or inadequacies of the government to bring about changes are widely discussed. In this part of the article the market and the hierarchy, the two most dominant forms of government and their failure to bring about sustainability improvements are discussed. Subsequently, co-operative governance structures between private and public actors will be presented as a possible solution to correct both these forms of government failures.

Market failures

Markets are often considered to be unable to contribute to sustainability improvements because such improvements have public goods characteristics. They are incompatible with the mandate of profit seeking in a pure free market economy. Public goods are defined as being non-exclusive and non-rival. A good is non-exclusive if nobody can be excluded from the benefits of its use. Further, the good is said to be non-rival if the consumption of one unit of the good does not lower the consumption opportunities still available to others (Sandler, 1992:6). These attributes of non-rivalry and non-excludability make private production of these goods unattractive. However, this standard concept of public goods can be problematic (Nelson 2002). The attributes may change due to technological progress.⁴ Although citizens are usually taken as one aggregated unit, they benefit from public goods in innumerable different ways. Preferences are often heterogeneous and change over time. The assumption of a fixed borderline between private and public goods seems no longer tenable. In fact, the borderline can be argued to be blurred. At the same time sustainability improvements frequently result in certain private benefits (e.g. higher levels of efficiency, lower total costs and a green image). It is more appropriate to regard improvements in sustainability as an impure collective good of the so-called joint product variety.⁵ Such a conceptualisation provides a new perspective on the roles of public and private actors in the field of sustainable development.

The notion of *externalities* raises further questions. Third parties that so far have not been involved can be affected by internalisation efforts within Coase-type negotiations. Governments have to serve their respective voters and may tend towards decision-making in favour of certain interest groups. This might lead them to overlook vulnerable groups inside and outside of the society that are only modestly organised. Participation is a topic of internalisation strategies that has merits also in other areas of sustainability. Its relevance becomes even clearer when we look at the openness of technological change (Freeman 1998), where mechanisms for absorbing new knowledge are crucial. The acknowledgment that firms

⁴ The examples lighthouses illustrate such a conversion from a former public to a private good due to technological improvements and better pricing possibilities. They have been mostly replaced by modern navigation systems which are required by law and which are provided by private companies.

⁵ A collective good can be defined as a joint product, where the collective activities result in a multiple output.

pursue these interests of knowledge transformation into business concepts creates the scope for an endogenous internalisation of externalities.

The category of *information and adaptation deficits* refers to the speed at which markets and firms adapt to new circumstances that arise from new legislation and other exogenous factors. The field of evolutionary economics has shown that markets evolve step by step (Witt 2003; Pelikan / Wegner 2003), created by pioneers and early imitators from a variety of firms. However, in the evolution of markets stakeholders are at least as important as the Schumpeterian entrepreneur. In fact stakeholders are central information carriers for the learning processes that drives the evolution of markets. Stakeholder involvement is therefore a key to reduce the information and adaptation deficits.

Based on this overview of different market failures it can be concluded that the correction of unsustainable market behaviour is often a question of learning processes that involve a variety of actors. Collective learning processes, new products and technologies that bring about private and public benefits can be developed through the involvement of different stakeholders. In other words, collective learning processes should be seen as a key factor for the internalisation of externalities and for the provision of collective goods. Therefore, the development of collective learning processes and stakeholder involvement should be a focal point in the governance of sustainable development.

The failures of hierarchy

This article proposes that co-operation between private and public actors in the development of learning processes is essential for sustainability improvements as it responds to a central weakness of hierarchical governance. The problem goes beyond the too simplistic general view of public choice theories. The fact is that economic actors, and also politicians and bureaucrats, are driven by self-interest. This provides at least some initial insights on why public policies are likely to involve failures (Buchanan / Musgrave 1999). In this context, hierarchical top-down regulation may have been designed without the knowledge of the interests and knowledge of the actors and processes in the local networks where the real changes take place. Such forms of regulation can lead to dissatisfaction, conflicts and spore behaviour of self-interest both by private and public actors.

Command-and-control is an example for hierarchical governance. It is often defined as legally mandated standards that are enacted by a series of agency decisions that are enforced by local authorities. In her analysis of German water and air pollution controls Mayntz (1978) concludes that the environmental standards do not automatically result in the assumed target group behaviour. Further she argues that control, monitoring activities and prosecution of violators are necessary for the effectiveness of such a regulation. However, the possibilities of the public to execute such a required control are limited. For this reason many polluters choose the risk of not complying with the standards.

