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Ulla Rosenström

Sustainable development indicators: Much wanted, less used?

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Sustainable development indicators: Much wanted, less used?

Yhteenveto:
Kestävän kehityksen indikaattorit: Moni haluaa, kuka käyttää?

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Original publications

This dissertation is based on the following five articles which are referred to in the text by their Roman numerals.

I Rosenström, U. and Lyytimäki, J. 2006. The role of indicators in improving timeliness of international environmental reports. European Environment 16(1): 32-44.

II Rosenström, U., Mickwitz, P. and Melanen, M. 2006. Participation and empowerment-based development of socio-cultural indicators supporting regional decision-making for eco-efficiency. Local Environment 11(2): 183-200.

III Rosenström, U. and Kyllönen, S. 2007. Impacts of a participatory approach to developing national level sustainable development indicators in Finland. Journal of Environmental Management 84 (3): 282-298.

IV Heinonen, S., Hietanen, O., Lyytimäki, J. and Rosenström, U. 2005. How to approach the sustainable information society? Criteria and indicators as useful tools. Progress in Industrial Ecology, An International Journal 2 (3/4): 303-328.

V Rosenström, U. 2006. Exploring the policy use of sustainable development indicators: Interviews with Finnish politicians. The Journal of Transdisciplinary Environmental Studies 5(1-2). http://www.journal-tes.dk/

Author's contribution

Article I was written together with researcher Jari Lyytimäki. The present author took the initiative and collected and analysed the data. The paper was jointly written.

Article II was written together with Adjunct Professor Per Mickwitz and Professor Matti Melanen. The article was initiated and planned jointly based on our earlier common research results. The present author wrote the paper with supporting comments from the co-authors.

Article III was written together with researcher Simo Kyllönen. The present author took the initiative and provided the material for the analysis, which was carried out jointly. The paper was also jointly written.

Article IV was written together with Professor Sirkka Heinonen, regional manager Olli Hietanen and researcher Jari Lyytimäki. The names are in alphabetical order. The present author bore the responsibility for the section "Indicators of a sustainable information society" and provided data for "The potential for using sustainable development indicators in policy-making in Finland". Writing the article and drawing the conclusions was a collaborative effort.

The author of this dissertation is fully and solely responsible for Article V.

List of abbreviations:

CSD	Commission for Sustainable Development
DEFRA	Department of Environment, Food and Rural Affairs
DETR	Department of Transport and Regions
ECOREG	The Eco-efficiency of Regions – Case Kymenlaakso
EEA	European Environment Agency
EPA	Environment Protection Agency (here of United States)
EU	European Union
EUROSTAT	European Union's Statistical Office
FNCSD	Finnish National Commission on Sustainable Development
GDP	Gross Domestic Product
IISD	International Institute for Sustainable Development
INW	Indicator network
MEP	Member of the European Parliament
MP	Member of the Parliament
NGO	Non-governmental Organisation
OECD	Organisation for Economic Cooperation and Development
PDF	Portable Document Format
R&D	Research and Development
SCOPE	Scientific Committee on Problems of the Environment
SDI	Sustainable development indicator
SME	Small and medium size enterprises
SYKE	Finnish Environment Institute
TERM	Indicators of Transport and Environment Integration
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
WBCSD	World Business Council for Sustainable Development
WWF	World Wildlife Fund

Sustainable development indicators: Much wanted, less used?

Ulla Rosenström

Department of Biological and Environmental Sciences, Faculty of Biosciences, University of Helsinki, Finland

Rosenström, U. 2009. Sustainable development indicators: Much wanted, less used? Monographs of the Boreal Environment Research No. 33, 2009.

For the past twenty years, several indicator sets have been produced on international, national and regional levels. 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. This dissertation focuses on the use of sustainable development indicator sets. The dissertation explores the reasons that have deterred the use of the indicators, discusses the role of sustainable development indicators in a policy-cycle and broadens the view of use by recognising three different types of use.

The work presents two indicator development processes: The Finnish national sustainable development indicators and the socio-cultural indicators supporting the measurement of eco-efficiency in the Kymenlaakso Region. The sets are compared by using a framework created in this work to describe indicator process quality. It includes five principles supported by more specific criteria. The principles are high policy relevance, sound indicator quality, efficient participation, effective dissemination and long-term institutionalisation.

The framework provided a way to identify the key obstacles for use. The two immediate problems with current indicator sets are that the users are unaware of them and the indicators are often unsuitable to their needs. The reasons for these major flaws are irrelevance of the indicators to the policy needs, technical shortcomings in the context and presentation, failure to engage the users in the development process, non-existent dissemination strategies and lack of institutionalisation to promote and update the indicators. The importance of the different obstacles differs among the users and use types.

In addition to the indicator projects, materials used in the dissertation include 38 interviews of high-level policy-makers or civil servants close to them, statistics of the national indicator Internet-page downloads, citations of the national indicator publication, and the media coverage of both indicator sets.

According to the results, the most likely use for a sustainable development indicator set by policy-makers is to learn about the concept. Very little evidence of direct use to support decision-making was available. Conceptual use is also common for other user groups, namely the media, civil servants, researchers, students and teachers. Decision-makers themselves consider the most obvious use for the indicators to be the promotion of their own views which is a form of legitimising use.

The sustainable development indicators have different types of use in the policy cycle and most commonly expected instrumental use is not very likely or even desirable at all stages. Stages of persuading the public and the decision-makers about new problems as well as in formulating new policies employ legitimising use. Learning by conceptual use is also inherent to policy-making as people involved learn about the new situation. Instrumental use is most likely in policy formulation, implementation and evaluation.

The dissertation is an article dissertation, including five papers that are published in scientific journals and an extensive introductory chapter that discusses and weaves together the papers.

Key words: definition of sustainable development, sustainable development indicators, use of indicators, policy-making

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Kestävän kehityksen indikaattorit: Moni haluaa, kuka käyttää?

Ulla Rosenström

Department of Biological and Environmental Sciences, Faculty of Biosciences, University of Helsinki, Finland

Rosenström, U. 2009. Sustainable development indicators: Much wanted, less used? Monographs of the Boreal Environment Research No. 33, 2009.

Kestävän kehityksen indikaattoreita on tuotettu viimeisen kahdenkymmenen vuoden aikana runsaasti niin kansainvälisellä, kansallisella kuin alueellisellakin tasolla. Indikaattoreiden kehitystyössä on keskitytty indikaattoreiden valintaan ja tilastotiedon hankintaan, käyttäjien ja heidän tarpeiden jäädessä vähemmälle huomiolle. Tässä väitöskirjassa tarkastellaan kestävän kehityksen indikaattoreiden käyttöä. Väitöskirja selvittää käyttöä vähentäneitä syitä, indikaattoreiden roolia päätöksentekoprosessissa sekä laajentaa käytön käsitettä esittelemällä kolme erilaista tutkitun tiedon käyttötyyppiä.

Työ perustuu kahden eri indikaattorihankkeen kehitysprosessien vertailuun. Hankkeet ovat Suomen kansalliset kestävän kehityksen indikaattorit sekä Kymenlaakson ekotehokkuuden mittaamista tukevat sosiaalis-kulttuuriset indikaattorit. Prosesseja vertaillaan tutkimuksessa kootun viitekehyksen avulla, joka sisältää viisi indikaattoriprosessin laadun pääperiaatetta. Periaatteet ovat merkittävä politiikkarelevanssi, hyvä indikaattoreiden laatu, tehokas osallistuminen, vaikuttava viestintä ja pitkän aikavälin institutionalisointi. Pääperiaatteita tarkennetaan erityisillä kriteereillä.

Viitekehyksen avulla määritettiin indikaattoreiden käyttöä vaikeuttavat tekijät. Merkittävimmät ongelmat ovat käyttäjien tietämättömyys indikaattoreiden olemassa olosta sekä indikaattoreiden sopimattomuus heidän käyttötarkoituksiinsa. Syyt näihin ongelmiin ovat indikaattoreiden epärelevanttius, huono esitystekniikka ja tilastokuvioiden laatu, käyttäjien osallistumattomuus indikaattoreiden kehittämisvaiheeseen, viestintäsuunnitelmien puute sekä indikaattoreiden ylläpidon ja päivittämisen puutteet. Ongelmien merkitys vaihtelee käyttäjien ja käyttötyyppien mukaan.

Indikaattoriprosessien lisäksi väitöskirjassa käytetty materiaali sisältää 38 kansanedustajien ja heidän avustajiensa sekä korkeiden virkamiesten haastattelua. Lisäksi työssä on hyödynnetty kansallisten indikaattorien Internet-sivujen käyttötilastoja, viittauksia kansalliseen indikaattorijulkaisuun sekä analysoitu kummankin indikaattoriprosessien saamaa mediajulkisuutta.

Tulosten mukaan kestävän kehityksen indikaattoreiden tärkein rooli poliittisessa päätöksenteossa on syventää käyttäjien ymmärrystä kestävästä kehityksestä. Näyttöä suorasta käytöstä päätöksenteon tukena on hyvin vähän. Myös muut käyttäjät kuten media, virkamiehet, tutkijat, opiskelijat ja opettajat käyttävät kestävän kehityksen indikaattoreita pääasiassa oppimiseen. Päättäjät itse pitivät indikaattoreiden ilmeisimpinä käyttökohteina omia puheita ja esityksiään. Kestävän kehityksen indikaattoreilla on erilaisia rooleja päätöksentekoprosessien eri vaiheissa eikä ennakko-odotusten mukainen suora käyttö päätöstenteon tukena ole todennäköistä kaikissa vaiheissa. Indikaattoreita käytetään omien tavoitteiden edistämiseen ja toisten vakuuttamiseen erityisesti silloin kun uudet ongelmat ilmenevät sekä silloin kun uusia politiikkoja suunnitellaan. Ongelmista myös opitaan toisten toimijoiden käyttäessä indikaattoreita argumentoinnissaan. Suora käyttö on todennäköisintä politiikan muodostuksessa, toimeenpanossa ja arvioinnissa.

Väitöskirja on tyypiltään artikkeliväitöskirja, jossa viisi julkaistua tieteellistä artikkelia sidotaan yhteen erillisen laajan johdantoluvun avulla.

Avainsanat: Kestävä kehitys, indikaattorit, päätöksenteko, indikaattoreiden käyttö

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1 Introduction

1.1 Sustainable development and indicators

Sustainable development became a master concept in international discourses of environment and development in the 1990s (Meadowcroft, 1999). However, the first policy documents to discuss the conflicts between environment and development came already from the 1972 Stockholm Conference on the Human Environment and the 1980 World Conservation Strategy of the International Union for Conservation of Nature (Kates *et al.,* 2005). With the publication of Our Common Future (WCED, 1987), the concept of sustainable development became a widespread policy objective. The influential report was followed by two large international conferences organised by the United Nations. The 1992 conference (the Earth Summit) set the agenda in key documents and agreements and the 2002 conference (the Millennium Summit) reaffirmed the commitment to sustainable development.

To measure the commitment, the United Nations has called countries and institutions to develop indicators for sustainable development (SDIs) (UNCED, 1992). The quest for SDIs has continued for nearly twenty years and the debate of identifying SDIs includes hundreds of projects (McCool and Stankey, 2004), which has led to a depiction of "an indicator industry" (King *et al.,* 2000; Rydin *et al.,* 2003).

The large number of projects is a consequence of difficulties to define the most suitable SDIs. That in turn has kept most of the indicator discussion on conceptual and methodological issues, rather than reaching the realm of practice (Hezri, 2005; McCool and Stankey, 2004; Rydin *et al.,* 2003). After several years of indicator "hype", many scientists have began recently to question the links between policy and SDIs (*e.g.* Bell and Morse, 2001; Gudmundsson, 2003; Hezri, 2004). Despite the many projects to identify SDIs, there is little information on how they have influenced real-life political argument and decision-making (Hezri, 2006).

I am one of those scientists questioning the policy link. Over the years I have participated in a number of SDI projects on both national and regional level as well as taken part in several international indicator exercises (*e.g.* United Nations, Nordic Council of Ministers, and the Eurostat). Acknowledging the hours spent on selecting indicators and collecting data, it has been frustrating to witness the meagre use of the indicators. This thesis is therefore a pursuit to find out why? Is it because sustainable development is an oxymoron (Redclift, 2005) and hence impossible to measure or because the indicators that have been developed have failed in some processional respect? Or are there some other factors related to the expected use and users?

A fundamental difficulty in measuring sustainable development stems from the vagueness of the concept as formulated in the Brundtland Report: "Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987 p. 8). Bell and Morse (1999, p. 9) conclude that most people agree that is about "leaving something for your kids", but a precise and more detailed commonly accepted definition has not been reached.

Since 1987, scientists have produced numerous and sometimes conflicting definitions of sustainable development ranging from wider view of "progress for the better" (Meadowcroft, 1999) or narrowing the concept to the environment point of view, *i.e.* considering environment as the limiting factor (Meadowcroft, 1997). Indeed, SDI processes are led and funded by the environment administration in many countries which has resulted in it being considered "a green issue". However, recently other sectors have become increasingly involved (*e.g.* in Finland and Sweden) as it has been realized that the environmental sector alone will not be able to secure even environmental policy objectives (Lafferty and Hovden, 2003), let alone a broader sustainability agenda involving social and economic aspects.

