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SUSTAINABLE DEVELOPMENT: LEARNING, INNOVATIONS AND THE ECONOMY

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Abstract Sustainable development is dependent on policy learning that should lead to fundamental reframing. Social and technological innovations should emerge and evolve through processes of co-evolution. In most industrialised countries, including the EU, strategies for sustainable development have strongly emphasised the environmental component and rather neglected issues of public finances. The economic crises from 2008 onwards have changed the sustainability agendas in the public sector. This study analyses how the public sector can respond to demands for learning, innovation and balanced-economy. Finland is used to provide example of the processes and challenges within the frame of sustainable development strategies. The links to the EU are of particular importance. The conclusion is that to progress sustainable development needs organised processes that provide broad and integrated views of all relevant aspects but also experiments that can challenge existing consensus and that cannot be fully assessed and evaluated in advance.

Sustainable development was initiated as a normative concept with the Brundland report (World Commission on Environment and Development, 1987). Since then it has become apparent that sustainable development will not be achieved through normative statements. Herman Daly (1991) among others noted early the need for a logically consistent and operational content of the concept. This content cannot be provided by appealing to a deus ex machina. Sustainable development cannot be declared but has to be discovered through learning and experimenting (Kemp and Martens, 2007). This means that cognitive learning about factual conditions needs to be expanded to what has often been called policy learning (Wals, 2007). Policy learning refers to a 'change in thinking', not any change in thinking but a structured, conscious change in thinking about a specific policy issue (Kemp and Weehuizen, 2005).

In the public sector policy-makers face choices about whether, how and how much to alter existing policy, practices or tools (Bomberg, 2007) to approach sustainable development. This is the essence of the process of policy learning, but to be more specific I will follow Radaelli (2009) in distinguishing between social learning that involves large scale paradigmatic changes, reflexive learning about governance, instrumental learning about "what seems to work", political learning about "playing the game" and finally cross-national emulation in which models and solutions are imported. Sustainable development requires nothing short of social learning that addresses basic assumptions and ethical values which eventually can lead to fundamental reframing of the issues at hand (Argyris and Schön, 1996). Viewing the world differently is one step towards

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sustainability, but another critical aspect of learning for sustainability is also adaptability. There is no doubt that humankind will face changes and surprises (Tetlock 2005). Learning to live with the possibility of change is a crucial feature in any learning process.

Learning in the public sector is a necessary but not sufficient condition for sustainability. Sustainable development also requires fundamental change in consumption and production, including the use and management of natural resources, calling for radical innovations. Such innovations may arise in the private sector as a consequence of resource scarcity or a quest for profits, but in many cases the public and private sectors are intimately linked in the process that leads to innovations for sustainability. The public sector introduces rules and regulations that can provide incentives for innovations or favourable conditions for their diffusion, but also stumbling blocks. This creates a dual role for the public sector: It should foster innovations in the private sector but also renew its own activities in innovative ways.

Innovation policies for sustainable development are of particular interest as they should be evolutionary and include adaptive policy approaches that are concerned with the dynamics of variation, selection and retention of alternative solutions (Nill and Kemp, 2009). It is, however, also important to look into the innovation effects of other policies than those specifically focused on fostering innovations (Kivimaa and Mickwitz, 2006; Mickwitz et al., 2008). For example tax or energy policies may, depending on their design and implementation, provide significant incentives for innovations that support sustainable development or they may stifle innovations by reinforcing a strong path dependence in, for example, the evolution of the energy systems.

The economic dimension of sustainable development has received increased attention in the wake of the global and regional economic crisis. As such economic issues have been part and parcel of sustainable development from the very start with the three "Ps": people, planet and profit. Much debate has focused on the need for dealing with adverse consequences of continuous economic growth (Daly, 1991). The recent economic crisis has highlighted a related but slightly different dimension of the economic sustainability in the industrialised countries: the need to balance public expenditures and to find ways of increasing the resilience to economic chocks. In Europe the discussion on public expenditures and the need to reduce them is evident in nearly all countries and in some countries austere measures have already been undertaken or announced. For example, the Financial Times has run a special series of "austerity in Europe" discussing the active attempts to reduce public debts.[1] The EU has since the formulation of the Lisbon Strategy (European Council, 2000) aimed at finding solutions that would be based on comptetiviness, economic growth and innovations.

In this article I will examine links between learning, innovation and public expenditures and how these links may partly reframe what sustainable development is about in the public sector. Based on an analysis of key documents I will argue that although all main elements of sustainability have been raised in the discourse on sustainable development they have remained partly disjointed in the public sector. I will base the argument using Finland as a case, with reference to the wider context of the European Union. Being a relatively small northern country and a Member State of the European Union Finland serves as a suitable mirror for the issues that have emerged in recent years. My focus is on the public sector but as will become evident, this does not exclude the private sector.

■ POLICY LEARNING FOR SUSTAINABILITY

One response to the Rio Conference on sustainable development was the emergence of national sustainable development strategies (NSDS). In 2009, 106 Member States of the UN were implementing an NSDS, as per their reporting to the Commission for Sustainable Development or its Secretariat. The

[1] www.ft.com/intl/indepth/austerity-in-europe [1.6. 2011]

emergence of these strategies is a least a sign of political learning, and such strategies have become almost mandatory. But strategy documents are not necessarily policies. Niestroy (2005) notes that "moving towards sustainable development polices requires considerable rethinking and changes in governance styles. Such shifts cannot be introduced top-down; they require time for developing both within government and society." This also means that other forms of learning are required, and signs that this has happened can be detected (Table 1).