The top-down approaches have been criticised in the general political debate because of their implicit assumption that public authorities control the organisational, political, and technical processes affecting implementation. Similarly, the approach fails to acknowledge the importance of the interaction between bureaucrats, target groups, and other private associations. The knowledge of actual problems these groups have, should be put to use by the top-level of the hierarchy (Enevoldsen 2001:88; Jordan / Wurzel / Zito 2003; Pelikan / Wegner 2003).

The development of co-operative institutions for collective learning processes

The possession of knowledge of private and public actors can be seen as a central reason for the existence of policy networks. Policy networks are therefore proposed as a mode of governance (Börzel 1998; Kenis / Schneider 1991). During the last decade a development and strengthening of the societal organisational structures outside of the state hierarchy has been witnessed (Kenis / Schneider 1991). More resources have come under control or were produced by private organisations. These changes have developed alongside the growth of new technologies, products and services. This has resulted in higher levels of complexities within policy making. These complexities require knowledge, expertise and access to resources beyond the scope of public actors. As a consequence, governments have become increasingly dependent upon co-operation and joint resource mobilisation between policy actors from sectors outside of the traditional hierarchical control of governments (Börzel 1998:260). These changes have favoured the emergence of policy networks as a new form of governance. These new forms of governance are different from the two conventional forms of governance (namely market and hierarchy). These two conventional forms allow governments to mobilise political resources in situations where resources are widely dispersed between public and private actors (Börzel 1998).

On the one hand, we agree with the view that the development of networks between private and public actors is central for the co-ordination and mobilisation of resources necessary for the implementation of profound change. On the other hand, we see the co-operation between private and public actors as the central argument for the development of learning processes that, we suggest, is a key factor to sustainability improvements. In actor centred institutionalism interests are treated as exogenous. If preferences are treated as given, however, one fails to recognise learning processes as a central driver behind change. In the approach presented in this article it is assumed that learning processes can alter the interests and preferences of actors. This is why we argue that the generation of collective learning processes should be a central pillar in governance strategies.

However, market development instead of policy implementation is the aim of the kind of networks proposed in this article. This concept has an influence on the composition of networks and the issues discussed. The networks we analyse deal with the strategic issue of bringing economic activities on (transition) paths towards sustainability. It is not the aim of the networks to seek strategic influence on the ongoing national and/or local political agenda. Networks of this type will be made up by business and political actors and consumer groups (both on the decentral and central level). In those networks public policy acts only as a participant but not as a centre of hierarchical control. It can provide insider information on possible regulatory trends both within the EU and on the Member State level in order to lower transaction costs. (Dror 2001; Stiglitz 1998; Pelikan / Wegner 2003; Young 1999).

From this viewpoint, the traditional dichotomy between the market and the government, or between laissez-faire and intervention, loses importance. The market and the state serve complementary functions that keep the system running. A well-performing market economy is a mixed composition of government regulation and (free) markets. Langlois and Robertson (1995) formulate similar views on business institutions.⁶ Governance towards sustainability is

⁶ See further North (1990), Pelikan / Wegner (2003).

a co-evolution between the market and the state, where private and public actors search permanently for market and policy improvements.