Instead of asking for a single comprehensive definition of sustainable development, one can

choose an alternative approach to operationalise the concept by identifying issues that should be considered or measured. For example, Agenda 21 (UNCED, 1992) brings forth issues to be addressed in sustainable development. The issues are grouped into social, economic, environmental and institutional dimensions. Although all of these have long policy traditions, the concept of sustainable development introduces some specific features that complicate the matter. The distinguishing attributes relate to the temporal scale of the problems which are normally longer than those considered in policy cycles or politics; the spatial scales that cross traditional boundaries of policy sectors; the need to limit economic and population growth and the irreversibility of development (Dovers, 1997: 309-310). The uncertainty that characterises issues such as climate change is also inherent to sustainable development.

Setting targets for sustainable development is another approach to operationalise sustainable development. The Millennium Summit, also known as Rio+10, presented Millennium Goals that provide a global framework of sustainable development (UNDP, 2006). National level targets have also been defined widely and by the 21st century many countries have published strategies for sustainable development (*e.g.*DEFRA, 2005; Natural Resources Canada, 2006; Prime Minister's Office, 2006). However, since sustainable development is an open-ended process that must adapt to changing circumstances (Farrel *et al.,* 2005), targets tend to be vague as well (*e.g.* decrease or mitigate something). Being a distinct policy area that comprises multiple sectors, values, and perspectives, sustainable development demands a greater stock of information compared to traditional policy areas (Hezri, 2006) which both complicates and increases the volume of work.

The third approach is to use indicators to define sustainable development. This leads to a paradox, as developing measurement tools without knowing what to measure is impossible (McCool and Stankey, 2005) and may furthermore allow data availability influence the result. There is also risk that the quest for SDIs leads to an endless loop where one defines the other. The next section will present some of the main international approaches and milestones in this quest with a reference to the Finnish developments in the field.

1.2 Influential international sustainable development indicator processes

To start with a definition of a SDI, many would agree that an indicator is something that provides a clue to a matter of larger significance or makes perceptible a trend or phenomenon that is not immediately detectable (*e.g.* Hammond *et al.,* 1995). SDIs are commonly constructed from economic, social and environmental statistics. The OECD (2006, p. 33) defines SDIs as "statistics [that] are needed to illustrate to policy-makers and the public the linkages and trade-offs between economic, environmental and social values; to evaluate the longer-term implications of current decisions and behaviours; and to monitor progress towards sustainable development goals."

SDIs are distinguished from other indicators because of the framework they are in. For example, a greenhouse gas emission is an indicator that appears in most SDI sets. It does, however, belong to most environmental indicator sets as well. Hence SDIs are about sets and when discussing their use, we need to focus on the whole set. The sets can of course be marketed through single indicators, but in order to enhance sustainable development it is the whole unit that counts.

Before going into the most prominent SDI sets that have influenced my approaches in the projects I have participated in, let us take a brief look at the history statistics. The seeds of modern statistics in the Western civilizations that serve as a basis for SDIs can be dated to as early as the 16th century when State descriptions were compiled for rulers on the conditions in different countries (Statistics Finland, 2006). In the Kingdom of Sweden – which Finland was then part of – the population statistics began in 1749 with records of births and deaths (Koskinen *et al.,* 2006). Fifty years later, Thomas Malthus was among the first to

raise concern about sustainability perspective as he noted an inherent tendency for human numbers to 'outstrip the means of subsistence' (Malthus, 1798).

Official statistics were founded towards the end of the 1800s (*e.g.* the United States in 1869 and Finland in 1865) with continuing emphasis on social statistics. The World Wars and economic recession at the beginning of the 1930s shifted general interest to economic statistics. The 1960s witnessed another emergence of social statistics and the word indicator was taken into wider use. In the United States, regular publishing of social indicators began and continued for a short while, but interest in them waned due to little use and changes in political priorities. (Cobb and Rixford, 1998).

The collection of environmental statistics dates back to the early 1970s (*e.g.* UNEP, 1973; OECD, 1979; EPA, 1980). More regular use of environmental statistics at the international level began with the Worldwatch "State of the World" in 1984 and a yearbook "Vital Signs" in 1992. The Organisation for Economic Co-Operation and Development (OECD) published an influential environmental indicator report in 1994 (OECD, 1994) with the pressure-state-response framework that has also been adapted in modified forms to many SDI sets. The European Environment Agency reviewed the state of the European environment for the first time in 1995 (Stanners and Bordeau, 1995). The growth in volume of State of the Environment books strengthened the popularity of environmental indicators in the early 2000s (Article I).

The first collection of environmental statistics in Finland was published in 1973 (Statistics Finland, 2004) after the inception of official environmental statistics in 1971. The book was published every four to six years until 2000 and thereafter annually.

At present researchers and civil servants are making efforts to provide SDIs to decision-makers on all levels from international to national and local level. On the international level, one can identify two pathways of work: organisations developing indicators for monitoring purposes (*e.g.* the European Environment Agency, Eurostat, the OECD, the United Nations) and research institutes searching to find better indicators and indices such as the dashboard or ecological footprint (*e.g.* International Institute for Sustainable Development, European Institute for Sustainable Development, European Commission Joint Research Centre).

The main international exercises or processes that have influenced my work with indicators over the years and reasoning in this dissertation were those of the United Nations, the OECD, the European Environment Agency and the Eurostat. The projects will be briefly described in the following paragraphs.

The first international set of SDIs was published by the United Nations in 1996 (UN, 1996). The framework of the indicators followed the Agenda 21 content and hence that was the definition of sustainable development used. The initial indicator set was tested by 12 countries (including Finland) and the testing process greatly influenced national indicator work (Section 2.2.1).

The United Nations recently held two meetings to look at future options for their SDI work based on a report prepared by Pintér *et al.* (2005). The main concern of the UN is that although a front runner in the field, their indicator work has resulted in very little use in the member countries. The indicator-menu was published in 1996 (UN, 1996) and revised in 2001 (UN, 2001), but neither of them has been adapted for national purposes nor updated and published by the UN itself. Pintér *et al.* (2005) concluded that the main reason is the difficulty to agree on a universal set that suits all countries.

The OECD worked on a set of SDIs in the early millennium (OECD, 2004), but it has not been updated. The framework was not based on a strategy. Perhaps related to that, OECD is currently working jointly with UNECE on sustainable development frameworks to find a common way to structure SDIs, however, agreeing on a suitable approach for the framework has proven extremely challenging (Eurostat, 2006). The reason is that there are two competing approaches to the way the indicator framework should be developed. There are proponents for both a capital approach and a problem oriented approach (WGSSD, 2008).

The capital approach defines sustainable development as "development that ensures non-declining per capita national wealth by replacing or conserving the sources of that wealth; that is, stocks of produced, human, social and natural capital" (OECD, 2005).

The most recent indicator activity in the OECD is the *Measuring Progress* that resembles previous SDI projects (OECD, 2008). The difference is that leading personnel in the statistical division of the OECD have concluded sustainable development to be too value laden of a concept and that troubles to define it has prevented constructive work on the indicators for too long (personal communication with Jon Hall, 10.2.2008). To overcome the problem, statistical offices of all member countries are invited to join in defining up to 100 indicators to measure progress and also to form national round tables to define what progress is.

The third international organisation that has considerably assisted both conceptually and methodologically its member countries is the European Environment Agency, although its focus is mainly on environmental indicators. Sustainable development is, however, reflected in many of their more analytical studies on sector indicators (*e.g.* TERM, 2002) and Policy Integration Evaluations (EEA, 2005a). Furthermore, the European Environment Agency emphasises policy relevance and communication of indicators. They have also advanced to concretely "fame and shame" the European Environment Agency member countries by using nine environmental indicators (EEA, 2005b) and developed further the OECD P-S-R framework into the DPSIR framework (driving forces-pressure-state-impact-response) that gives a more detailed view of the issue at hand. The EEA hosted a working group on environmental reporting for over ten years from 1997 onwards during which countries could learn from both EEA's innovative approaches to presenting information as well as from others. This type of experience sharing was very valuable to national work.

The European Union has given the Eurostat a mandate to develop SDIs for monitoring its Strategy for Sustainable Development (Eurostat, 2004). The indicators were be published in 2007 (Eurostat, 2007), but work on improving them continues. The work involves member countries as the indicators are continuously revisited and improved by a special working group focusing on the weakest points and data gaps. In this process, countries are influencing the work of the Eurostat to a great extent. The working group also provides a forum for the member countries to compare experiences and receive new information and solutions to their national indicator work.

Besides the formulation of indicator sets significant efforts to develop single stand-alone indices that combine several variables of sustainable development have taken place. Among the best known and most disputed are the ecological footprint and the environmental sustainability index ESI (from 2007 the environmental performance index EPI). Indices are useful in awareness raising as they easily reach the headlines. Furthermore, international indices compare countries and the results initiate public discussion.

One of the indicator sets presented in this dissertation included indices (*e.g.* GDP, bird species), but in principle indices were avoided and hence they will not be discussed further in this dissertation. The decision to avoid indices was made in the national indicator network on the grounds that indices would be too difficult to communicate to decision-makers and the citizens. It was considered more transparent to show concrete values and numbers as much as possible.

1.3 The purpose and structure of the dissertation

My role in the two indicator processes that will be assessed in this dissertation has been central. The combination of being both a practitioner and a researcher has given the indicator work a unique status through a mechanism where research results from interviews (Section 3.1) and the literature studies have been implemented directly to the on-going indicator development work such as in the development of indicator leaflets for the FNCSD meetings (Section 4.2.4). Over the past ten years the national process has been a learning process to increase the use of the indicators by active

promotion, improvement of their visual appearance and by attempts to develop indicators that respond to the feedback given by the potential users.

The motivation for this dissertation is the insignificant use of the SDIs that puzzles me. My research problems are which factors influence the use of SDIs, what has deterred their use, and what is the appropriate role of SDIs in sustainable development policy?

Since the indicators are not actively referred to as basis of decisions, they are either not used at all or they are used differently. Hence it makes sense to explore whether they are actually used in other ways than directly. Furthermore, if there are many ways of use, are the types of use complementary to each other or do tensions arise?

Although there may be other ways of using indicators, it is clear that there are factors that deter their use. This stems partly from the fact, that research on the user point of view of indicators is scarce. Is it therefore apt to ask what deters their use.

A third aspect of indicator use that can reveal how to influence their use is to explore where the indicators are used, especially in the policy cycle. Who in the policy cycle are the most likely users of the indicators and are some indicators more popular than others?

The research questions are:

1. What drives the use of SDIs?
   a. Are there different types of use and if so, which type of use is most common?
   b. Are there tensions between the different types of use?
   c. What influences use and what are the key criteria for different types of use?

2. What deters their use?
   a. Which factors have deterred different types of use?

3. What is the appropriate role of SDIs in sustainable development policy?
   a. What is the role of the indicators in different stages of the policy cycle?
   b. Who are the most likely users of the sustainable development indicators?
   c. Which kinds of indicators are most popular?

The first purpose is to select a framework to analyse SDI projects by focussing beyond the conceptual and methodological issues of the indicators. I will then use the framework to assess the two indicator development processes.

The dissertation is built on the following articles published in peer-reviewed journals which will be referred to with their roman numerals.

I Rosenström, U. and Lyytimäki, J. 2006. The role of indicators in improving timeliness of international environmental reports. European Environment 16(1): 32-44.

II Rosenström, U., Mickwitz, P. and Melanen, M. 2006. Participation and empowerment-based development of socio-cultural indicators supporting regional decision-making for eco-efficiency. Local Environment 11(2): 183-200.

III Rosenström, U. and Kyllönen, S. 2007. Impacts of a participatory approach to developing national level sustainable development indicators in Finland. Journal of Environmental Management 84 (3): 282-298.

IV Heinonen, S., Hietanen, O., Lyytimäki, J. and Rosenström, U. 2005. How to approach the sustainable information society? Criteria and indicators as useful tools. Progress in Industrial Ecology, An International Journal 2 (3/4): 303-328.

V Rosenström, U. 2006. Exploring the policy use of sustainable development indicators: Interviews with Finnish politicians. The Journal of Transdisciplinary Environmental Studies 5(1-2). http://www.journal-tes.dk/

The answers to the research questions are sought for in the following chapters. Chapter 2 provides the conceptual background and material on which the research questions will be reflected on. It begins with the introduction of the framework to assess indicator processes and then moves on to explore types of indicator use and tensions between the uses (Article

V), indicators' role in the policy cycle and user point of view. The second part of the chapter describes the indicator processes (Articles II and III) and methods used to measure the use of the particular indicator sets (Articles IV and V).

Chapter 3 presents the results and they are discussed in Chapter 4 by comparing the indicator processes according to the framework and deducing the main handicaps that have deterred the use of the SDIs. The role of the SDIs is revisited by analysing the concept of use in a broader sense. Chapter 5 concludes the dissertation.

2 Material and methods

The starting point for this research is very personal and it is therefore difficult to remain objective which may impede critical assessment. Part of classic academic research advocates the virtue of objectivity and thereby detachment from the research object is considered important. Qualitative methodology recognizes that the subjectivity of the researcher is intimately involved in scientific research (Ratner, 2002). On the other hand, one of the studied indicator processes was undocumented as only the decisions taken in the in the indicator network meetings were documented. Having an outsider research these particular indicator projects could never yield the same detail. The weakness is that detachment is difficult, especially in the assessment of the outcome and process. However, the passing of time and improvements in the indicator field help to see the sets in more critical light.