Evaluations form an essential part of learning processes in the public sector. Such evaluations have been undertaken in several countries and Niestroy (2005) provided benchmark information on progress. The EU has its own strategy for sustainable development and has established a statistical framework for monitoring progress (Eurostat, 2009). Finland has carried out specific evaluations of its own strategy for sustainable development.

The first evaluation of the Finnish Strategy for Sustainable development was completed in 2002 (Patosaari, 2003). It emphasized the main challenges of all the dimension of sustainable development but it did not dwell deeply on the difficulties in the actual implementation. Its contribution to instrumental learning was therefore somewhat limited but it provided some input to reflexive learning through the issues it raised. The evaluation of the renewed strategy of 2006 (Ramboll Management Consulting, 2009) focused more on the critical phases of implementation. It provided direct input into reflexive learning by concluding that "the contents of the strategy for sustainable development have gained in importance in public administration, as a governing instrument the strategy has lost rather than gained ground. This is due to the central themes of sustainable development being steered through other strategies, while the strategy's contents are determined by decision-making processes steered separately from the strategy itself." It raises the issue of how and by whom sustainable development should be managed in the public sector.

The observation that sustainable development has been adopted by the public sector in Finland suggests that instrumental learning has occurred in different sectors of government. The strategy processes provide forums in which actors can discuss relevant themes. The National Audit Office (2010) has made a similar conclusion but points out that the implementation of actions that aim at achieving sustainable development vary considerably between sectors. The learning process also lacks several links. Thus progress towards sustainable development is not reported regularly to the Parliament, contrary to, for example, general progress in state financies and related government action.

The available documentation indicates that reflexive learning and wider reframing is still in early phases of development, despite a special programme aiming at fostering sustainable consumption and production ("Kultu: Getting more and better from less – Proposals for Finland's national programme to promote sustainable consumption and production") which was unanimously accepted in June 2005. In their analysis Berg and Hukkinen (2011) concluded that the expectations of a radical societal transformation through the programme have largely been foiled, but that it has nevertheless initiated processes that over time may contribute to a social learning process and change.

TABLE 1. DIFFERENT PROCESSES OF POLICY LEARNING WITH EXAMPLES REFERRING TO SUSTAINABLE DEVELOPMENT IN FINLAND.

PROCESS	INDICATIONS OF OCCURRENCE WITH REFERENCE TO SUSTAINABLE DEVELOPMENT (SD) IN FINLAND
Social learning	Active effort to achieve reframing in the Kultu-programme, but still in early stages (Berg and Hukkinen, 2011). Initiatives at the local level for radical change in, for example, the Carbon Neutral Municipalities[2]
Reflexive learning	Creation of a Sustainable Development Council initially headed by the Prime Minister in 1993, a discussion forum for all relevant ministers and also stakeholders including NGOs, industry, and labour organizations.
Instrumental learning	Use and modification of specific policy instruments, Government Decision in Principle on sustainable procurement 8.4.2009: renewable energy, low energy buildings, public transport, sustainable food, criteria for energy and environment labeling. Ministers have reported on progress and separate evaluations have been carried out of the strategies for sustainable development.
Emulation	Importing of approaches – sustainable development indicators
Political learning	The formulation of a SD-strategy in 1998, general references to sustainable development in legislation, for example the Land Use and Building Act (132/1999) is based on the objective to "promote ecologically, economically, socially and culturally sustainable development."
Increasing adaptability	Revision of the sustainable development strategy in 2008, increasing emphasis on evaluation of progress in policies related to sustainable development. Establishment of research programmes for sustainable change.

■ POLICIES SUPPORTING INNOVATIONS FOR SUSTAINABILITY

The non-sustainability of the current development has been amply demonstrated at global, regional and national levels. The millennium ecosystem assessment concluded among other things that " Global environmental sustainability goals, which are part of the MDGs [Millenium Development Goals], largely fail, while local environmental quality is projected to improve in some scenarios." (Toth et al., 2005). The IPCC-report notes that "Continued GHG [green house gas] emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century." (IPPC, 2007).

The hope is that social and technological innovations will put resource management, the use of natural resources, use and production of energy, consumption of food and goods, production technologies, transport, construction and infrastructure on track for sustainable development. This is one of the key messages of the recent European Commission's strategy Europe 2020 (European Commission 2010). The public sector can contribute to these changes through innovations of its own, and through innovation push and pull. The processes that are required to achieve major technological change are, however, more complex than policy papers such as Europe 2020 admit. New approaches are needed to analyse and understand them (Meeus and Hage 2006).

In developing science and technology policies there is a strong tendency among countries to emulate one another and also solutions that the OECD proposes. Lemola (2002) has noted that this phenomenon can be

[2] www.ymparisto.fi/default.asp?contentid=324257&lan=en&clan=en [10.1. 2011]

detected throughout the OECD countries. From the point of view of policies for innovation for sustainability this has both advantages and drawbacks. If relevant subject matters are chosen the convergence of policies may increase the likelihood of a radical break-through as the focal areas receive more resources in different environments. There is competition for excellence and the congruent efforts may also prepare the ground for the diffusion of innovations. The mobile technology development is a case in point. Lehenkari and Miettinen (2002) have demonstreated that the building of a new technological systems comprises not only the technical design but also political, legal and economic negotiations and decisions as well as co-evolution. The co-evolution affcets the design and also the role that different actors play in the system.