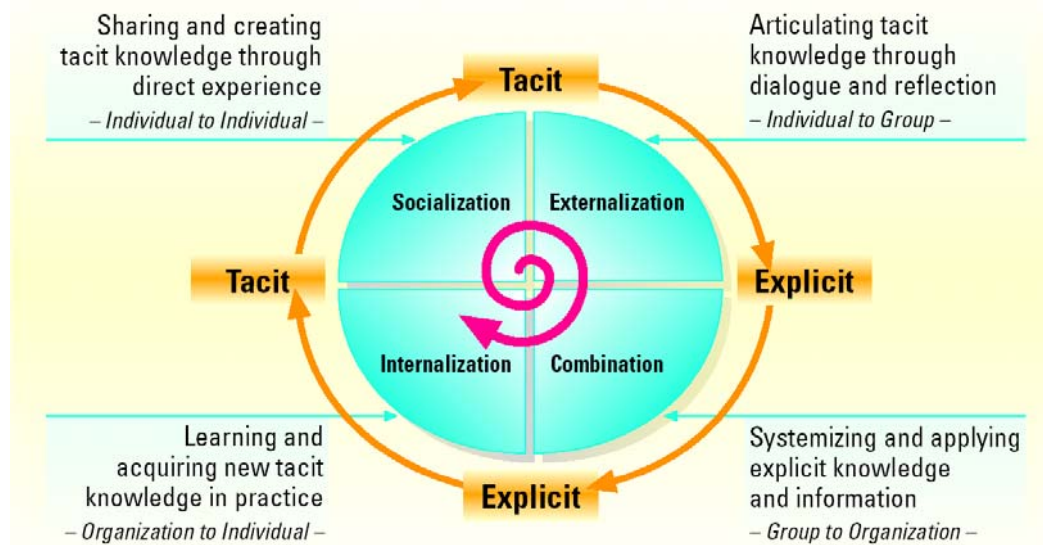
3. Firms and Market Evolution

How does the behaviour of profit maximisation of firms fit into the approach of collective learning described above? What is the interest of firms to engage in such forms of co-operation and why would they not defect if it would pay off? Indeed, this might well be the case. Corporate behaviour is unlikely to become benevolent for society as a whole or for the global commons. Still the “shadow of the law” is one option for policies that will reduce the likeliness that corporate actors will defect from such relations (Scharpf 1997, Börzel 1998). Another – and perhaps more important – point is that in many cases it proves profitable to develop new technologies, products and services which result in sustainability improvements (Weizäcker et al. 1997). In other words, profit seeking can go hand in hand with sustainability improvements. The following section explains why.

Recent economic analysis (Nelson 2002) reveals a shift in the corporate behaviour driven by profit maximisation. Previously it was quite naturally assumed that businesses are motivated by profits and an optimisation process alongside a sharply defined set of opportunities. Firms were not regarded as groping, experimenting and gradually innovating towards incremental improvements. The idea was that profits were predetermined by the given set of total average cost, marginal revenues and technological choices. The role of the management consisted in an optimisation towards the market equilibrium. Such companies would obviously have no interest in a contribution towards public goods or the internalisation of externalities.

However, this kind of model could not account for the dynamics of competition and knowledge generation. More recent theories establish an analytical model of knowledge-based firms (Leonard-Barton 1995; Langlois / Robertson 1995; Grant 1996; Nonaka / Toyama 2002). It is assumed that firms act under uncertainties and information deficits. They rely on permanent knowledge generation provided by outside sources, experiments or internal implementation processes. At times, firms might be able to create markets from scratch through coordination with others along vertical or horizontal lines. In doing so, firms communicate with stakeholders in order to learn about changes in demand and the development of useful goods and services on the one hand, and to avoid hostile reactions, on the other hand. Figure 1 illustrates that firms make use of a spiral of knowledge generation that helps them to transform information that was generated elsewhere into marketable knowledge. Moreover, it may develop into transaction cost-reducing routines.

Figure 1: The spiral of knowledge generation



Source: Nonaka / Toyama 2002.

Does this new model overcome the existing assumptions about corporate approaches to sustainable development and the involvement in governance structures? If the model is acknowledged to reflect competitive markets what are the implications for the questions outlined here? Basis for an answer is a) our proposition that there is no fixed borderline between common and private goods and b) that there are potential low-cost or even profit generating options (*low-hanging fruits*). Basically, knowledge-based firms contribute in two respects towards sustainable development while they still serve their own interests: they develop technologies and/or services that are private but which contribute to public goals at the same time. Renewable energies and technologies for clean water are just a few examples (see van Dijken et al. (1999), www.faktor4.org, www.japanfs.org).⁷ Firms also work on the creation of demand, either by marketing or other professional business forms. An illustration for this are services like leasing, renting, pooling and sharing of goods that also happen to contribute to the commons, e.g. the organisation of car-sharing in order to save costs for parking space.