The research method whereby the researcher collects data from his/her own organisation and seeks to use it to change action within the organisation is known as insider action research (Greenwood, 1994; Hart, 1996). Insider action research involves opportunistic and planned interventions in real time situations and a study of those interventions as they occur, which in turn informs further interventions. Insider action research has its own dynamics to distinguish it from an external action researcher approach. (Coghlan and Casey, 2001). This was the research method used although its use was not consciously recognised when the interviews to explore use were made (3.1).

2.1 Central concepts

In order to answer my research problems, I will begin by introducing a framework to structure the work. It includes a set of criteria for evaluating the indicators and processes relevant for the use of indicators. Besides looking at the qualities of the SDIs and processes to develop them, one needs to be aware of the other side, namely the users, as well. This chapter explores the types of indicator use, the role of the indicators in a policy cycle and brings forth the user point of view.

The terms policy-maker and decision-maker are both used in this dissertation. Generally, the term decision-maker is used when referring to end users of the indicators, especially to those that were interviewed. Bauler (2007) has criticised the use of the term "policy-maker" in my earlier works based on the fact that policy-makers comprise of different categories (politics, administrations, agencies *etc*.) and have strongly differing information needs. He considers that my interviews involved "decision-makers in a policy domain". While the domain is not a clear issue, it is worth trying to be as precise as possible when referring to the interviewees, whether politicians, their assistants or Permanent Secretaries. When citing other publications, the term used in the original text is retained.

2.1.1 Framework for evaluating sustainable development indicators

My original idea was to employ in the analysis the Bellagio Principles (Hardi and Zdan, 1997) that provide an exhaustive list of criteria that cover most of the important issues for SDIs. They were developed in 1996 by an international group of 24 measurement practitioners and researchers brought together by the International Institute for Sustainable Development. The principles address the articulation of a sustainable development vision, clear goals,

Table 1. Bellagio Principles (Hardi and Zdan, 1997).

1. Guiding Vision and Goals
■ Assessment of progress toward sustainable development should be guided by a clear vision of sustainable development and goals that define that vision.
2. Holistic Perspective
Assessment of progress toward sustainable development should: ■ include a review of the whole system as well as its parts ■ consider the well-being of social, ecological, and economic sub-systems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts ■ consider both positive and negative consequences of human activity, in a way that reflects the costs and benefits for human and ecological systems, in monetary and non-monetary terms
3. Essential Elements
Assessment of progress toward sustainable development should: ■ consider equity and disparity within the current population and between present and future generations, dealing with such concerns as resource use, over-consumption and poverty, human rights, and access to services, ■ as appropriate consider the ecological conditions on which life depends ■ consider economic development and other, non-market activities that contribute to human/social well-being
4. Adequate Scope
Assessment of progress toward sustainable development should: ■ adopt a time horizon long enough to capture both human and ecosystem time scales thus responding to current short term decision-making needs as well as those of future generations ■ define the space of study large enough to include not only local but also long distance impacts on people and ecosystems ■ build on historic and current conditions to anticipate future conditions: where do we want to go, where could we go
5. Practical Focus
Assessment of progress toward sustainable development should be based on: ■ an explicit set of categories or an organising framework that links vision and goals to indicators and assessment criteria ■ a limited number of key issues for analysis ■ a limited number of indicators or indicator combinations to provide a clearer signal of progress, standardising measurement wherever possible to permit comparison comparing indicator values to targets, reference values, ranges, thresholds, or direction of trends, as appropriate
6. Openness
Assessment of progress toward sustainable development should: ■ make the methods and data that are used accessible to all ■ make explicit all judgments, assumptions, and uncertainties in data and interpretations
7. Effective Communication
Assessment of progress toward sustainable development should: ■ be designed to address the needs of the audience and set of users ■ draw from indicators and other tools that are stimulating and serve to engage decision-makers ■ aim, from the outset, for simplicity in structure and use of clear and plain language
8. Broad Participation
Assessment of progress toward sustainable development should: ■ obtain broad representation of key grass-roots, professional, technical and social groups, including youth, women, and indigenous people to ensure recognition of diverse and changing values ■ ensure the participation of decision-makers to secure a firm link to adopted policies and resulting action
9. Ongoing Assessment
Assessment of progress toward sustainable development should: ■ develop a capacity for repeated measurement to determine trends ■ be iterative, adaptive, and responsive to change and uncertainty because systems are complex and change frequently ■ adjust goals, frameworks, and indicators as new insights are gained ■ promote development of collective learning and feedback to decision-making
10. Institutional Capacity
Continuity of assessing progress toward sustainable development should be assured by: ■ clearly assigning responsibility and providing ongoing support in the decision-making process ■ providing institutional capacity for data collection, maintenance, and documentation ■ supporting development of local assessment capacity

holistic perspective, scope, effective communication, broad participation, ongoing assessment and institutional capacity (Table 1).

However, after initial testing, I felt that the principles do not match my experience of essential aspects of indicator process. For example, the Bellagio Principles demand the concept of sustainable development to be clearly defined and require that it is high on the political priority list of the intended users. However, over the years some have seen sustainable development as an oxymoron (*e.g.* Parris and Kates, 2003, see also Chapter 1) and not a leading political vision. Hence having a clear vision has proven challenging and in reality indicators themselves often define what the author(s) mean by sustainable development.

Many of the recent SDI sets are connected to existing strategies instead of trying to measure sustainable development holistically. This means that principles 1, 2 and 3 are of limited applicability in judging the use of indicators, as the vision, goals and [holistic] approach are derived from the strategies. Hence I have combined the principles into one principle called high policy relevance. This modification conflicts with the underlying holistic assumption of sustainable development, but considering the current status of sustainable development as a policy, I consider it more effective from the usage point of view to clearly articulate policy relevance to be a leading principle in the development of such indicators.

Besides adding certain specific criteria (*e.g.* timeliness), I felt that re-grouping the principles into five major principles would provide a more tangible framework and better highlight the essential features. The following sections will elaborate and justify the five principles that are high policy relevance, sound indicator

Table 2. A framework to highlight the essential features of sustainable development indicators that influence their use. The specific criteria have been compiled and edited from the Bellagio Principles (Hardi and Zdan, 1997), Hezri (2004), Becker (2004), Petts (1995), DETR (2000), and Articles I, IV, and V.

Principle	Specific criteria
High policy relevance	Link to existing strategy or goals (relevant) Comprehensive: all important aspects have been included Linkages to sustainable development, causal relationships between the three dimensions
Sound indicator quality	Time series and trends Regional/local comparisons International comparisons Forecasts Framework Number of issues Number of indicators Data available for the chosen indicators
Efficient participation	Representativity of the participants Transparency Early involvement Task definition Influence/ compatibility Degree of awareness and knowledge achieved Legitimacy of the product
Effective dissemination	Availability of methods and raw data for other users Critical assessment of data (reliability) Design the indicators for users Emphasis on availability as suitable products (presentation material, The Internet) Simple and clear indicators Present the indicators to decision-makers Timing Timeliness
Long-term Institutionalisation	Responsive to change Flexibility to changing political priorities and new knowledge Plans and funds for updating the indicators Assigned responsibility for updating and dissemination

quality, efficient participation, effective dissemination, and long-term institutionalisation.

High policy relevance

Traditionally, environmental indicators have been largely descriptive and not explicitly tied to policy concerns (Atkinson and Hamilton, 1996). Bell and Morse (2001) state this to be the principal reason for the modest use of SDIs in policy cycles. Further current argumentation on the little use of indicators comes from David Stanners from the European Environment Agency who claims the lack of policy relevance to account for the little use: "When we started work ten years ago, we were imposing on users the indicators we thought were relevant. But the users, the policy makers, said 'Oh well that's very interesting, but not very relevant to what we are doing.' So we didn't have any impact on the system." (Brennan, 2008).

Policy relevance entails that the indicators are responsive to changes in driving forces and have threshold or reference values against which progress may be measured (Atkinson *et al.,* 1997). Ideally, the targets would come from a commonly agreed strategy or programme that the indicators have been designed to monitor. In fact, for indicators to be used instrumentally (Section 2.1.2), a clear association with policy or a set of possible actions is a prerequisite (Innes and Booher, 2000).

The current trend is to design SDIs to monitor published strategies; for example the United Kingdom, Sweden, Finland and the European Union are following this model. The usefulness of the indicators in these cases is partly dependent on the quality and comprehensiveness of the strategy itself. When strategies are not available, the relevance can be increased by sensitivity to political agendas and timing.

Sound indicator quality

This principle includes the core values of the indicators, those that guided the early work of the SDIs. The characteristics of good indicators are quite often listed in the literature and translated into specific criteria (*e.g.* Dale and Beyeler, 2001; Bell and Morse 1999; Moldan *et al.,* 1997). Although no universally accepted criteria exist, certain features appear more often than others, e.g. measurability, sound data quality, importance, representativity.

The national SDIs were to be selected according to their reliability and usability (Rosenström and Palosaari, 2000). The two criteria were further specified that reliability means timely and regionally representative, scientifically acceptable, and repeatable indicators that do not overlap with other indicators [in the set]. Usability required that the indicators were relevant, simple and easily interpreted, sensitive to change, enable forecasting and comparison, and that the indicator is available at a reasonable cost. As will be seen later, the criteria were not fulfilled in the selection.

The Bellagio Principles also list data availability, comparison and forecasts inherent to the adequate scope of the indicators. Practical focus requires a working framework and limited number of issues and indicators. When the indicators are clearly connected to a strategy, the framework and number of issues are defined by the strategy.

Morrone and Hawley (1998) list ability to measure, sound data quality, importance and representativeness as the key criteria. They consider that balance of having adequate information and yet keeping the indicators simple for public understanding as the key challenge.

Simplicity of the indicators is understood to mean that the message is explicit, for example increase means we are approaching sustainable development. However, this criterion is seldom met because indicators often display mixed messages and furthermore because sustainable development is commonly undefined by those presenting the indicators.

Another practical issue relates to the way the indicators are presented to make sense to the non-expert reader, for example the choice of measuring units (percentage, rate, per capita, absolute value, *etc.*) (Mitchell, 1996). Adhering to basic statistical rules is important to achieve correct and appealing graphic presentations which also promote effective dissemination.

Efficient participation

The main arguments for public participation are that it leads to stronger democracy (Barber, 1984; Saward, 1998; Elster, 1998) and generates new relevant and higher quality information for decision-makers (OECD, 2001). In addition, wide participation can also be seen to increase efficiency, as the number of conflicts can be reduced (Forester, 1999; OECD, 2001) and the end-results can receive also better support from both the citizens and the policy-makers (Becker, 2004). Substantial inputs by potential users are also considered to increase the sense of ownership of the end product, which enhances the life expectancy of the product (Hezri and Dovers, 2006).

Participation is an integral constituent of sustainable development and it has also been widely accepted to the indicator processes. However, one should not aim for a participatory process without careful planning. Despite the many potential gains by participation, the results do not always realize (*e.g.* Akkerman *et al.,* 2004). Especially effectiveness and efficiency is quickly lost when numerous people are consulted and many events are organised. Participation may also hamper the usefulness of the resulting indicators when very different interests groups take part in the development work (McCool and Stankey, 2004). Either parties cannot agree on suitable indicators and the result is compromised or the indicator presentation suffers from compromises. This was especially obvious when "the Finnish Strategy and Indicators for Sustainable Development" was drafted in 2006. Many years of work to develop clear indicators with simple and meaningful headlines turned into political jargon as certain stakeholders could not accept more explicit wording. For example, an indicator to measure instability in the working life could not be called "short term" or "fixed term" tenure but "atypical tenure". This type of civil servant jargon gravely undermines communication efforts.

Literature on participation has also raised the issue of "consultation fatigue", *i.e.* engaging people in participatory processes is so popular among practitioners that it is increasingly difficult to persuade people to take part in new initiatives (Richards *et al.*, 2004). Hence care should be taken to consider participatory approach only when there is a commitment to listen and act on the issues presented. Furthermore, there must be a genuine possibility to influence the process and outcome. Indicators that are intended to monitor a Government Strategy benefit mainly from the presence of providers and the users, *i.e.* the practitioners, statisticians, civil servants and the policy makers. Hence the principle is called efficient participation as very wide participation may not automatically lead to wanted results.

Despite the criticism towards participation, it must be stressed that participation of the foreseen end users of the SDIs is essential for both producing a usable product and for early "marketing" of the product.

Effective dissemination

Society does not suffer from a lack of information, on the contrary there is too much of it. But the information is scattered and few providers of information take care of properly disseminating the information. There are two main channels to enhance effective dissemination: the product must be communicable and it must be actively promoted to the potential users.

Ability to be communicable relates to the way the product looks like and to the ease of its use. Size of the publication or the technical solutions of the internet site play a major role. Efforts could also be made to name the indicators in a clear and explicit manner (see also Schiller *et al.,* 2001). The early SDI publications often used a single colour (*e.g.* United States, 1998; European Community, 1997; Rosenström and Palosaari, 2000) which made them unappealing to non-experts and the interpretation of the graphs was difficult. Combination of scientific robustness and artistic insight can add considerably to their appeal. Introduction of mobile phones with the Internet access has made it common practise to check facts on the Internet, which means more challenges for the graphic displays.