The drawback of a convergence of policies is that it reduces diversity which is the fuel for all evolutionary policies (Nill and Kemp, 2009). With the emergence of strong significant innovation policies at a European level it may very well be that diversity could contribute more to sustainability than still greater convergence. Convergent policies are likely to advance large scale or standardized technological solutions, but are less efficient in supporting context dependent distributed solutions, which in the end may be significant even for global problems such as climate change (Ostrom, 2009).

The EU has number of ambitious programmes in different sectors following the spirit of the Lisbon declaration.[3] Recently OECD has stressed the need for innovations not only as a way out of the economic crisis but also recognized sustainability issues as a justification for effective R&D-policies (OECD, 2010). Finland has been one of the countries living up to OECD's recommendation and has presented similar arguments for its own innovation strategy (Government of Finland, 2008), demonstaring political learning as well as emulation (Table 1).

It is not easy to determine what share of the innovation expenditure is focused on innovations for sustainability. The political learning (Table 1) has meant that sustainable development objectives are referred to at a general policy level, but this does not mean that these objectives are translated into specific criteria that would affect the development of all technology (Kivimaa and Mickwitz, 2006). In Finland several R&D-programmes have focused specifically on fostering innovations for a society that would be radically different from the current one. Funding has been provided in particular by the Academy of Finland, which focuses on academic research, the Finnish Funding Agency for Technology and Innovation, whose aim is to develop business ideas, Sitra, the Finnish Innovation Fund, which is an independent public fund under the supervision of the Finnish Parliament, and the Environmental Cluster programme, which was managed by the Ministry of the Environment. The programmes have focused on, for example, climate change, ecoefficient production, industrial ecology, sustainable management of natural resources, and resource- and energy efficient building.

The top down programmes can provide innovation push. It is, however, a slow way to reach transitions in society. The push effect is difficult to maximize as the policy environment is complex with many interacting factors (Foster et al. 2006). Local initiatives may in this context play a role by paving the way for greater change. Local initiatives can, at a practical level, challenge existing frames in the sustainability agenda. By demonstrating what actually works on a local level they may also be able to bypass institutional barriers that have been found to be next to impossible to overcome in top-down transition management (Farla et al., 2010).

In a European perspective Finland is a small player and could have some freedom to experiment also at the policy level. Historically Finland has been able to develop innovative solutions in policy fields such as energy (Table 2). Currently most of the national policy activities arise as a response to initiatives that emerged in the European Union as a result of interaction between the individual Member States and the European Commission. This means that there is an increasing emphasis on incremental improvements of policy innovations. The development of joint public private innovation activities and the resource efficiency are cases in point (Table 2).

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[3] Europe 2020 is the EU's growth strategy for the coming decade http://ec.europa.eu/europe2020/index_en.htm [1.1.2011]

TABLE 2. EXAMPLES OF INNOVATIVE IDEAS AND THEIR APPEARANCE IN FINLAND AND BEYOND

POLICY AREA/ INNOVATIVE IDEA	APPEARANCE AT DIFFERENT LEVELS		
	LOCAL	NATIONAL	EU
Energy policy/ District heating	Community structure, reduction of local air pollution	Key element in programmes for energy efficiency	"Good practice" example in energy efficiency
R&D policy/ Strategic centres for science, technology and innovation	New public-private partnership projects	Attempts to find new public-private partnerships for speeding up innovation processes, renewing industry clusters and creating radical innovations in specific sectors. [4]	Attempts to develop Knowledge and Innovation Communities (KICs)[5] which are expected to become key drivers of sustainable economic growth and competitiveness across Europe through world-leading innovation.
Environmental policy/ Resource efficiency	Local activities supported by regional funds	Broad discussion on resource efficiency, development of material efficiency analyses and methods. Active involvement at the international level.	Contribution to the creation of the international resource panel to deal with wide ranging resource issues.[6]

There is clearly room for genuinely local innovative activities. In Finland one of the interesting examples is the project "Carbon Neutral Municipalities (CANEMU)"[7] in which business decided to join forces with municipalities to change the production structure and inputs and outputs of the municipality. The active engagement of the business community is in stark contrast with, for example, the attempts to approach sustainability through local Agenda21-processes, which in Finland have tended to focus on planning and public action rather than interfering with activities that have direct bearing on production, resource use, and emissions of green house gases. The CANEMU-examples have generated considerable interest. Similar examples exist elsewhere, for example Denmark has its carbon neutral island Samsø (Jørgensen et al., 2007). It remains to be seen to what extent they are able to diffuse more widely and create pressure for a bottom up transition. There is, however, no doubt that they are important as pure top-down transitions are almost bound to face severe problems without innovative bottom up solutions (Lauridsen and Jørgensen, 2010).