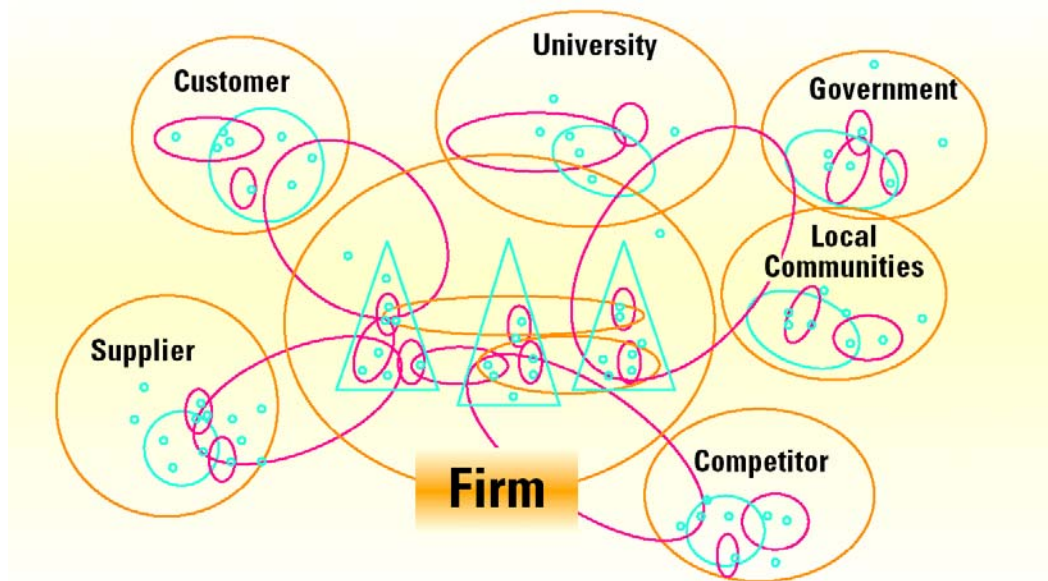
In the context of collective learning, firms can benefit from participation with stakeholders in the evolution of new market rules. This is not only due to the fact that they can influence the outcome. The main reason is, once again, that there could exist an advantage to be a forerunner or fast imitator. The adaptation times for participating firms are significantly shorter. Learning during times of governmental policy reforms can trigger competitive advantages (Porter / v. d. Linde 2000).⁸ In other cases, any further regulation has to rely on

⁷ These two websites provide some examples from Europe and Japan.

⁸ This is a thesis that has not been tested empirically so far but would require more research. To really explain the behaviour of actors would require the use of game theory.

the experiences gained by pioneering firms because they generate data on the costs and benefits of various institutional mechanisms. Thus, such governance systems may well be stimulated by exploration and experiments undertaken by corporate actors. The free-riding position to simply wait for the establishment of new market rules might turn into a competitive disadvantage. Figure 2 presents firms as a part of the social environment where the decisions of the firms are likely to be influenced by being embedded into this system of rules.

Figure 2: Firms as parts of social environments



Source: Nonaka / Toyama 2002.

The tentative conclusion for collective learning is not that the model of the knowledge-based firm reflects the only or dominant form of doing business. Many firms struggle to survive and hardly spend time with learning processes and exploring new opportunities. Though they may be seen as laggards, they are still relevant for an analysis of collective learning processes. One also has to take into account that firms do not necessarily act with total consistency. Some operations may become more sustainable than others where asset-specific investments that imply sunk costs hinder rapid change. We would like to suggest that firms tend to imitate pioneers and early followers through benchmarking processes. Incentives for improvements are then easier to understand, especially if they come from markets and not only from governments or the legislative. These processes of imitation can lead to a horizontal diffusion of best practices that is pivotal for sustainable development (see Figure 3 below).

Looking at market evolution overall, transaction costs associated with research and development as well as with the establishment of new markets have to be taken into account. Markets for sustainability goods involve a multitude of actors. The demand of the consumers needs to be stimulated as they only have a vague idea of some of these goods (Loasby 2001). Firms, markets and institutions can economise on these transaction costs. Within the analytical framework outlined here, this process is characterised by public activities that gradually move towards the involvement of viable markets. A point that gains more and more

attention by research is that co-evolving incentives set through governance systems are an essential prerequisite.⁹ In terms of market evolution, the following steps can be expected to lower transaction costs:

- overcoming information deficits,
- improving sustainability management within firms,
- establishing supply chain management among firms (vertical co-operation),
- involving stakeholders in innovation processes alongside the supply chain,
- initiating sequences of incremental innovations or more radical innovations like functional redesign or system renewal,¹⁰
- promoting horizontal diffusion of innovations.