Active promotion is another aspect of efficient dissemination. Scientists tend to believe

that their job is solely to provide top quality information (Pawson, 2006). Besides providing the politicians with the products, it is also important to present them and demonstrate their use. Many projects end with the publication of the indicators and without a proper plan to disseminate and update them (*e.g.* Rydin, 2004). The dissemination of the indicators to promote their use requires people and funds. This is especially a relevant criticism to public sector that does not sell its products and hence tends to ignore promotion. Active promotion will increase politicians' attention to the message of the indicators and even if they do not meet their current political needs, an enlightening experience might take place.

Some consider the Internet to solve the dissemination to a large degree as many people use the search engines actively. However, these people are seeking specific piece of information and seldom a comprehensive set of data such as the SDIs.

Long-term institutionalisation

Institutionalisation of the indicator projects ensures dissemination and updating. Institutionalisation of the indicator work to a research institute or a ministry also supports continuous development and improvement of the indicators. Sustainable development is a long-term goal and resources to monitor should be allocated accordingly. People might change, but the indicator programmes should be intended for the longer term and institutional memory should be recorded.

Timeliness of information serves many purposes: prompt reporting permits early detection of emerging problems and thus the attention of decision-makers can be obtained in time to act (Munn *et al.,* 2000; Hukkinen, 2003b). Timeliness also relates to the quality of the information (Dwyer and Wilson, 1989). A message that contains recent information seems more accurate and correct than a figure that relates to the situation four years back in time. The ability to produce up-to-date information signals the competence of the providers (Article I).

Lack of timeliness is a significant deterrent to the use of indicators (Article I). When politicians use indicators to persuade or impress others, they do not want to present opponents with old news. Besides publishing timely data, scientists should pay attention to regular updates of the indicators and carefully communicate to the users about the next updates. This further strengthens the credibility.

2.1.2 Types of indicator utilisation

The rationale for indicator use is based on the assumption that decision-makers behave rationally and are willing to use correct information when it arrives to make better decisions. However, policy-making entails much more than simple facts being always a reconciliation of interests in consensus negotiation (Weiss, 1978). Hezri (2004) further claims that context laden concepts such as sustainable development only make the use even more complicated and irrational.

Frustration about understanding why there is little evidence on the use of the SDIs has led researchers to review studies on evaluation research use that took place in the 1960-70s (*e.g.* Hezri, 2004; Gudmundsson, 2003; Article V). Weiss (1979) reported that decision-makers seldom use research findings as intended. Instead, they seem to assimilate the information, but its impacts may be detected only years later. Over the years literature on evaluation research has produced various classifications of use with sometimes conflicting nomenclature. There are, however, three distinct types of use that most agree on. They are (1) instrumental use, (2) conceptual use, and (3) legitimising use (*e.g.* Amara *et al.* 2004; Beyer 1997). These three types will be further described in this section and later used to classify the types of indicator use that emerged from the interviews (Section 3.1).

Instrumental use (1) is what the practitioners expect. It refers to using research as a basis for action to change behaviour or action (Johnson, 1998). More concretely, research findings are used to make direct decisions about changing programmes (Shadish *et al.,* 1991). According to Weiss *et al.* (2005), pure instrumental use is

uncommon. Most decisions are based on a variety of issues and research recommendations alone seldom precipitate change.

Barriers to instrumental use relate to both policy relevance of the research and to the characteristics of the intended user. The scientist assumes a consensus with the policy-makers on what the desired solution to the problem is: the research only provides the appropriate means to reach that goal (Weiss, 1979). However, if the decision-maker finds the information contradictory to his/her goals and objectives or contradicts his/her beliefs, rejection is likely (Weiss, 1980). The timing of the research results with the political agenda or careful selection of the indicators can improve the chances of instrumental use considerably.

The conceptual use (2) of research findings refers to slower changes in user attitudes or ideas as a consequence of reading about the results. The policy-makers consider research and evaluation studies useful, even when there is no immediate action to implement them (Weiss, 1979). Enlightenment may then indirectly affect a decision later on, but it will be more difficult to trace the impetus for certain views. Conceptual use has also been described as education or organisational learning or cognitive processing (Weiss and Bucuvalas, 1980). As a form of research use, it has been found to be the most important effect of research and evaluation on policy (Weiss *et al.,* 2005).

Legitimising use (3) occurs when research is used to "convince others to support a position or as a defence from attack" (Rich, 1977). The opinions of politicians are often set for reasons of ideology, intellect or interest, and it will not be easily shaken by new evidence (Weiss, 1979). Hence he/she only accepts information that suits him/her and uses it to persuade others, an activity central to politics (Weiss, 1978). The object of persuasion may be other politicians, civil servants or voters. The legitimising use of research findings may be very direct, or the information may be refined to suit the politicians' own views. In extreme cases findings can be misused by distortion or omission of significant elements (Weiss *et al.,* 2005; Cousins, 2004).

Without wanting to confuse the reader, there are certain often reported use types not included in the analysis but worth mentioning. They are the process use and ritual use. Process use occurs with people involved in the research or evaluation process changing their behaviour or understanding (Patton, 1997). According to Johnson (1998), process use brings the scientists and users closer together in thinking models, leading to several benefits such as increased use of the evaluation procedures and increased confidence in and sense of ownership of the results. There are views that process use is not comparable to the first three uses presented above, as it reveals more how the influence arose (Weiss *et al.,* 2005) and it also overlaps partially with instrumental and conceptual use (Johnson, 1998). A prerequisite for process use to occur is that the foreseen users take part already in the process. Otherwise this learning takes place only among those developing the indicators. For the purpose of my work process use is mostly considered to be part of conceptual use.

Ritual use takes place when information is collected for a façade but not really used (Hezri, 2004). Certain politicians may carry with them statistical tables to give an impression that they use data in order to make their views look like they are evidence-based. The whole exercise of developing SDIs to measure sustainable development strategies may be ritual if they are not really used. In other words, statistical reports and indicators are produced periodically for no real use. However, there was no reason for the interviewed people to pretend that they are using the SDIs and neither did they do that, hence this type of use has not been included in the specific analysis as it represents "non-use".

The literature of use types contains some discrepancies with regard to legitimising use. Carolyn Weiss (e.g. 1979) does not recognize ritual use and uses the term "symbolic use" to mean legitimising use, where as Hezri (2004) uses symbolic to mean ritual use. I have also used symbolic use to describe legitimising use in Article V, but will now change the nomenclature to better reflect what the words really mean.

A further common practice is to differentiate between tactical and persuasive kind of legitimising use (*e.g.* Hezri 2004; Vedung, 1997). The difference is that in tactical use the information is used to tactically to deflect attention from somewhere else and persuasive use is then to further the users' own political agenda with the selected information.

The types of research use presented here were derived from studies of evaluation use. Evaluations differ from SDI sets in that they are more focussed and usually carried out only once. They also contain recommendations of how to proceed with the issue that has been evaluated. SDIs attempt to measure and evaluate policies as well, but at least the current publications tend to leave judgements to the readers and recommendations are implicit.

2.1.3 Tensions between instrumental, conceptual and legitimising use

The three types of use contain interesting tensions, as they assign very different roles and purposes for indicators. Instrumental use of indicators implies indicators that are policy relevant and relate directly to targets that decision-makers have themselves set. The indicators serve to measure policy performance and they reflect issues that are deemed important by the current views. A significant problem with direct policy performance measurement is that the attention of policy-makers is deviated from what is essential to what can be measured and diverting funds to complex monitoring schemes that may not be useful in the long run (Lehtonen, 2008).

Sustainable development is considered a continuous and adaptive learning process (NRC, 1999). This view strongly contrasts with rigid indicator sets that follow political agendas. Instead, indicator sets that contain a wider array of issues are more likely to result in conceptual learning, which would genuinely steer policies towards sustainable development. Hence creation of indicator sets that would not follow closely current political agendas, are more in line with the concept of sustainable development. However, this approach clearly compromises instrumental use of indicators that is often most desired by practitioners as the impacts of the indicators can be readily detected. Conceptual use is much more diffuse to assess.

Legitimising use can take advantage of both kinds of indicator sets, as politicians using indicators to advance their own agendas choose suitable information from a wide array of sources. Hence the indicator set may be either closely related to current policies or more encompass more widely sustainable development issues. The main problem is that in legitimising use the practitioner does not influence the user's choice. In instrumental use the indicators are used as intended: to measure policy performance. Similarly, conceptual use increases the knowledge of those issues that the developers deem important, although control of what eventually is learned lies within the user. However, in legitimising use the salience with the user's worldviews becomes central. The indicators may also be misused to clearly drive the personal agendas of the user. No matter how well the indicators fulfil given criteria of policy relevance, timeliness, effective communication and credibility, if the indicators are not salient with the user's views they will not be used.

Bearing in mind these shortcomings of the classification of indicator use, they serve well the evaluation of the types of use that has taken place with the two indicator processes presented in the section 2.2.

2.1.4 Indicators and the policy cycle

The quest for indicators echoes the movement to base modern polices on evidence (Pawson, 2006). The literature presents the roles of indicators to include guidance of policies and monitoring the changes in the state of the environment, the identification of emerging issues, the evaluation of policy effects, comparing countries and regions, raising awareness, and helping to investigate links with sectors, cause-effect chains, and synergies (Hukkinen, 2003a; Hezri, 2004; McCool and Stankey, 2004). Many problems can be avoided or mitigated

by informed, prudent policy and timely action that indicators support (Caldwell, 1993).

Public policy-making is often described as a process that entails problem identification, identification of possible courses of action, comparison of these alternatives, policy formulation, implementation and evaluation (Sutton, 1999). Information is used at all stages of the process, although the role of indicators is seen most explicitly in policy formulation as a tool to identify the problem that needs to be addressed and in policy evaluation to measure the extent to which the policy has affected the problem (Bosch, 2002). In order to explore the different uses and users of the SDIs, it is worthwhile to investigate the policy cycle (Figure 1.)

Researchers are often the first ones to acknowledge emerging threats to the society. For example, it has taken more than a decade to convince policy makers of the global warming to be a consequence of man-made actions. A recently published report contains over 1,000 studies to prove the existence of the problem (IPCC, 2007). To convince policy makers and the public of the problem, we need indicators to characterise the issue in a clear and convincing manner (Moldan, 1997). Here the main users would be scientists and experts who use indicators to communicate the new problems that have been identified.

The next stage continues from the public acknowledgement of the problem to persuade the decision-makers to act on the issue. Here indicators can serve as a powerful tool to ensure that action is taken to formulate a policy. Hence the users can be both those raising public awareness (scientists and politicians with interest in the matter) and decision-makers that are influenced by the indicator messages. The media can also have a prominent role in publishing indicators and thereby influencing the public opinion.

Policy formulation and action can be based on information that indicators provide. Policies, such as sustainable development strategy processes, should also contain quantitative targets or at least qualitative goals (Moldan, 1997). By this, the decision-makers ensure that after the implementation phase the results of the policy can be duly evaluated. Development of specific indicators together with the policy further strengthens the future evaluation and also adds to concreteness of the policy. The

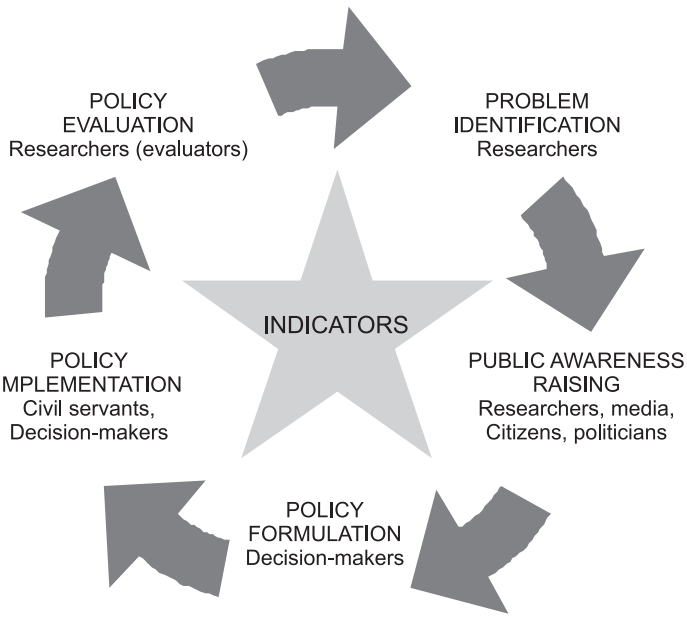

Figure 1. *Policy cycle and the use of indicators. Modified from Moldan, 1997.*

role of indicators may be very important to decision-makers after the policy or decision has been made. The indicators are used to explain the decision, possibly even to persuade others about its justification (Majone, 1989). Here the users are explicitly those drafting the policy.

Policy implementation is the most difficult and time-consuming phase of the whole cycle. It may take years and involves numerous people. In many cases the implementation also requires public support. To receive that support, indicators can play a central role. During the potentially long time span, situations may differ and information on them can be found from indicators. Decision-makers and those implementing the policy are the main users of the indicators.

The final phase of the policy cycle is the policy evaluation. Indicators not only measure the impacts of the policy, but also aid in guaranteeing that the policies have been executed. The results of the evaluation will show that anticipated change has taken place or that amendments need to be made to the policy. Here the users are evaluators that include indicators in their assessment and the users of the assessment, *i.e.* the decision-makers.