■ SUSTAINABLE DEVELOPMENT AND PUBLIC EXPENDITURES

Economic aspects were part of the sustainable development agenda from the very beginning in 1987. Initially the economic aspects were stressed in developing countries. In industrialized countries the focus of

4 http://www.tekes.fi/en/community/Strategic0Centres0for0Science_0Technology0and0Innovation/360/Strategic0Centres0for0Science_0Technology0and0Innovation/1296 [June 5 2011]

5 http://eit.europa.eu/kics1/what-is-a-kic.html [June 5 2011]

6 http://www.unep.org/resourcepanel/ [June 5 2011]

7 www.ymparisto.fi/default.asp?contentid=324257&lan=en&clan=en [January 10 2011]

sustainable development strategies has been on the environmental aspects. For example in the Netherlands the National Environmental Policy Plan NEPP was one of the main drivers also in the strategy for sustainable development (Zijst, 2006) . In the EU the sustainable development strategy has strongly emphasized the environmental component, although there are also indicators that refer to economic conditions and investements (Eurostat, 2009). No indicators exixts for public finances. In Finland the secretariat for the Commission on Sustainable Development was placed in the Ministry for the Environment, but the agenda has stressed also economic aspects and public expenditures.

In Finland public expenditures were, together with the issue on aging, raised in the first review of the national sustainable development strategy with a demand to "restrict expenditures to a level which ensures a sustainable public economy" (Patosaari, 2003). In the strategy of 2006 (Government of Finland, 2006) the issue was explicitly raised as one of the key challenges:

> "How can the services and income transfers that are essential to a welfare society be ensured as the population ages and the need for expenditure grows and international tax competition prevents an increase in the tax rate?" and "it is alarming that, according to international and national assessments, Finland's public economy does not appear to be on a sustainable foundation in the long term."

The solutions to the challenges that are emphasized in the strategy echo in many respects the arguments in the Lisbon strategy of the EU, which was originally launched in 2000 as a response to the challenges of globalisation and ageing (European Council, 2000). The European Council specified the objective of the strategy for the EU "to become the most dynamic and competitive knowledge-based economy in the world by 2010 capable of sustainable economic growth with more and better jobs and greater social cohesion and respect for the environment". Solutions have been sought in improved competiveness, innovations, growth of green enterprises and life-long learning all contributing also to increased revenues that should finance the welfare state (Government of Finland, 2006). The re-launched Lisbon Strategy of 2005 had similar aims. One can here detect both instrumental learning and emulation.

The strong belief in economic growth seemed well founded, for a while. The evaluation of the Lisbon strategy claimed that "18 million new jobs were created *before the crisis hit"* (EC, 2010) (emphasis added). Similar findings are available for Finland. Key economic indicators show that the Finnish economy recovered rather rapidly after the recession of the early 1990s, but the economic downturn that began in 2008 weakened these indicators significantly (Ramboll Management Consulting, 2009).

It has now become evident that parts of the Lisbon strategy and the associated measures were based on wishful thinking. The Commission noted (EC, 2010) that "the strategy should have been organised better to focus more on critical elements which played a key role in the origin of the crisis, such as robust supervision and systemic risk in financial markets, speculative bubbles (e.g. in housing markets), and credit-driven consumerism..." These observations suggest that several Member States have only paid lip service to genuine sustainable development, in particular by paying scant attention to making consumption (and production) more sustainable and public finances more durable.

The crisis in public financing that has forced Greece and Ireland to apply for emergency funding from the EU and the IMF and that have put Portugal on the brink of a similar situation illustrates very well what Taleb (2010) calls a black swan event. The main observation, which is also stressed in the Commission's own evaluation of the Lisbon strategy (EC, 2010), is that more effort should be put into strengthening the resilience of the systems. This could mark the beginning of genuine social learning leading to reframing of the problems at hand (Table 1). The complexity of the global economic system is so great that unpredictable events with major repercussions will occur. These events cannot be avoided, but their impacts can be contained to a lesser or greater degree.

There are significant differences between the EU member states when it comes to resilience against economic crises that influence public finances. In Finland one can identify a widespread concern and awareness for problems related to public finances. It was reflected in the 2006 strategy for sustainable development, and systematic efforts to keep public spending in check have been made. These efforts have

been presented under the euphemism of a "productivity program", which in practice has meant efforts to reduce the work force directly employed by the public sector and in particular the government. Before the economic crisis, in 2000–2008, central government finances were kept in surplus through disciplined fiscal policy (Ministry of Finance, 2010a).

The Ministry of Finance has noted that the productivity programme has progressed according to the plans, but that there is a need for significant borrowing (Ministry of Finance, 2010b). This suggests that development is still some distance from being sustainable. The obvious conclusion has been that "Greater emphasis than at present should be given to the sustainability of public finances in future development work on fiscal policy rules and in the setting of targets for the next parliamentary term" (Ministry of Finance, 2010a). It is, however, obvious that these changes will not be achieved by reducing the work force of the government. The big expenditures are related to various forms of transfers and subsidies.

Local government finances appear to have been more successful in balancing their economies. The Ministry of Finance (2010b) predicts that finances will be restored to balance 2010-2011; with growth of local government tax revenues and moderate development of personnel expenditure. Such averages do, however, hide a wide variation. Local governments that have been hit by structural change in the form of closures of major industries and loss of work force still face severe financial sustainability problems.