In some areas emerging markets for sustainability are evident as the case study on wind energy in section 5 shows. But how does this apply to other environmental problems such as climate protection? Is the climate itself not a truly global public good? This article does not seek to argue against open access to, and non-rivalry in consumption of the atmosphere of the Earth. However, the proposed thesis on markets for sustainability may open a new perspective on the problem of non-excludability. The issue of climate protection is closely linked to energy efficiency, increasing shares of renewable energies and hydrogen and growing markets for eco-efficiency that act as a substitute for resource-intensive manufacturing processes. These markets can be made profitable. The marginal cost functions can be modelled as step-shaped functions.¹¹ Markets for sustainability produce positive externalities together with a learning governance structure. Hence, governance for sustainable development might become a positive-sum game: once markets for energy efficiency, renewable energies and eco-efficiency start to emerge, they can provide public goods or, more precisely, reduce risks and contribute to stabilisation of the atmosphere. Ways have to be found to strengthen the processes of search, discovery, innovation and diffusion in order to realise such a scenario. This is an explicit challenge for firms, stakeholders and governments. Figure 2 (above) illustrates the double meaning of the environment: firms act as parts of the natural and social environments. Markets for sustainability emerge as a method in order to solve coordination problems among different actors, and thereby to provide goods.

Technological change has a definite bearing on market evolution (Freeman 1998; Langlois / Robertson 1995). Discoveries can set the route to cleaner production, more efficient manufacturing processes, new products that are able to lower environmental pressure, etc. Technological change can result in a shift at the margin from public towards private goods. As a consequence, goods formerly considered to be public can now be provided by private efforts. For that reason private market activities can at least partly provide a clean environment. Firms are interested in these emerging markets as long as they can expect profits. Sequences of incremental technological change can stimulate markets just as well as

⁹ See for example Bleischwitz (2003a, 2003b), Cashore (2002), v. Dijken et al. (1999), Gabel / Sinclair-Desgagné (1998), Haufler (2001), Héritier (2002), Weizsäcker et al. (1997).

¹⁰ Radical innovations imply higher risks which have to be assessed by the firms itself. This is why firms prefer sequences of incremental innovations.

¹¹ This is still rather a thesis than empirically tested. We argue that this kind of impediments may hinder firms to immediately exploit eco-efficiency benefits. For further reading see Jaffe et al. (2002).

radical innovations can do. Furthermore, incremental changes are more open to flexible incentives provided by other firms, stakeholders and regulatory efforts. This fact is important because it proves to be easier to manage changes via improvements in incremental technological rather than a backstop technology. Such changes, however, ought to be embedded in institutional reforms where government strategies of sustainability act as a permanent driving force for markets and firms to search for innovation.