To summarize, indicators serve policy-making well in theory as they can arguably support many phases of the policy cycle and the users range from researchers and evaluators to decision-makers and the public. However, for indicators to reach these purposes they must overcome many obstacles of which the user's personal preferences are central. The following section discusses this issue.

2.1.5 Understanding the users

Hezri (2006) argues that those who produce indicators must also understand their distribution and use in policy processes. The argument is supported by the notion that in order for indicators to be used in the policy cycle, they must be provided to the users at the right time. Furthermore, it is useful to understand what influences the use of information and the different types of information use (indicator utilisation).

The characteristics and constraints of the intended user determine whether the indicators are used and how (Farrell *et al.,* 2005). The literature on research use has established that politicians have in-built conditions for information use (*e.g.* Barbier, 1999). People, and especially politicians, use information mainly for their own purposes (*e.g.* Silvasti, 1994). Research on the usefulness of international scientific assessments shows that they are most influential if they are credible as to their scientific methods, salient to the potential users, and legitimate in the way the assessment is designed (Eckley, 2001). Saliency, or relevance, refers to the core values of the users, *i.e.* their own experiences and worldviews.

Weiss (1983) proposes ideology, interests and information as the three driving forces behind decision-making. The three also contribute to saliency. In Parliament, ideology relates mainly to political orientation, although a person's background, principles and values also play an important role. Interests may be more ruthless: in politics decisions may often originate from self-interest in attaining greater authority, a higher position or favouring certain sectors of electorates *etc.* Information is the knowledge base on which the politicians form their views. Information may be partial, biased or completely incorrect. Nevertheless, prior knowledge significantly influences the uptake of new information. (Article V).

The three driving forces interact constantly (Weiss, 1983) together with process and communication. Ideology influences the type of interests the politician develops and the type of information he/she gathers and approves. Information is also collected to suit one's own interests. The role of interest cannot be assessed without closer relationships with the politicians. Information, and especially the role of prior information, influences how indicator type of information is perceived.

Politicians also have clear preferences regarding the forms of information that attract them and that they prefer to use. Webber (1992) has distinguished six sources of policy knowledge that the politicians use in varying degrees. They are personal, journalistic, practitioner's, and three types of research. The types

are policy research, policy oriented research and disciplinary research. For example, the Finnish Parliamentarians use expert hearings extensively as well as the Parliament's own Information Service (Personal Communication with Antti Rautava 28.5.2001). According to Weiss (1983) research use is also influenced by information sources such as direct experiences, craft lore, information interaction with colleagues, consultants and advisors. Awareness of these aspects can improve the product design and communication of the indicator sets considerably.

2.2 The indicator processes

Two indicator sets and processes to develop them are presented here. Descriptions of both processes have been published (Articles II and III) but for the dissertation they are presented in a similar style to enhance comparison. The comparison helps to tease out characteristics of the sets and processes that influence indicator use. The indicators were developed a few years back which gives perspective and possibility to estimate their use and success.

2.2.1 The process of developing national sustainable development indicators

The first Finnish set of national SDIs was published in the year 2000 (Article III). The work was preceded by the publication of the OECD environmental performance indicators for Finland in 1996 (Rosenström *et al.*, 2007) and testing of the United Nations' indicators for sustainable development in 1997 (Rosenström and Muurman, 1997). The mandate for the indicators came from the national sustainable development strategy published in 1998 (Ministry of the Environment, 1998). Instead of following the framework of the strategy, the 83 indicators adhered to the three pillars or dimensions of sustainable development with relevant issues or themes which was a common practice in 1990s (UN, 1996).

The main responsibility for the indicator development was assigned to the Ministry of the Environment and the work was carried out at the Finnish Environment Institute (SYKE). A national task force, "Indicator Network" (henceforth called the network), was formed already in 1997 to support the UN indicator work and continued with national work in 1998. The network consisted of representatives from the following ministries and research institutes in 1998-2000:

- Ministry of Agriculture and Forestry
- Ministry of Social Affairs and Health
- Ministry of the Environment
- Ministry for Foreign Affairs
- Ministry of the Interior
- Ministry of Trade and Industry
- Ministry of Transport and Communications
- Association of Finnish Local Authorities
- Government Institute for Economic Research
- Statistics Finland
- Finnish Environment Institute

At later stages in 2001 representatives from the Ministry of Justice, the Ministry of Education and the Ministry of Defence joined the network.

Another important stakeholder was the National Commission for Sustainable Development (FNCSD). The representativity of the FNCSD is warranted by its broad composition. To give political impetus on sustainable development issues, the Commission was chaired by the Prime Minister from 1993 to 2006 and co-chaired by the Minister of the Environment. The Minister for Foreign Affairs, the Minister for Foreign Trade and Development, the Minister of Social Affairs and Health, the Minister of Labour, and the Minister of Agriculture and Forestry were also members of the Commission.

Other members of the Commission represent important sectors, institutions, and interest groups in Finnish society, *i.e.* Parliament, public administration including local authorities, business and industry, labour unions, churches, the academic community, NGOs, interest groups representing various sectors of society and the media. In 1998-2002 the FNCSD consisted of a total of 49 stakeholders (Annex I). The prominent members of the

FNCSD gave the SDI work important support as they could be referred to when collecting data and comments. Hence it's role was very important giving the SDI work a high status, although the FNCSD actually discussed the work only twice during the development process. Furthermore, the members were invited to a seminar that presented the preliminary set of SDIs in autumn 1999 and asked for comments in spring 1999 (Figure 2).

The first step in the development process was to choose a suitable framework for the indicators (Figure 2). The options discussed in the network were a problem and sector-oriented approach. The problem-oriented approach would divide the indicators according to problems, *e.g.* climate change or poverty. A sector division would have resulted in headings such as transport or energy. The problem-oriented approach prevailed because many sectors already had their own indicator process (*e.g.* transport, agriculture, forestry).

The network convened several times during the first months to identify problems threatening sustainable development. The national sustainable development strategy was used as a basis, but later the network adopted a wider definition of sustainable development that would present all three dimensions as equally important (the government strategy promoted ecologically sustainable development, see Table 5). The work on issues was carried out exclusively within the network, relying on the expertise contributed through the members from the various ministries.

Before choosing the actual indicators the network asked various interest groups for feedback on the issues included in the framework. These included the FNCSD and two of its subcommittees. A small working seminar was organised for interest groups and other experts were consulted as well.

The latter part of 1998 was spent on identifying possible indicators and presenting them at the network meetings. The civil servants were supported by experts when needed. The experts were given the indicator proposals for certain issues in advance and they could then present their critique and comments at the meetings and make suggestions for improvements. The number of experts at the actual meetings was small, usually most indicators were already prepared together with the ex-

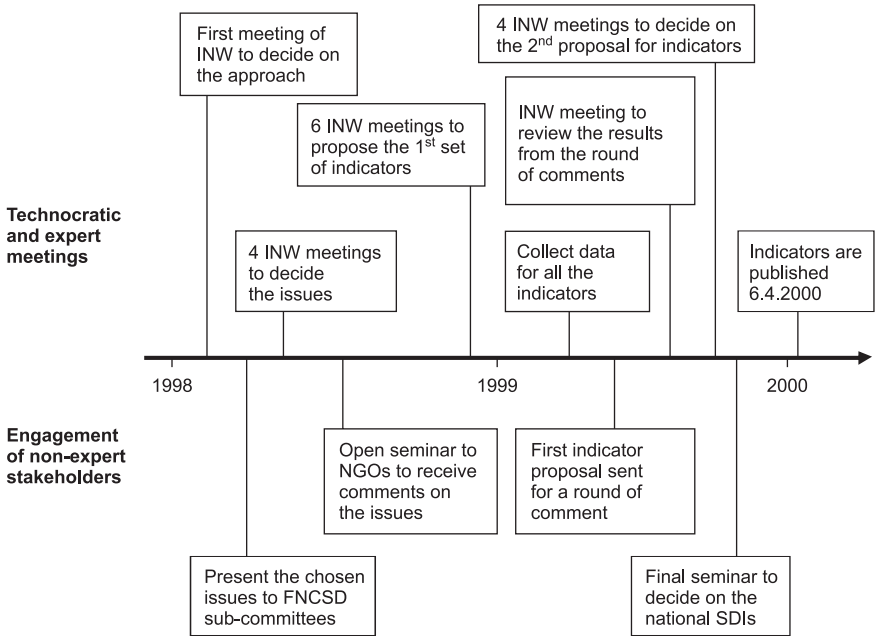

Figure 2. *The Finnish national indicator process in 1998-2000. INW= indicator network. Modified from Article III.*

Table 3. Distribution of stakeholders providing written comments on the proposed set of national DIs in 1999.

Stakeholder according to the major field of expertise	Stakeholder comments according to the three dimensions of sustainable development			
	Economy	Environment	Socio-cultural	Total
Business	–	1	–	1
Ministries and municipal authorities	3	9	3	15
R&D and education	–	3	4	7
NGOs	1	2	4	7
Total	4	15	11	30

perts and their role was more to explain the choices to the members of the network.

The first proposal with 99 indicators presented by graphs (data was already collected) was ready for comments after one year. The proposal was circulated to the members of the FNCSD. A total of 30 written comments was received in two months. Table 3 presents the distribution of the groups that sent comments. It shows that most of the comments came from the environmental administration which reflects that sustainable development was indeed a "green issue".

The review of the comments led to a new proposal of the indicators. Towards the end of 1999, the FNCSD organised a seminar attended by about 60 people. As a result of the seminar, the second proposal of the indicators was accepted for publication. After the indicators had been agreed on, time was taken to update the data and write the interpretations. Interpretations for each indicator included a description of the issue, recent trends and existing targets and goals for the issue. The final compilation of data, drawing of the graphs and writing the texts took three months and the publication was ready in April 2000. The final set included 83 indicators divided into 20 issues in 3 dimensions (Table 4).

The indicators were available in the Internet concurrently. The Internet pages followed the same logic as the book: one page per indicator. To facilitate the use, the indicators that were connected through a phenomenon were linked to each other. Furthermore, the indicators could be accessed from a table that provided direct links to indicators.

Although this dissertation is mainly concerned with the results and success of the process described above, the later stages are recited briefly. The first revision of the SDIs took place in 2004 and led to a complete revision of the framework by employing a modified GEAR-SD framework developed by the European Environment Agency (Stanners *et al.,* 2007). The purpose of the GEAR-SD framework is to make the concept of sustainable development more tangible by organising the indicators according to over-arching sustainable development issues rather than traditional themes. For example, R&D expenditure, environment-related taxes, use of renewable energy sources, and the area of nature reserves were included under the theme "Adapting to the future" which in itself communicates sustainable development values. Although the framework was renewed, the original assignment from the Ministry of the Environment was only to update the existing set and hence the new product was not actively disseminated or published. Only the Internet pages were updated for all three language versions.

The national sustainable development strategy was revised in 2005-06 through a process that used existing indicators in identifying issues and key challenges (Prime Minister's Office, 2006). The process also led to a complete revision of the indicators. The resulting framework for the indicators was identical to the national strategy and hence more policy relevant for the work of the FNCSD than the previous sets. The set is to be used biannually in assessing sustainable development in Finland. In addition to the national indicator set, theme leaflets were produced during 2004-06 specifically to provide background information to the meetings of the FNCSD. This practise was continued in the new FNCSD formed in 2007. Table 5 summarises the major indica-

Table 4. Finland's SDIs 2000. (Rosenström and Palosaari, 2000).

Environmental issues	**Economic issues**	**Socio-cultural issues**
Climate change Greenhouse gas emissions Finland's mean temperatures Ice-breaking date of the River Tornio *Ozone layer depletion* Importation of ozone layer-depleting substances Stratospheric ozone above Finland *Acidification* Acidifying emissions Exceeding the critical sulphur load *Eutrophication* Nutrient discharges Nutrient balance Water quality Algae levels *Biodiversity* Numbers of threatened species Population trends in farmland and forest birds Numbers of grey seals Protected areas Implementation of nature conservation programmes *Toxic contamination* Emissions of volatile organic compounds Mercury emissions Pesticide sales PCB levels in Baltic herring Dioxin levels in breast milk	*Economic development* Gross Domestic Product Current account surplus State financial assets and liabilities Inflation *Environmental policy instruments* Environmental taxes and fees Environmental protection expenditure Taxes per CO_2 content of fuels EMAS registrations and environmental certificates *Natural resources* Forest age structure Annual forest increment and drain Cultivated and fallow land Reindeer numbers Commercial fisheries Fish farm production *Community structure and transport* Urban land area and the urban population Urban population densities Average commuting distance Car numbers and use Trends in car and public transport use Air quality in cities *Production and consumption* Total energy consumption Energy use Total consumption of natural resources Water consumption Holiday air travel Household consumer spending Generation of waste Waste deposited in landfills Recovery of packaging materials	*Demographic developments* Annual population changes Dependency ratio Life expectancy Internal migration *Lifestyles and illnesses* Daily smokers Obesity Alcohol and drug related illnesses HIV infections Suicides *The workforce* Unemployment Long-term unemployment Occupational accidents Retirement age and disability pensions Social problems and equality issues Incidence of poverty Income level differences The homeless Women's earnings relative to men's Relocated children Violent crime *Education, research and participation* Education levels Research and development expenditure Young people neither studying nor working Voter turnout *Access to information* Newspaper circulations Library loans Internet users *Cultural heritage* Meadows and pastures Visits to museums Age structure of buildings *Ethnic minorities* Classes taught in Saame Immigrant unemployment rate *Development co-operation* Official development aid Development aid to regions near Finland

Table 5. Important milestones in the history of national SDIs in Finland.