This brief overview shoes that the sustainability challenge in public financing has been well documented in the EU generally and in individual member states such as Finland. The economic crisis faced by Greece, Ireland, Portugal and other countries empirically show that unpleasant scenarios can unfold with "black swan" characteristics: initially small events escalate to major impacts throughout the economy. The question is, how can one meaningfully respond to the challenges in a sustainable development framework?

■ ADJUSTING THE SUSTAINABLE DEVELOPMENT FRAMEWORK

The economic crises of 2008-2010 are connected, but differ between member states of the European Union. In some, such as Finland, the immediate effects seem to have passed relatively quickly (Ministry of Finance, 2010a), but the crisis in the euro-zone has fuelled a debate on the obligations to take partial responsibility for the economic problems of other countries in the euro-area. In other countries the crises have revealed major structural problems. They are also clearly connected to the sustainable development agenda although the sustainable development strategy of the EU has, so far, been mainly concerned with other than financial matters.

The economic crises have revealed that the links between the Sustainable Development Strategy, the Lisbon Strategy and other EU instruments and/or strategies, have not been sufficiently strong, so that rather than being mutually reinforcing some of the strategies have been operating in isolation (EC, 2010). The awareness of and the problematic nature of these links is also revealed by the monitoring of EU's sustainable development strategy. The indicators were silent about the looming crisis and even after the fact it will take time before a reliable assessment of their impact on the indicators can be made (Eurostat, 2009).

The most recent strategy outline for Europe, Europe2020 (European Commission, 2010) recognizes the link to sustainable resource use, green economy and innovation as "flagship projects", and stresses the need for continuous learning, but it is not overly concerned with improving resilience to shocks of any kind. Resilience is only mentioned once in the context of climate risks (p. 13). This is somewhat surprising since risks, including risk assessment, are mentioned 13 times in the document in different contexts. Europe2020 builds on a vision of a benevolent state of affairs that can be achieved if only certain already identified risks can be avoided. Evidence for this thinking is also revealed by the scenarios of steady growth that are included in Europe2020 strategy (p. 7). Yet one of the key characteristics of crises are that they arise unexpectedly.

The idea that resilience should be considered as part of sustainable development has received increasing emphasis since the early 2000s (Folke et al., 2002). One major argument has been that the resilience of socio-

ecological systems can be increased. These analyses have so far mainly focused on the use of concept of resilience in searching for solutions to problems related to the exploitation of natural resources. In this context increased resilience can be achieved by paying due attention to the pressure that human activities exert on natural systems and making sure that this pressure is kept sufficiently low. In this way fluctuations and surprises in the ecological system, such as poor reproduction or an outbreak of a disease, do not increase pressure to the point of potential collapse. Societies that have learned this lesson have been resilient over long periods of time (Ostrom, 1990). In Europe this aspect of sustainability and resilience has been recognized, although it has been proven difficult to achieve in practice (Eurostat, 2009). In Finland many important natural resources are sustainably used, but difficulties have arisen in linking the specific strategies to a wider sustainability agenda (Ramboll Management Consulting, 2009).

In wider usage issues of resilience are not limited to the use of natural resources, but can be explored in many problems that socio-ecological systems face. For example, the stress test applied to banks (Solomon and Hilsenrath, 2009) can be seen as an example of how the concept of resilience is applied to a specific activity. So far these stress tests have been carried out purely in the economic realm, but it is conceivable that there could be an evolution of stress test also for banks taking into account a wider sustainability agenda.

Overall the economic crisis calls for a reframing of the sustainability agenda. So far the sustainability strategies in Europe have stressed the environmental or ecological aspects of sustainability, assuming that other strategies will emphasize the economic aspects. It now seems that the economic agenda would benefit greatly from a broader sustainability debate that also recognizes uncertainties and surprises. Such partial reframing appears to be in progress. The Finnish economic stability programme (Ministry of Finance, 2010a) has raised sustainability issues from a financial perspective, but is rather oblivious concerning surprises and pays little attention to the environment. In contrast, the foresight analysis by the same ministry (Ministry of Finance, 2010c), raises climate change as a key factor to be taken into account, together with the pure economic aspects recognized by the stability programme. However, a broader environmental or natural resource perspective is missing. This aspect is stressed by the Ministry of the Environment (2010), which, however, in its turn pays rather little attention to the sustainability of public finances.

Partial views can also be found in relation to innovations. All strategy documents reviewed for this study stress innovation as a source of future sustainable development. Innovations are seen to contribute to economic growth, solve environmental problems, contribute to efficient use of natural resources, and reduce emissions of green house gases. The Europe2020 also recognises the need to adress regulation and governance in new innovative ways (European Commission, 2010), but this has not been picked up by, for example, the Finnish national documents, which only stress radical innovations outside the government. The complementary blind spots suggest that there could be fruitful ground for social learning. The question is how one can achieve learning that would truly reframe the public policies.

■ PROCESSES AND TOOLS FOR IMPLEMENTING A BROAD SUSTAINABLE DEVELOPMENT AGENDA

As I argued in the introduction sustainable development must be lead to social learning. To qualify as "social learning", a process must: (1) demonstrate that a change in understanding has taken place in the individuals involved; (2) demonstrate that this change goes beyond the individual and becomes situated within wider social units or communities of practice; and (3) occur through social interactions and processes between actors within a social network (Reed et al., 2010). The substance is relevant but so are the actors and the context (Zito and Schout, 2009). Here the question is how the public sector can ensure that it contributes to a society that becomes and is resilient to adverse events that may be driven by economic or social changes or external processes such as climate change.