4. Regulation

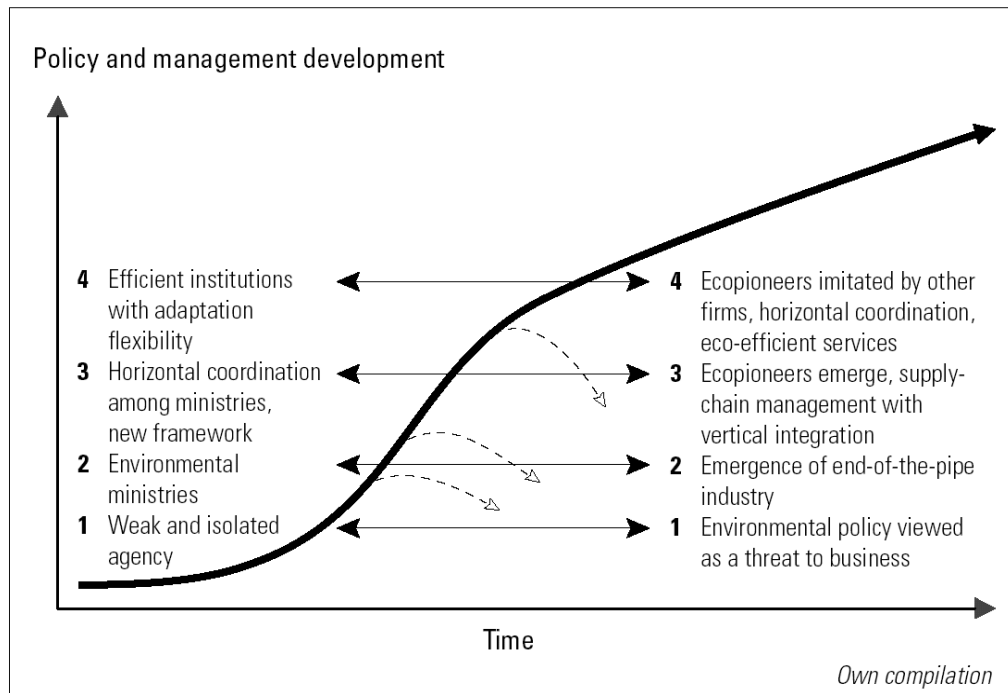
Any governance of sustainability has to deal with various forms of doing business as well as with the day-to-day policies of a wide variety of actors. Still, command-and-control approaches and other policies exist that restrict businesses in case of permanent non-compliance or high-risk activities. Our approach of governance becomes especially important if long-term tasks are to be performed, e.g. climate protection that requires learning, innovation and change. For such tasks, innovation-inducing regulation (Jänicke / Jacob 2002) fits into our conceptual framework. This type of regulation is not only conducive to innovation but develops also alongside with the specific developments in each case. Such co-evolution between corporate and political actors is based on the insight that important governance functions have to be dealt with at the level of day-to-day governance. They cannot completely be regulated ex-ante by any political or constitutional order. The reasons for this are uncertainties, knowledge deficits and, by and large, the unpredictable results from human activity. One may note that these uncertainties result from different sources: previously unknown facts and the persistence of market failures that are more difficult to overcome than previously expected. For this reason, innovation-inducing regulation interacts with corporate activities and the emergence of new markets for sustainability. In contrast to Jänicke and Jacob (2002), who put great emphasis on political actors, we would argue in favour of collective learning that leads to change. This view of co-evolution has more far-reaching implications than the analysis of Jänicke and Jacob (2002) reveals.

Innovation-inducing regulation has a relatively short time horizon up to a few years. On the other hand, strategic frameworks have an impact over many years if not decades. Innovation-inducing regulation relates to the governmental functions of addressing problems of the society, bringing together heterogeneous actors and finding solutions for specific problems. At the same time, this type of regulation takes into account that governments do not necessarily have the knowledge of what exactly can be done. The governments first draw business attention to certain problems instead of telling them what to do. Governments set goals and help to establish win-win coalitions, but they do not specify which action should be taken. They participate in networks and other forms of multi-actor coalitions without being in a dominant position. There is a shift in the process of policy-making from public policy-makers to a multitude of other actors that include corporate actors and environmental and/or social NGOs. Corporate governance and the notion of knowledge-based firms fit well into such a comprehensive governance system.

Figure 3 illustrates this view. It basically shows that policies and management develop through different stages, from immediate problem solving, via institutionalisation to low-cost, innovative and preventive approaches. The meaning of governance is twofold: Firstly, each stage serves a certain function and any institutional leapfrogging strategy may come at the expense of comprehensiveness and of the major actors. Secondly, any progress depends on

co-evolution, not only on success in policy or management. There is hardly a country in the world where eco-efficient services (stage 4 in environmental management in the figure below) emerge without incentives being set by governments. Neither is it easy to find a country where horizontal coordination among ministries and institutional adaptation improves flexibility (stages 3 and 4 in environmental policy) without support from vested or newly established interest groups.

Fig. 3: Co-Evolution of Corporate and Political Governance



Source: Bleischwitz 2003a.

This figure suggests that participatory and administrative processes in governments and businesses increasingly fulfill important governance functions were previously which the prerogative of a political framework. Stabilisation not only results from a framework but also from the adaptation towards new conditions. The importance of adaptive flexibility increases with the degree of uncertainty and change. For governance that aims at long-term changes with varied innovations, adaptive flexibility is at least as relevant as an ex-ante framework. This implies a kind of regulation that is not determined by a rigid framework. It precludes strict regulation that would stifle the adaptive flexibility of markets and societies. Such criteria should play a role when the European Union employs ‘Sustainability Impact Assessment’ in support of its policies.