The product	Framework/ structure
Trends in the Finnish Environment. Indicators for the 1997 OECD Environmental Performance Review of Finland, 1996	Climate change; Ozone layer depletion; Eutrophication; Acidification; Toxic contamination; Urban environmental quality; Biodiversity; Waste; Water resources; Fish resources; Forest sector
Results from testing CSD indicators 1997	Agenda 21 chapters
National strategy for sustainable development. Council of state Decision-in-Principle on the promotion of ecological sustainability 1998	Finland's role in international cooperation; Consumption, production and products; Energy sector; Regional structure, communities and transport; Countryside and use of renewable resources; Research and education
Signs of Sustainability 2000	Climate change; Ozone layer depletion; Acidification; Eutrophication; Biodiversity; Toxic contamination; Economic development; Environmental policy instruments; Natural resources; Community structure and transport; Production and consumption; Demographic developments; Lifestyles and illnesses; The workforce; Social problems and equality issues; Education; Research and participation; Access to information; Cultural heritage; Ethnic minorities; Development co-operation
Restructured sustainable development indicators 2004	Adapting to the future; Distributional equality; Eco-efficiency and community structure; Environmental pressures; Human health and well-being; Inter-generational equity; Preserving natural resources; Global responsibility
Indicator Leaflets 2004-	Finland and long-term climate goals; Finland on the Move; Corporate responsibility; Ecological tax-reform; Decreasing eutrophication of the Baltic Sea; Sustainable welfare from biologically diverse forests; For nature - for humankind: biological diversity trends in Finland; Sustainable regional development; Education; Government policy to aid developing countries
National strategy for sustainable development and indicators 2006	The strengths and challenges of sustainable development in Finland; Balance between the use and protection of natural resources; Sustainable communities in a sustainable regional structure; Citizens' health and well-being; The economy as a means of ensuring sustainable development; Finland as a global actor and bearer of responsibility; Supporting sustainable choices

tor projects that have shaped or resulted from the national SDI work.

2.2.2 The process of developing socio-cultural indicators supporting the measurement of eco-efficiency in the Kymenlaakso Region

The goal of the Life Environment funded ECOREG Project (Article II) was to demonstrate the concept of eco-efficiency and its evaluation on a regional scale, using Kymenlaakso region as an example (Figure 3). The long-term goal was the desired transference of the evaluation tools to other regions of the European Union.

Eco-efficiency emerged in the 1990s as a "business link to sustainable development" (Lehni, 1998; WBCSD, 2000). A broader definition of the OECD (1998) presents eco-efficiency as the efficiency with which ecological resources are used to meet human needs. The role of eco-efficiency in sustainable development is to serve as one of the means to achieve it. Hence the concept can be expressed as follows: Sustainable development aims at increasing well-being – *e.g.* health, employment, quality of the environment – in an eco-efficient and just manner. The central concern is how to ensure long-term development within the carrying capacity of the ecosystem.

Hence the regional indicator set does not directly measure sustainable development but supports the measurement of eco-efficiency. However, the resemblance to SDIs is so great, that it can be compared to the national SDI process. The whole set of ECOREG Project indicators includes also environmental and economic indicators, but they were both developed by different methods and by different researchers. Hence inclusion of the two other indicator

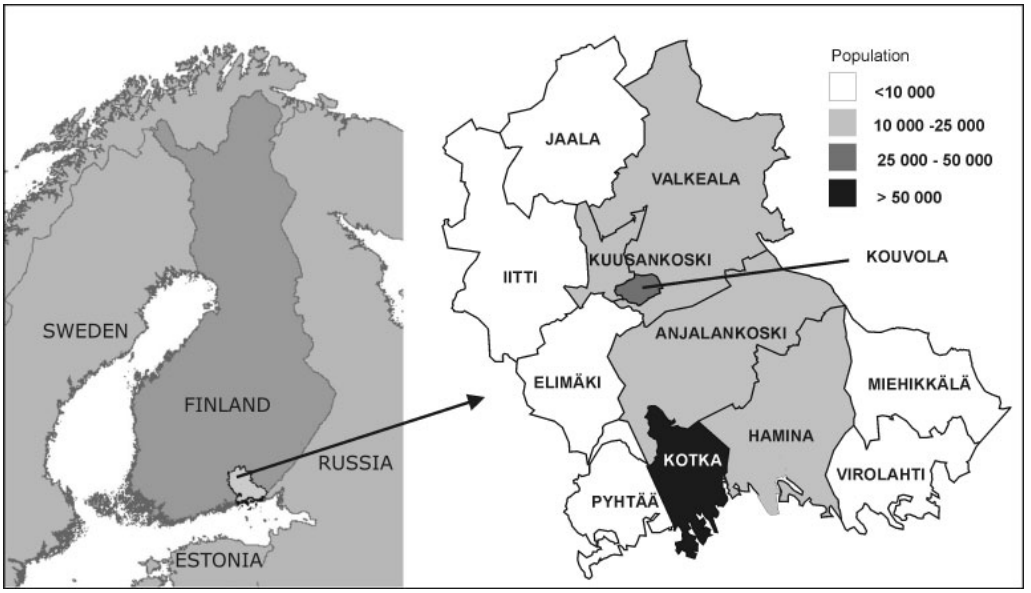

Figure 3. *The location of the Kymenlaakso region. (Article II.)*

sub-sets would have required two more sets to analyse since the methods and even presentation of the indicators differed markedly.

The ECOREG Project was carried out by the Finnish Environment Institute (coordinator), the Thule Institute at the University of Oulu, and by two important bodies located in the Kymenlaakso region; the Southeast Finland Regional Environment Centre and the Regional Council of Kymenlaakso.

In addition, the ECOREG Project had a steering group comprising decision-makers and experts from the Kymenlaakso region. Ideas and concepts were discussed in this forum and decisions on how to continue the work were taken there. The parties represented in the steering group were as follows:

- Regional Council of Kymenlaakso (Executive Director, chairperson)
- Southeast Finland Regional Environment Centre (Director, vice-chair)
- Kymenlaakso Regional Organisation of the Finnish Association for Nature Conservation
- LCA Engineering Oy (as SME)
- Finnish Environment Institute
- City of Kouvola (Director of Social Affairs)
- Port of Kotka Ltd
- Employment and Economic Development Centre Southeastern Finland
- Stora Enso (one of the large industrial companies with production in Kymenlaakso)

Significant inputs also came from local actors participating in the three workshops organised (Table 6.) The table below shows that participants with a background in socio-cultural issues was very small which could have potentially influenced the quality of the process negatively. The distribution of the participants reflects the mainstream definition of eco-efficiency.

The ECOREG Project was launched in autumn 2002 (Figure 4). Work on the socio-cultural indicators began in late spring 2003 with the identification of relevant themes for the framework that the indicators would be embedded in. The work was carried out in SYKE by two researchers.

The first ECOREG workshop in Kouvola was the most important event for the socio-cultural indicator task. In the workshop, the participants were asked to determine the most

Table 6. The number of decision-makers and experts of Kymenlaakso and their major speciality field. Average of three workshops.

Stakeholder according to the major field of expertise	Stakeholder comments according to the three dimensions of sustainable development			
	Economy	Environment	Socio-cultural	Total
Industry [a]	5	4	–	9
Regional and municipal authorities	5	11	2	18
R&D and education [b]	2	11	2	15
NGOs, media	1	1	–	2
Total	13	27	4	44

important socio-cultural themes to be monitored and further valuated their importance.

The results were used to form the final framework. The final chosen issues were not identical to what the participants indicated, because the issues were further discussed with local researchers on welfare and their reports were studied as well. The reason is that problems such as unemployment were not considered important by the participants and we felt that some negative issues needed attention as well. Perhaps the participants wanted to bring forth only positive issues as the facilitators were all outsiders to the region.

The framework and the preliminary indicators were presented in the second workshop held in Kotka. The proposal was well received and the work continued on finalising the indicators, collecting the data and finally publishing a report with the indicators in May 2004.

The outcome was a list of 21 indicators divided into eight themes (Table 7). The themes were further divided into those describing the state (population change, employment, social exclusion, and health) and the attractiveness and potential of the region (safety, education, culture, and local identity).

In addition to the indicator graphs, the report provided an assessment of the socio-cultural state in comparison to the whole country and of the development of the Kymenlaakso region during the period 1995-2002 (or the closest year available).

The latest updates of the indicators (Toikka (ed.), 2005 and 2006) excluded a poverty rate

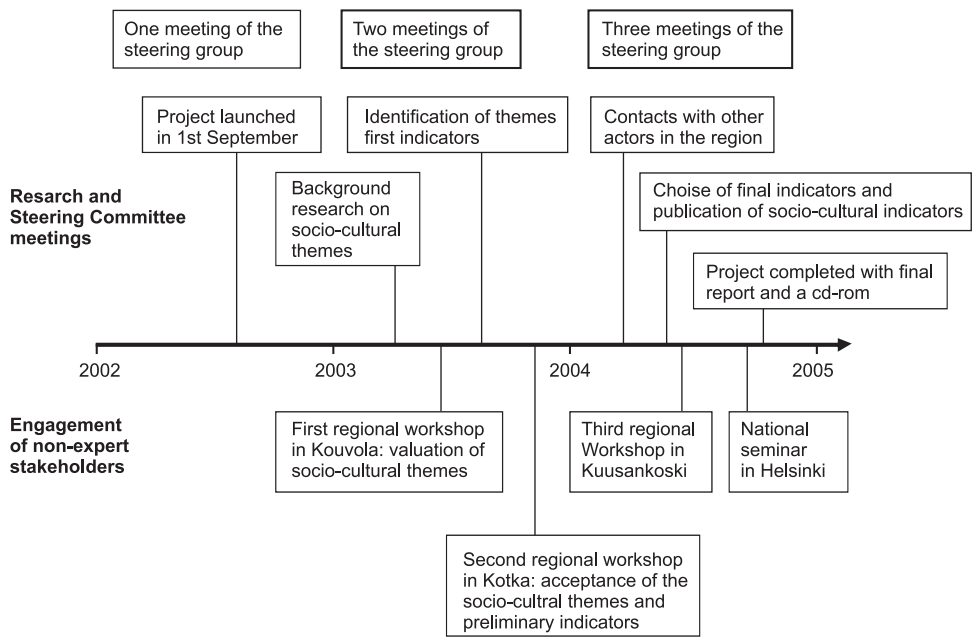

Figure 4. *The ECOREG Project process for the socio-cultural indicators.*

Table 7. Selected socio-cultural indicators (Rosenström and Mickwitz, 2004). (Article II)

Theme	Indicator
Population change	Migration in the region Population change Population dependent on those employed Population growth through immigration
Employment	Unemployment Job structure
Social exclusion	Social assistance to the less-advantaged People falling outside the social safety net Poverty
Health	Life expectancy Premature deaths
Safety	Traffic safety Violent crime Traffic accidents
Education	Level of education Research and development
Culture	Resources for educational and cultural provision Use of public libraries
Local identity	Participation in decision-making Tourist visits Newspaper circulation

indicator, changed the framework into calling the first 15 indicators social and the last five cultural. Furthermore the names of the indicators were slightly modified.

2.3 Evidence of indicator use

This section presents methods used to answer the question of how indicators have been used and what influences use. The first part presents 38 interviews carried with high-level decision-makers and their assistants in Finland. The second part describes how indirect sources were studied to gain information on indicator use. The sources were use statistics of the national indicators' Internet site, references to the national indicator publication and media coverage of both indicator sets. They also reflect on the accessibility of the national SDI set.

2.3.1 Interviews

To assess the need and willingness of Finnish high-level decision-makers to use indicators a number of theme interviews, altogether 38, were carried out in 2000-2002 (Articles IV and V). The list of the interviewees is appended to Annex 2.

The interviews were semi-structured by thematic guides. The questions were based on four different themes and posed in random order within one theme in order to sustain the interview as a systematic discussion (for the methodology, see *e.g.* Taylor and Bodgan, 1984; Silverman, 2001). The aim was to create a more relaxed atmosphere where the politicians would be more frank. The interviewees had differing backgrounds and the discussions often took unexpected turns (for example one interviewee spent considerable time lecturing on his own values, because he claimed that he would not be able to contribute much to the research).

The themes were chosen to answer a research question on the conditions on which decision-makers would be willing to use SDIs. At the time that was the aim of my research and I have refined it since. The second objective was to gain concrete feedback on how to improve the existing set of indicators. The role of information society was added to collect material for another project called E-knowledge (Article IV). Besides the purpose of gaining information through the interviews, there was a secondary motive of distributing the indicator publication.

The themes included 1) the familiarity and use of the "Signs of Sustainability"-publication, 2) criteria and uses for indicators in general, 3) the use of environmental information, and 4) the dimensions of sustainable development in policy-making and the information society. The interviews lasted from half an hour to an hour. All themes were intended to support my research with the exception of the last question on information society. The questions are presented in Annex 3.