To a limited extent the public sector can progress on its own and learn to reframe some basic assumptions concerning the path to sustainability. But all processes of policy learning interact with other members of

society (Table 1) and the most successful learning processes in terms of actually changing the situation have involved active exchange between the public and private sector. In some cases private actor can take the lead in (partial) transformations (Kautto, 2009), whereas in others the public sector has been in the driver's seat. For example, in developing emission trading the EU Commission has been classified as an "entrepreneurial epistemic leader" (Skjærseth and Wettestad, 2010). These observations suggest that there is plenty of room for reflexive learning on how to organize progress towards sustainable development in practice.

One of the leaders of the processes for sustainable development could be the commissions on sustainable development. Niestroy (2005) has argued for an independent body, but her analysis shows that there are successful commissions both among those which are independent and those which are linked to public authorities. The examples reviewed in this analysis, from transition management and its difficulties (Lauridsen and Jørgensen, 2010; Farla et al., 2010), comparative analysis of different innovation policies (Nill and Kemp, 2009) and the results of the CANEMU-project all point in the direction of evolutionary processes. The concept of co-evolution (Lehenkari and Miettinen, 2002) appears to be particularly appropriate. It highlights that sustainable development is not just about the development of particular solutions to identified problems. Sustainable development, if it is to occur, delivers solutions but these also change the role of actors at different levels. Thereby their roles and division of labour also evolve.

Evolving technological systems give direct feed-back to the developers and implementers and provide input to instrumental learning processes. In some cases the feed back may contribute to a complete reframing of the original concept. Public actors intervening in socio-ecological system with the aim to make them more sustainable often lack such immediate feed back. For policy learning to occur in the field of sustainable development there is a need for tools that can supply impulses for learning processes. The actors need to look both forward and back and be willing to experiment with new solutions (Crabbé and Leroy, 2008; Hildén, 2009).

Indicators have been regarded as one of the tools that should provide information on progress towards sustainable development. Countries with strategies for sustainable development have developed indicators which also have been developed for the EU and at global levels (Eurostat, 2009). It has been found that most of the work has concentrated on the selection of the indicators and on collection of the pertinent data, but less attention has been given to the actual users and their needs (Rosenström, 2009). When indicators are developed in isolation from the policy context a part of the potential for policy learning is lost. Indicators that have been developed in interactive participatory processes (Rosenström et al., 2006) can contribute more to the co-evolution of sustainable policies. One should not, however, put too high hopes on indicators alone. Their clearly most common use is in political learning (Table 1) (Rosenström, 2009).

Stronger impacts on the learning can be expected when indicators are coupled with ex post evaluations and review processes, provided that the processes and the information they use and deliver are perceived to be credible, salient and legitimate (Lehtonen, 2008). This is one of the challenges in the EU and the multilevel governance structure it entails. There are complex interactions between the Member States, the Commission and the EU Parliament in the processes for developing new legislation and in implementing policies. The slow progress in implementing the Lisbon Strategy, the stumbling in responding to the economic crises of individual Member States and also the very mixed progress in achieving key objectives for sustainable development such as a decoupling of economic growth from energy and resource use (Eurostat, 2009) show that fundamental social learning is yet to occur.

Sustainability assessments have been presented as one of the tools that can be used to support policy learning. Sustainability assessments have been developed with an emphasis on future development. Based on a review of practices Rorarius (2007) suggested that an "ideal" sustainability assessment in Finland should:

- Stress multi-stakeholder participation and individual ideological orientation.
- Provide conditional conclusions (social learning process).
- Be an ex-ante assessment.

- Be flexible and innovative (challenge current paradigms).
- Take into account spatial (cross-boundary) and temporal (long term) dimensions.
- Combine various existing assessment tools and indicators to help decision-making.

In principle it is easy to agree with this list that stresses both contents and process as well as the need to approach the task with a multitude of methods and approaches (Gasparatos et al., 2008). New tools are developed all the time that provide additional insights into the fundamental issues of sustainability strategies. For example, input-output models couple with material flow analysis provide new insights into the use of natural resources, including verifications of the importance of global trade (Seppälä et al., 2011).

The tool box is not complete without approache that help to consider fundamental uncertainties and risks, and there is a need to develop and use ex post evaluations. The risks arise from the essence of sustainable development, which is likely to involve considerable change from current structures and practices. Sustainable development is about great uncertainties and high stakes and thereby requires support from 'post-normal' science (Funtowicz and Ravetz, 1999). The contribution of ex post evaluations is that they can reveal the path dependencies that constrain options for future development.

In theory full blown sustainability assessnent could provide important input to all processes of the policy learning (Table 1). In practice sustainability assessments face the same difficulties that constrain strategic environmental assessments when it comes to social learning that would bring about large scale paradigmatic changes. A well organised and structured approach that uses sophisticated tools is useful for incremental change. Radical change is inevitably more chaotic and will not just involve an orderly reframing but also struggles between alternative frames. Arenas for these struggles may open up unexpectedly and provide opportunities for experimentation. Finland, with its long tradition of coalition governments, does not provide a particularly favourable environment for experiments at the level of government. Therefore local experiments such as the CANEMU-project are important, as their grass root perspective can challenge the consensus of what can and what cannot be done. Empirical support for this idea is also provided be the analyses of local communities that have been able to solve resource management issues where governments have failed (Ostrom, 1990).