5. A case study: developing Dutch, German and Swedish wind turbine industries

The development of the wind turbine industries in Sweden, the Netherlands, and Germany illustrates the governance approach we suggest. The German wind turbine industry is now the

second largest in the world. The Dutch and Swedish industries only account for very low shares of the world market. These outcomes can be explained by the development of different public and private relations and collective learning processes. Johnson and Jacobson (2000) see two phases in the different development paths of the German, Dutch and Swedish industries. The first phase, roughly between 1975 and 1989, was characterised by substantial technological variety (and uncertainty), underdevelopment of markets and entry of many firms. The second phase, roughly between 1990 and 1999, was characterised by a considerable turbulence, driven by rapid growth in the market and an up-scaling of turbines. Further, there were many exits and some new entrants including a few larger firms (Johnson and Jacobson 2002:7). The differences in the institutional frameworks, both in the first and the second phase, can be seen as a central factor explaining the different evolution of the emerging industries in the three countries.

At the end of the 1980s, a large number of actors, firms and universities developed and tried out a range of different technological designs both in Germany and in the Netherlands. In both countries R&D policies encouraged a broad range of technical experiments that stimulated the creation of new knowledge. In contrast, the funding policies in Sweden were directed towards large turbines (MW sized) and did not support small and medium sized turbines. At the same time only a few large firms were involved in the development of the wind turbine industry. Therefore, a great variety in the industry was developed in Germany and the Netherlands with respect to the generated knowledge and the exploration of it. In contrast, the variety of the technology and the existence of actors in the Swedish industry were low. Only one firm was mainly involved in the development of knowledge and was merely focused on large turbines.

The German market expanded rapidly due to the market formation programme, which included significant subsidies lowering the price of wind electricity (Assmann et al.2004). The price regulation for renewable electricity was based on fixed enumeration prices established by law, independent from public budgets. These enumeration prices declined over time and were financed by a small charge on electricity use. In a legal sense it is not a kind of eco-tax. Therefore, the income that was generated by wind turbines was high and predictable and greatly reduced the risk of the investment. Another cause for the rapid expansion of the German market was the fact that it was required by a federal law of 1997 to provide land to build wind turbines, and hence compulsory for the different federal states (Länder). The German wind turbine industry witnessed at the same time the development of two forms of networks that made the market formation possible. Firstly, learning networks that facilitated the diffusion of wind turbines developed between the different actors in the product chain of wind turbine technology. Secondly, policy networks were created that actively took part in protecting German wind energy policies within the German wind turbine industry. Large energy companies particularly demanded these networks.

The market formation in the Netherlands failed because of other reasons. The investment subsidies from the Dutch government did not have the intended effect. One reason was a problem of finding sites for wind turbines. The building permits were issued by local authorities, which forced a lot of local resistance (NIMBY), in turn exploiting slow and time consuming procedures. This blocked the formation of the Dutch market. The failure of the *Windplan foundation*, which was organised by several Dutch electricity distributors, is another cause of the failure of the formation of the Dutch market. The idea behind the project was to coordinate procurement and thereby acquire cheaper and better wind turbines. The project was ambitious at that time (measure in MW) and also attracted foreign firms.

However, the project of the *Windplan foundation* was abandoned in a very late stage of the project phase because the electricity distributors started to question the benefits from joint procurement. Further, the *Windplan foundation* is seen as a central reason why the Dutch wind industry failed to acquire shares of the expanding German market. The Dutch industry concentrated on the domestic market because it looked very promising. Although the opinions on this matter do not concur, it is also argued that technical requirements of the *Windplan project* made the Dutch industry develop a wind technology that followed (too) specific requirements. However, these requirements were not commercially feasible with respect to other markets. “Without access to a booming market and the associated economic benefits, the Dutch firms had neither the resources to develop their technology fast enough or to keep up with the German suppliers nor the political strength to influence the vital building permit issue” (Johnson and Jacobson 2002:28).

No virtuous circles for the industry were engineered in Sweden although a growth in demand developed. An important reason for the former was that potential industrial partners were not interested. The Swedish wind industry therefore lacked resources in the development of new technology and market shares. There were investment subsidies within the facilitation of the Swedish market, even though they were much weaker than in Germany and the Netherlands. The Swedish firms lacked a strong response capacity in the second phase due to the low technology variety during the first phase. This became a second reason causing the failure of the market formation.