The interviewees were chosen from three different groups: Members of the Finnish or the European Parliament (politicians), their assistants, and senior civil servants working closely with the politicians (in the parliament or as Permanent Secretaries[1] of Ministries). The first group provided first hand information

[1] The highest civil servant position in a Finnish Ministry.

on politicians' use of indicators and information in general, whereas the latter groups elaborated on both their own information sources and also on how they perceived the politicians' use of indicators and information. With reference to the policy cycle presented in Section 2.1.4 (Figure 1), the role of the assistants is to facilitate in problem identification, whereas the civil servants take the responsibility of policy formulation, implementation and evaluation.

The choice of interviewees was made by determining the main users from the group "politicians" (defined as the main users in the "Signs of Sustainability"-indicator publication) (Rosenström and Palosaari, 2000). The members of the two parliamentary committees were foreseen to be the most likely users of the indicators. Assistants and the Head of the Parliament Information Centre were identified as important sources of information during the first interviews. After the first set of interviews in the Parliament, additional information was deemed necessary on the way information affected high-level decision-making. The Permanent Secretaries of Ministries were considered to be able to give professional answers based on their long experience in the field. However, the interviews with the Permanent Secretaries did not yield information on the use of the indicator set in question. Instead, the discussion revolved around their own sector indicators and on the issue of information use in politics.

The two parliamentary committees were the Environment Committee and the Committee for the Future. The interviews were conducted in two parts: first the indicator work was presented to the committee, and then those present were interviewed. The first presentation was given to the Environment Committee before a committee session with only seven out of eighteen politicians present who were later interviewed in addition to the Committee Counsel. The Committee for the Future allowed the presentation to be given during a committee session. Twelve MPs were present, and all were interviewed later.

A Finnish Member of the European Parliament (MEP) and the Minister for the Environment both of the Green Party were also interviewed because they had been provided with the indicator set when it was launched.

In 2002 Finland had 13 ministries responsible for strategic and financial planning, law preparation, research and development, monitoring, international affairs and government owned property under each specific sector. The Ministries also govern agencies, research institutes, and companies that belong to their respective sectors. Each Ministry is led by a Minister, closely supported by a Permanent Secretary. The Permanent Secretary is then responsible for the development of the ministry, the strategic and financial plan, and its monitoring, likewise duties designated by the minister concerned. Ten Permanent Secretaries agreed to participate.

Each member of the Finnish parliament may employ an assistant, whose duties vary from secretarial work to real information provision. All five assistants interviewed gathered information for their employers and thus compiled information to be used directly by the politicians.

The supporting Parliamentary staff and the MEP and Minister for the Environment were asked the same questions as the parliamentarians, but for the Permanent Secretaries the questions were slightly modified to discuss how politicians use information. The answers were transcribed and fed into Nvivo programme for analysis. In the analysis the answers were first coded according to the questions and further grouped according to the two main themes which proved most interesting, namely how the indicators can be used in politicians' decision-making and what are the main criteria for useful indicators.

2.3.2 Internet downloads, media, citations

Morrone and Hawley (1998) stated that "availability is different from accessibility and just because the information is 'out there' does not mean that the public can access it". Both indicator processes presented in this dissertation made an effort to enhance the accessibility of the indicators to the wider public by the Internet and press releases. Furthermore, the

ECOREG Project also produced a cd-rom to disseminate the results to the wider audience.

The success or extent of the dissemination is explored through download statistics, media coverage and Internet hits with a search engine. The results provide indirect information on the users, uses, and user preferences of the indicators.

The download statistics were used to obtain information on the amount of use and on which indicators were mostly accessed. The analysis was done in the time period between April 2000 and January 2003 (Article IV).

Another approach to generate information about use is to employ a search engine to investigate the references made in the literature to the indicator publications. The national indicators were searched in December 2006 using both the names of the authors and the name of the indicator publication in Finnish ("Kestävyyden Mitta"). Using the English name "Signs of Sustainability" mostly yielded other works. The ECOREG Project publication was not searched partly because the project produced several reports and their differentiation could have been difficult and partly because I thought the project had ended too recently.

Newspapers and electronic media are important sources of information for both politicians and the public. The interviewees highlighted the role of media repeatedly. Section 3.3 presents the extent of media coverage achieved during the projects. Besides media interest in general, the results also indicate the types of issues that were raised in the newspaper articles. Furthermore, the indicator columns in *Helsingin Sanomat* provided information on the individual indicators that the media find interesting.

3 Results

This chapter presents the results of my search to find out who has used and how they have used the indicator sets presented in the previous chapter. The interviews also provide answers to questions on what influences use (*i.e.* user criteria for useful indicators) and why the indicators have not been used as much as expected.

3.1 Interviews with the decision-makers

Familiarity and use of the "Signs of Sustainability"-publication

The main purpose of this theme was to determine whether the interviewees had used the national indicators and whether they found them useful. Nobody had directly used the publication but most reported to have browsed through it. Many added that if I was to question about the context, they could not answer. Only two assistants and one parliamentarian claimed to have never heard of the work previously. The parliamentarian had, however, attended my presentation according to the minutes of the Committee session.

The two main reasons for their acquaintance with the publication were that I had presented it at the Committee session and that they had prepared themselves for the interview. Three politicians had heard about the indicators prior to my presentation: one because he was involved in the process through being a member in the FNCSD and two through the press release. One of the two had read the Internet version and the second one had asked her assistant to prepare a written question to the government. The answers strongly support the impact of direct marketing. A presentation that uses visual tools was regarded highly by politicians that are daily presented with a plethora of information. A long-term prominent politician considered my presentation in the Parliamentary Committee useful and said "You were really good there. Everyone said so. That's exactly how one should come and talk to us". (25.4.2001)

The general attitude among the interviewees was that the indicator publication is good and informative. Criticism was given to the use of limited number of colours and generally low quality of the graphs. The opinion on the number of the indicators varied among the interviewees: some thought it nice to browse through a comprehensive set of indicators and felt that having only a limited number of indicators would restrict them too much. Nearly all of the Permanent Secretaries, however,

would have preferred a smaller number of indicators. They also felt that sustainable development did not concern their ministry and they assessed the content from the point of view of their sector. The minister of the Environment on the other hand felt that the indicator selection did not answer her needs. She would have preferred indexes that show together energy consumption, GDP and total material requirements.

The overall result was that despite efforts to disseminate the indicator publication through a press release and the Internet, the use had not been wide. The presentation in the Committee sessions and the interviews increased awareness but not use.

Indicator criteria and uses for indicators in general

The purpose of this theme was to gather information on potential indicator use in the decision-making processes. One aspect was the factors that determine the usefulness of indicators. Four features emerged above the others: reliability, simplicity, longer time trends, and comparability. Furthermore, people working with politicians underlined the need for data that is relevant and timely. The answers were used in selecting a suitable criteria for the framework in Section 2.1.1.

Reliability was deemed important in the sense that the data is retrieved from reliable sources so that the politicians can trust the indicators in their decisions or present the graphs in their speeches. For example, Statistics Finland was considered a more reliable data provider than non-governmental organizations. The scientific validity of the data was also connected to reliability.

Reliability was also seen as a question of neutrality, SDIs should not be chosen to serve a certain single-minded purpose (*e.g.* nature conservation or nuclear power). The indicators were seen as tools with multiple options. The decision-makers preferred a multi-stakeholder approach when developing the indicators to ensure a wider applicability of the end result.

The politicians also felt that facts and figures make their speeches and presentations more credible, possibly suggesting that politicians consider fact-based products more trustworthy, and the kind of material scientists should provide them with. Quoting a politician "one gets a long way here [the Parliament] with facts. The one who can present facts is taken seriously here". (19.5.2001)

All the politicians and their assistants emphasised their constant lack of time and information overflow, hence the need for simple, concise information. Another reason for easily understandable indicators is that politicians have very different educational backgrounds ranging from PhD to basic school and their prior knowledge of issues may be limited.

Clear presentation of the indicators is related to simplicity. The politicians want to be able to grasp the meaning of the indicator quickly, as their workload is immense. The indicators should be practical and user-friendly. Indicators like the "ice-breaking date of the River Tornio" used to illustrate climate change or bad air quality in cities are preferred as they touch the everyday lives of the public and the variables (number of days, a date) are familiar to people.

The need for longer time series was important to all politicians. Long time series enable the decision-makers to see at a glance how different issues are developing, even if the implications of the actual parameters (tonnes of something, currencies) are not understood. For environmental policy-making the relevant question will always be "Is a certain change in the environment good or bad? And how good or how bad?" More plainly, a politician said that "figures from just one year or short monitoring periods are worthless" (4.5.2001). Furthermore, "One can't draw conclusions unless we have long time series that show that we are going in the wrong direction and it is time to react", said one of the Permanent Secretaries (5.3.2002).

The fourth clear preference expressed by numerous politicians was local and international comparison. Most politicians wanted to put the indicators into a context, *i.e.* the magnitude of the indicator is more easily comprehended when it is compared to the global situation. Besides international comparison, regional

comparison in Finland was also deemed important.

The development into a more unified Europe requires that politicians know more about other countries and indicators were considered a useful tool in that: one learns quickly what has happened and where we stand. Furthermore, there are issues with trans-boundary effects and hence international data must be added.

Local comparison provides more detailed information. A leftist politician pointed out that national averages hide local problems. For example, national suicide rates may show as unchanged trend while a dramatic increase may take place in certain areas if there is decrease elsewhere. The need to breakdown variables by sex, age or region is obvious.

Two criteria were considered important only by civil servants, who are in some sense also information providers. The first was relevance: "Currently researchers do not provide anything useful to the decision-makers or the public" (21.2.2002) was claimed by one of the Permanent Secretaries. Indeed, indicators that do no touch current issues are likely to become background information.

The need for timely and updated data was not explicitly expressed by the politicians, but according to the head of the parliamentary information centre, availability of updates is crucial to the politicians. The Parliamentary Information Centre receives over 5,000 requests annually. The head of it said that paper publications are tricky because "If I give this [the indicator publication] to my customer and he sees statistics from 1999, he will immediately ask for something more recent. And we start digging… an Internet service that is regularly updated would be of extreme importance to us". (28.5.2001)

The interviews with parliamentarians and their assistants indicated many potential uses for indicators (Table 8), but none could recall a specific use that actually took place. The most likely use was for speeches and as background material to support their existing views which is legitimising use.

The Permanent Secretaries assured that politicians can be influenced by facts. This can be illustrated by the following quote "Today all politicians base their decisions on facts. I think I remember an anecdote that Johannes Virolainen (a prominent long-term politician) said in the 1970s "don't bother me with

Table 8. Main uses of indicators by indicator use typology. Source: Article V.

Interviewee	Research use types		
	Instrumental use	Conceptual use	Legitimizing use
Member of Parliament or high-level politician	• assessment of wider issues • comparison • decision-making • evaluate different strategies • checklist • preparation of law • committee work • local politics	• improve general knowledge of the state of the environment • how decisions affect the environment • help tool • get the big picture • learn about useful issues • to spread information • thinking tool • easily digestible information • provide basic facts	• speech • show trends to others in preparation of motions, views • to justify own views • ready-made slides • to show what needs to be done • support own views • presentation
Political assistant	• decision-making • comparison	• exact information on issues	• speech • reference material • background information • MP wants to draw attention to certain issues
Senior civil servant (incl. Permanent Secretaries)	• after the economic recession in the early 1990s led to the use of facts • ministers and the government must use facts, politics does not play a major role	• interactive communication with an expert is good • SDIs are best to enlighten people and increase their awareness	• justify our policies

facts", but that is not how things are run today". (27.2.2002). However, basing decisions on facts does not necessarily imply instrumental use of all facts such as those provided by indicators. Instead the users can be highly selective and then the use is legitimising.

The use of environmental information

Originally the main purpose of this theme was to provide feedback to those responsible for coordinating state of the environment reporting in the Environmental Administration. However, for the purpose of my dissertation, the theme serves to elaborate on where the interviewees search for information and how indicators match that.

The interviews suggest that educational background and political experience affect the way the parliamentarians treated indicators and information in general (Table 9). The information can be used in further development of SDI products and it also sheds light on the diversity needed to market the indicators, i.*e.* some politicians are more likely to find the information from the Internet whereas others prefer personal consultation.

The parliamentarians could be divided roughly into four groups: I Academic degree and first term parliamentarian, II non-academic and first term in the parliament, III non-academic and more than one term in the parliament, and IV academic degree and more than one term in the parliament. Assistants and Permanent Secretaries were not included in this characterisation, because both groups were more homogeneous.

There were some exceptions, but it could be seen that the young politicians were gathering information mainly from the Internet and sought new information actively. The second group with less political experience and lower-level education came generally from the countryside and seemed more fixed in their opinions. They could not clearly name information sources and claimed that they were too many and in case of environmental information, the information was unreliable. One parliamentarian from that group said that "I have been voted with certain views and opinions and I cannot change them. I would betray my electorates" (6.6.2001). The third group that could be identified consisted of people with considerable political experience and usually a practical profession such as a nurse. Their main source of information was experts and civil servants. The last group of academic long-term politicians used mainly reports and even scientific journals to find information. They said to have many fixed views on matters but also said that they were open for new information.