■ CONCLUSION

This analysis has shown that there is a need for two different types of tracks on the road to sustainable development. The first is the organised track for path dependent major decision concerning, for example, energy policy and the choice of sources of primary energy. In this the strenghts of participatory sustainability assessments and strategic environmental assessment can provide valuable input for instrumental and reflexive learning. The second track is the experimental path where novel solutions are tested on a pilot scale. A public sector that succesfully balances between these two tracks can deliver solutions that sustainable development requires and also respond adequately to inevitable surprises.

■ REFERENCES

Argyris, C.,Schön, D.A. 1996. *Organizational Learning II: Theory. Methods and Practice*. Addison-Wesley, Reading, MA.

Berg, A.,Hukkinen, J.I. 2011. Beyond effectiveness: The uses of Finland's national programme to promote sustainable consumption and production. *Journal of Cleaner Production* In Press, Accepted Manuscript.

Bomberg, E. 2007. Policy learning in an enlarged European Union: environmental NGOs and new policy instruments. *Journal of European Public Policy* 14, 248-268.

Crabbé, A.,Leroy, P. 2008. *The handbook of environmental policy evaluation*. Earthscan, London.

Daly, H. 1991. Operational principles for sustainable development. *Earth Ethics*. Summer 1991, 6-7.

EC. 2010. *Lisbon Strategy evaluation document*. Commission Staff Working Document, SEC(2010) 114 final. European Commission, Brussels.

European Commission. 2010. *EUROPE 2020 A strategy for smart, sustainable and inclusive growth Communication from the European Commission*, COM(2010) 2020 European Commission, Brussels.

European Council. 2000. *Presidency Conclusions, Lisbon European Council 23 AND 24 March 2000*. EC. http://consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/00100-r1.en0.htm [Jan 2 2011].

Eurostat. 2009. *Sustainable development in the European Union - 2009 monitoring report of the EU sustainable development strategy*. European Communities, Luxembourg.

Farla, J., Alkemade, F., Suurs, R.A.A. 2010. Analysis of barriers in the transition toward sustainable mobility in the Netherlands. *Technological Forecasting and Social Change* 77, 1260-1269.

Folke, C., et al. 2002. *Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations*. The Environmental Advisory Council to the Swedish Government, www.sou.gov.se/mvb/pdf/resiliens.pdf . [1.1.2011].

Foster, J., Hildén, M., Adler, N. 2006. Can regulations induce environmental innovations? An analysis of the role of regulations in the pulp and paper industry in selected industrialized countries. In J. Hage, M Meeus (eds.) *Innovation, Science and Institutional Change*. Oxford University Press. p. 122-140.

Funtowicz, S.O.,Ravetz, J. 1999. Post-normal science-an insight now maturing. *Futures* 31, 641-646.

Gasparatos, A., El-Haram, M., Horner, M. 2008. A critical review of reductionist approaches for assessing the progress towards sustainability. *Environmental Impact Assessment Review* 28, 286-311.

Government of Finland. 2006. *Towards sustainable choices - A nationally and globally sustainable Finland*. Prime Minister's Office Publications 7/2006. Prime Minister's Office, Helsinki.

Government of Finland. 2008. *Government's Communication on Finland's National Innovation Strategy to the Parliament*. Helsinki.

Hildén, M. 2009. Time horizons in evaluating environmental policies. in: Environmental program and policy evaluation: Addressing methodological challenges, M. Birnbaum,P. Mickwitz (Eds.). *New Directions for Evaluation* 122, pp. 9-18.

IPPC. 2007. *Climate Change 2007: Synthesis Report*. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland.

Jørgensen, P.J., et al. 2007. *Samsø – a Renewable Energy Island - 10 years of Development and Evaluation*. Samsø Energy Academy. www.onlinepdf.dk/Books/onlinepdf.aspx?onlinepdf=24054 [January 5 2011].

Kautto, P. 2009. Nokia as an Environmental Policy Actor - Evolution of Collaborative Corporate Political Activity in a Multinational Company. *Journal of Common Market Studies* 47, 103-125.

Kemp, R.,Weehuizen, R. 2005. *Policy Learning: What does it mean and how can we study it?* NIFU STEP. http://www.step.no/publin/reports/d15policylearning.pdf. [January 10 2011].

Kemp, R.,Martens, P. 2007. Sustainable development: how to manage something that is subjective and never can be achieved? *Sustainability: Science, Practice, & Policy* 3, 5-14. http://ejournal.nbii.org [January 10 2011].

Kivimaa, P.,Mickwitz, P. 2006. The challenge of greening technologies--Environmental policy integration in Finnish technology policies. *Research Policy* 35, 729-744.

Lauridsen, E.H.,Jørgensen, U. 2010. Sustainable transition of electronic products through waste policy. *Research Policy* 39, 486-494.

Lehenkari, J.,Miettinen, R. 2002. Standardisation in the construction of a large technological system--the case of the Nordic mobile telephone system. *Telecommunications Policy* 26, 109-127.

Lehtonen, M. 2008. Mainstreaming Sustainable Development in the OECD through Indicators and Peer Reviews. *Sustainable Development* 16, 241-250.