According to Johnson and Jacobson (2000), the level of legitimacy of the new technology enjoyed by public and private actors is a central explanation in the analysis of the different evolutions of the wind turbine industry in the Netherlands, Sweden and Germany. The legitimacy of a new technology and new ideas can be seen as a part of learning processes where actors develop new understandings and perceptions of human life and market opportunities. In this context, the absence of an interest of potential industrial partners within the Swedish industry was connected to lack of legitimacy of wind power that came due the so-called *nuclear trauma*.¹² On the other hand, a political consensus existed in the Netherlands and Germany in the 1980s that the wind turbine industry should be supported. It was seen as legitimate for private capital to exploit wind turbine technology. “The legitimacy meant that firms responded to various stimuli, e.g. the Californian ‘boom’, R&D programmes etc., by diversifying into wind turbines or by starting new firms” (Johnson and Jacobson 2002:32). Interestingly, the authors find that the low legitimacy in Sweden caused weak responses by Swedish firms to the very same stimuli that made German firms invest. In addition, the Californian ‘boom’ did not inspire Swedish firms to the same extent as in the other two countries.

The Dutch government did not find a solution for the problem of the establishment of locations for wind turbines.¹³ Johnson and Jacobson (2000) associate this with the fact that the

¹² Johnson and Jacobson (2000) use the term *nuclear trauma* to describe the entrenchment of the Swedish nuclear power debate (pro versus con). Any interest in wind power is automatically taken as being against nuclear power. This was seen as a betrayal by the Swedish industry that benefited the cheap nuclear power.

¹³ One has to note that the Netherlands is the most densely populated country in the world, which at the same time struggles with complicated water management and large areas below sea level. Thus, land-owning policies have a long and strict tradition for many reasons. One cannot expect these policies to be lifted just for new huge windmills. It is typical that a new surge in windmill policy is based on windmill parks in the North Sea. We thank Jacques Pelkmans for this comment.

political support for the Dutch wind industry failed in the second phase. This lack of political support is also reflected by the fact that even after the Dutch market formation failed no more powerful political measures were taken. The German industry benefited from the highest legitimacy, reflected in well-designed incentives and in creative corporate networks and in demand.

A crucial factor to explain the evolution of the Dutch, German and Swedish wind turbine industries was that the ideas and interests of the three national industries were embedded. A decisive impact on co-operation preparedness, the developed policies, the technology and knowledge generation and the market formation, consisted in the perception of these emerging industries by public and private actors. The case of the wind turbine industry concurrently illustrates the relationship of collective learning between the government and the market mechanisms in the development of new sustainable markets. It further shows what happens if both parties fail to co-operate. At the same time, this case shows the important function of governments in setting the institutional frame for knowledge generation between public and private actors. Finally, the expansion of the wind turbine industry in Germany and the development of economic and political networks illustrate the specific dynamics of sustainable markets.

6. Conclusions

Governance in the pursuit of sustainability, as described in the present article, reveals its greatest strength where long-term innovatory tasks with low immediate damage potential are pursued. Such processes usually result in new coalitions and the formulation of new rules of the game. Areas of application are climate change policies (beyond the need of the management of specific impacts), eco-efficiency policies, water policies, provision of collective goods, etc.

In contrast to many other approaches, our conceptual framework on collective learning processes welcomes the self-interest of business as a beneficial force. The self-interest of private business may prompt companies to move beyond the exploitation of *low-hanging fruits*. Instead, it may seek to promote the creation of new knowledge because business recognises the changing market expectations and the resulting needs for a market evolution. Of course, business can opt out of the collective learning processes if profits fall short of the expectations. The function of governance is thus to support processes of mutual learning where the governments are in a strong but not (too) dominant position. This function extends well beyond the usual compliance procedures.

Network institutions for collective learning between private and public actors are essential in order to correct market and government failures within the evolution of sustainable markets. The provision of collective goods and the internalisation of externalities can gradually shift to co-evolutionary processes managed by both private and public actors, in marked contrast to the conventional idea that that such activities a core competence of governments.

Our analytical framework for corporate action combines elements of new institutional economics, evolutionary economics and actor-centred institutionalism. We would like to claim that the overall framework seems to be consistent and well suited for the analysis of the

evolution of the Dutch, German and Swedish wind turbine industries. We expect it to be useful for various other case studies in the EU in the long search for sustainability.

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