Lemola, T. 2002. Convergence of national science and technology policies: the case of Finland. *Research Policy* 31 1481-1490.

Meeus, M., Hage J. 2006. Product and process innovation, scientific research, knowledge dynamics and institutional change: an introduction. In J. Hage, M Meeus (eds.) *Innovation, Science and Institutional Change*. Oxford University Press. p. 1-19.

Mickwitz, P., Hyvättinen, H., Kivimaa, P. 2008. The role of policy instruments in the innovation and diffusion of environmentally friendlier technologies: popular claims versus case study experiences. *Journal of Cleaner Production* 16, S162-S170.

Ministry of Finance. 2010a. *Stability programme update for Finland 2009*. Ministry of Finance publications 6c/2010. Ministry of Finance, Helsinki.

Ministry of Finance. 2010b. *Economic Bulletin 20.12.2010*. Ministry of Finance Economics Department, Helsinki.

Ministry of Finance. 2010c. *Julkinen talous tienhaarassa. Finanssipolitiikan suunta 2010-luvulla* (Finland's Public Finances at a Crossroads. Approach to fiscal policy in the 2010s). Valtiovarainministeriön julkaisuja, 8/2010. Ministry of Finance, Helsinki.

Ministry of the Environment. 2010. *Ympäristöministeriön tulevaisuuskatsaus* (The foresight analysis of the Ministry of the Environment). Ministry of the Environment, Helsinki.

National Audit Office of Finland. 2010. *Kestävä kehitys valtionhallinnossa* (sustainable development in government). Valtiontalouden tarkastusviraston selvitys 16/02/2010. Helsinki.

Niestroy, I. 2005. *Sustaining sustainability - a benchmark study on national strategies towards sustainable development and the impact of councils in nine EU member states*., EEAC Background study. Lemma, Utrecht.

Nill, J.,Kemp, R. 2009. Evolutionary approaches for sustainable innovation policies: From niche to paradigm? *Research Policy* 38, 668-680.

OECD. 2010. *The OECD Innovation Strategy: Getting a Head Start on Tomorrow*. OECD Publishing, Paris.

Ostrom, E. 1990. *Governing the Commons - the evolution of institutions for collective action*. Cambridge University Press, Cambridge.

Ostrom, E. 2009. *A polycentric approach for coping with climate change*. Background Paper to The World Development Report, October 2009. The World Bank, Washington DC.

Patosaari, P. 2003. *Kestävän kehityksen kansallinen kokonaisarvio* (Evaluation of sustainable development in Finland). The Finnish Environment, 623. Ministry of Environment, Helsinki.

Radaelli, C.M. 2009. Measuring policy learning: regulatory impact assessment in Europe. *Journal of European Public Policy* 16, 1145-1164.

Ramboll Management Consulting. 2009. *National assessment of sustainable development 2009*. Ministry of the Environment, Helsinki.

Reed, M.S., et al. 2010. What is Social Learning? Ecology and Society 15, r1. www.ecologyandsociety.org/vol15/iss4/resp1/ [January 1 2011].

Rorarius, J. 2007. *Existing Assessment Tools and Indicators: Building up Sustainability Assessment* (Some Perspectives and Future Applications for Finland). Report, 24.08.2007. Ministry of the Environment, Helsinki.

Rosenström, U. 2009. *Sustainable development indicators: Much wanted, less used*? Monographs of the Boreal Environment Research, 33. Finnish Environment Institute, Helsinki.

Rosenström, U., Mickwitz, P., Melanen, M. 2006. Participation and empowermentbased development of socio-cultural indicators supporting regional decision-making for eco-efficiency. *Local Environment* 11, 183-200.

Seppälä, J., et al. 2011. Assessment of environmental impacts of material flows caused by the Finnish economy with the ENVIMAT model. *Journal of Cleaner Production* Accepted for Publication.

Skjærseth, J.B.,Wettestad, J. 2010. Making the EU Emissions Trading System: The European Commission as an entrepreneurial epistemic leader. *Global Environmental Change* 20, 314-321.

Solomon, D., Hilsenrath, J. 2009. Bank Capital Gets Stress Test Dark Scenario Includes Jobless Rate Above 10% and Further 25% Drop in Home Prices. *The Wall Street Journal*, February 26, 2009, A3.

Taleb, N.N. 2010. *The black swan - The impact of the highly improbable*. Penguin, London.

Tetlock, P. 2005. *Expert political judgment: How good is it? How can we know?* Princeton University Press, Princeton.

Toth, F.L., et al. 2005. Policy Synthesis for Key Stakeholders. in: *Scenarios Assessment*, S. Carpenter,P. Pingali (Eds.). Washington DC: Island Press. Millenium Ecosystem Assessment, pp. 469-515.

Wals, A.E.J., ed. 2007. *Social learning towards a sustainable world - principles, perspectives, and praxis*. Wageningen Academic Publishers, Wageningen.

World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press, Oxford/New York.

Zijst, H.v. 2006. *Sustainable Development Strategy of the Netherlands*. RMNO-series Preliminary studies and background studies, Background study V.09(2006). RMNO, den Haag.

Zito, A.R.,Schout, A. 2009. Learning theory reconsidered: EU integration theories and learning. *Journal of European Public Policy* 16, 1103-1123.