The dimensions of sustainable development in policy-making

The interviewees were asked to reflect on the importance of the different dimensions of sustainable development. The answers varied to a large extent as can be expected with the

Table 9. The types of information sources that the parliamentarians report to use

Educational background	**Length of terms in the parliament**	
	First term parliamentarian	More than one term in the parliament
Academic	**I** • Internet • Google • Media • Information centre	**IV** • Reports, scientific journals • Magazines, newspapers • Ministries • Information centre
Non-academic	**II** • Newspapers • Parliamentary committee • Internet • Library • "Too much information"	**III** • Parliamentary committee • Experts • Information services • "I will call ministries"

concept, but environmental aspects emerged strongly. In fact, many politicians still saw sustainable development as being more of a green term, rather than encompassing social and economic dimensions as well. One of the MPs considered that to be a clear problem: "Sustainable development is seen as an environmental question, and that is a problem. When we make decisions, environmental impacts are rarely mentioned. Yes, sustainable development is not seen as a large issue… …it's a handy term used in many occasions, but when it comes to decision-making we just decide whether we have enough money… " (25.4.2001). Moreover, many of the Permanent Secretaries felt that the sustainable development policy domain belongs to Ministry of the Environment and the indicators should be used as their tools. This supports that the wider use of SDIs suffers from prejudice attitudes that place them in the environmental sector (Section 2.2.1. on who commented the national SDIs).

In order to further explore how the interviewees regarded the term sustainable development, they were asked to name the most important issues that should be monitored in the future. The question was considered difficult and many could not think of any answers. The result reflects the ubiquity of the concept of sustainable development that none of the interviewees were specialists in. Perhaps today, 6-7 years after the interviews more would name issues that have received attention in the media such as climate change and the ageing society as pressing sustainable development issues. This finding means that dissemination of SDIs is extremely challenging as the target user group does consider it a policy priority. Furthermore, the principle on high political relevance is emphasised (Indicator framework in Table 2).

3.2 Internet downloads of the national indicators 2000-2003

The number of downloads from all pages of the three language versions of "Signs of Sustainability" in the study period was approximately 260,000. The Finnish language version was most popular with 62% of all downloads. The English version had 28% and the Swedish version 10% of all downloads. During the same time period, the number of downloads for the whole Finnish Environmental administration was 12,611,746 which means that the indicator pages received roughly 2% of the visits. The total number of the Internet-pages of the Finnish Environment Institute is not available.

After the initial peak of visits during the launch, the number of visits increased gradually although summertime showed a slight decrease. This suggests that most visits were by people who needed the information at work, not the public concerned for the environment. Despite the apparent increase in indicator awareness, a general increase in the use of the Internet has to be taken into account.

The popularity of different indicators can also be determined (Table 10). The most popular indicators correlate with best known indicators such as Gross Domestic Product (3438 visits over the study period) and with topics that are in the headlines often, *e.g.* greenhouse gas emissions. The headline explanation is probably valid also for the seven social indicators in the most popular list.

Half of the least visited indicators were from the cultural side of the socio-cultural dimension. The reason could be that people visiting the website of the Environmental Administration were more interested in indicators related to the environment. In other words, a person seeking for environmental indicators is more likely to follow a search engine link to Environmental Administration's site that someone looking for data related for the least popular indicators. A further explanation could be that the internal links between the indicators did not link the socio-cultural indicators to the other two dimensions, although environmental and economic indicators were widely interlinked. Most likely though, these indicators were simply not very policy relevant.

The least used indicators were library loans and fish farming. These indicators can be suspected to be rather dull and the latter one also quite specific and hard to understand because its name is difficult in Finnish (Ruokakalan

tuotanto= "Production of foodfish"). Furthermore the naming was rather complicated due to insistence of the experts that contributed to the choice and presentation of the indicators. A similar example of a difficult naming was the indicator about trend in bird species number that had to be named "The development of some typical bird species of agricultural landscape" (in Finnish "Maatalousympäristön eräiden tyyppilintujen kantojen kehitys").

The visitor's backgrounds also reveal something of the uses. Most Finnish hits came from the private sector (3790) and universities (1655), which suggests that the indicators were used for other projects (researchers, consultants) on indicators or the issues measured in the book. Secondary level schools indicate the use of indicators as study material or that the students were seeking information on either indicators, sustainable development or on specific issues. This points clearly in the direction of conceptual use.

Some limitations related to these statistics must, however, be taken into consideration. A large number of visits may also indicate a web-portal from which it is difficult to find the information needed. The information about downloads does not reliably describe who visited the page. The visitor may be a person or a search engine and the visit may be intentional or unintentional. More importantly, the statistics do not show whether the visitor familiarised him/herself with the content of the webpage or not. Information on the time spent on a certain page and repetitive downloads is not available here. Some distortion is also caused by downloads from proxy-servers. Downloads from the computers of the Finnish Environmental Administration are not included here, although some of these downloads could reflect real use of the indicators.

To summarize, the use of the Internet site was not particularly large. The main reason was that the Internet site was not actively marketed. In order to find the pages, one had to really seek for SDIs. The predominance of GDP as the most popular indicator further suggests that people found the page mainly through search engines as it is not an obvious sustainable development parameter.

It is also important to note that the possibilities of the Internet were not fully exploited. Since the Ministry of the Environment could not afford full-colour indicator publication, the Internet pages could have done this instead of using the same graphs from the publication. One of the strengths the site had was that each indicator had its own page and navigation along the pages was easy. A recent study at the Prime Minister's Office strongly indicates that today the Internet is the mostly preferred source of information for politicians (Rosenström, 2008).

The importance of specific criteria on emphasis on the availability as suitable products and designing the indicators for users is highlighted by these findings (Table 2).

Table 10. The top ten most and least visited indicators of the national SDI set according to downloads between April 2000 and January 2003. Source: Välimäki, 2003.

Most popular	Visits	Least Popular	Visits
Gross Domestic Product	3438	Fish farm production	119
Suicides	2244	Library loans	189
Inflation	2130	Commercial fisheries	253
Unemployment	1981	Development aid to regions near Finland	301
Greenhouse gas emissions	1824	Implementation of nature conservation programmes	365
Acidifying emissions	1791	Visits to museums	411
Annual population changes	1728	Research and development expenditure	470
HIV infections	1657	Pesticide sales	514
Nutrient discharges	1639	Newspaper circulations	518
Income level differences	1553	PCB levels in Baltic herring	527

3.3 Media coverage

The publication of the national SDIs was reported in seven newspapers across the nation (Table 11). Most reacted very positively to the indicators, although *Vihreä Lanka* (linked to the Green Party) and *Maaseudun Tulevaisuus* (linked to the Centre Party) took a more critical attitude on the relevance and sufficiency of the indicators. The outcome is good, considering that the indicators did not bring breaking news on any issues. In other words, the only news was that the indicators had been developed. The indicator publication did not even include an assessment of sustainable development that could have raised some controversy.

The biggest national newspaper, *Helsingin Sanomat*, did not attend the press conference nor wrote about it. Nevertheless, a direct contact led to a series of indicators in the Sunday edition during the following year. This gave the indicators extremely wide visibility which had also been noted by some of the politicians interviewed.

The media provided insights to the selection of the indicators. *Helsingin Sanomat* presented indicators that citizens can relate with. The interpretations were written by the journalists and often included a real person, for example with life expectancy a mother with a newborn was interviewed. Furthermore, the newspaper invented some new indicators such as the number of vegetarians that eat at Helsinki University canteens and calls to help phones. All these are close to everyday lives of people and something that concern them. This points to the importance of the specific criteria on the

Table 11. Media coverage of the national indicators as they were published on 6.4.2000. * = indicator developed by the newspaper

Newspaper	Headline	Contents
Huvudstadsbladet	Better and worse environment in Finland	Indicators have been developed and published, examples of different trends
Ekobisnes	Sustainable development Indicators	Acclaim that indicators have been published, concern for the social pillar indicators, need to compare the different pillars more
Lapin Kansa	Domestic sustainable development can be measured with over 80 variables	Indicators have been developed and published, there is an aim to further develop headline indicators to really influence politics, examples of few trends, mention of international indicator activities
Maaseudun Tulevaisuus	National thermometer to help monitor sustainable development – the future of rural areas left open	Indicators published, indicators for agriculture and rural areas not sufficient. Indicators will be renewed. Ice-breaking date of the River Tornio.
Vihreä Lanka	Measurement that embraces the world	Presentation of the publication, analysis of what it really measures, expert comments on the role of the indicators.
Ympäristö	Measurement tools for Finland's sustainable development	Presentation of the indicators, trends and the whole list
Kaleva	Measuring tools for sustainable development	Presentation of the work, examples of certain indicators, special focus on Ice-breaking date of the River Tornio
Helsingin Sanomat	Sustainable development fascinates listed companies	• A series of 14 indicators: • Household consumer spending • Life expectancy • Numbers of grey seals • Library loans • Nature conservation areas • Car numbers and use • Women's earnings relative to men's • Water consumption in rented apartments* • Number of vegetarians in university canteens* • Import of Norwegian salmon* • Mercury emissions • Calls to help phones* • Stored nuclear power plant waste* • GDP

degree of awareness and design of indicators for users (Table 2).

The ECOREG Project submitted a press release at the launch of the project and in connection with each workshop including the final seminar (Table 12). The first press release was directed to the whole nation, but later on the focus was on local newspapers, who seemed more interested in the project.

The media coverage of the ECOREG Project was aimed to portray what the indicators reveal about the region. The story was not only the product, but the message the indicators convey, hence the journalists used the indicators. The circulation of the newspapers is quite large and hence the dissemination of the project results was wide. It is also noteworthy that information about the project was disseminated in the course of it, not only before and after. This may have increased interest and improved the subsequent use of the results.

The dissemination efforts of the two indicator projects were inherently different. The main difference was that the national SDI project held its only press conference upon publishing the indicators whereas the ECOREG Project communicated to the media all along the project cycle. This was likely to increase the interest of the project and may have influenced the way the indicators have been adapted to continuous use in the area (i.*e*. authorities have provided sufficient means to update and further develop the indicators). Specific criteria on early involvement and timing are supported by these findings (Table 2).

3.4 Citations to the national indicator set in Internet

The interviews (Section 2.3.1) were carried out with the target user group defined for the national SDIs. Citations to the set in the Internet provide information on other potential user groups that have not been clearly targeted. The search engine results suggest that the civil servants, researchers, practitioners, teachers, students and city officials are important user groups of the indicators as well (Table 13).

The main use has been for national purposes: the indicator book has been used as a reference in other indicator projects and in works to define sustainable development, mainly in local Agenda 21 related exercises. Another distinct usage type was study material for students and teacher guides. The uses have bearings of conceptual use.

International references were included in scientific journals, but mainly those written by Finns. The Finnish Government had also used indicators as a reporting tool to fulfil international obligations. Indicator practitioners in other countries had also referred to the Finnish experience, as well as researchers of global research projects.

Table 12. Media coverage of the regional eco-efficiency indicators.

Newspaper	Headline	Main contents
Kymen Sanomat	The eco-efficiency of the Kymenlaakso region will be analysed, 17.10.2002	Launching of the ECOREG Project
Kouvolan Sanomat	The eco-efficiency of the Kymenlaakso region will be analysed, 17.10.2002	Launching of the ECOREG Project
Kouvolan Sanomat	Kymenlaakso region in the forefront of eco-efficiency, 22.5.2003	Kouvola workshop proceedings and emphasis on transportations as the main environmental stressor in the region
Kymen Sanomat	Kymenlaakso region in the forefront of eco-efficiency, 23.5.2003	Copy of the previous article
Kymen Sanomat	Material flows are big in the Kymenlaakso Region, 2.12.2003	Kotka workshop proceedings and large material flows of the Kymenlaakso Region
Kouvolan Sanomat	Kymenlaakso leads the way, 6.10.2004	Summary of outcomes of the project and discussion of development trends in the Kymenlaakso region as presented by the ECOREG Project
Kymen Sanomat	Eco-efficiency indicators completed, 9.12.2004	Comprehensive background, aims and findings of the ECOREG Project, highlighting the current status of eco-efficiency in the Kymenlaakso Region

Table 13. Use of national SDIs according to hits by search engine in Internet.

Uses	Example
Other national indicator initiatives	National Forest Research Institute
Finnish Government institute studies	National Health Research Institute
Finnish Government reports to international organisations	Ministry of the Environment to meeting the UN "Istanbul +5"
Finnish research projects at universities	Helsinki University of Technology, University of Oulu
Students' theses	Helsinki University, Faculty of Biosciences
Local and regional indicator initiatives and Agenda 21 programmes	City of Mikkeli, City of Oulu
Educational curricula that include environmental or sustainable development aspects	Restaurant school, Helsinki University Faculty of Veterinary Medicine
Teaching material	http://www05.turku.fi/ekoteho/opettaja/opettajalle.htm
Finns publishing in international journals	Hukkinen, 2003a; Junnila, 2004
International research projects on indicators	EU 6th framework programme project: New Energy Externalities Developments for Sustainability
Websites for sustainable development and sustainable development indicators	http://www.mikkeli.fi/fi/sisalto/02_palvelut/04_ymparisto/14_ympsuojelu/14_kekekoulussa/linkkeja/index.htm

Besides explicit citations that indicate impacts of the national SDIs, there are more tacit influences to other indicator sets. Often indicator exercises are launched with exploration of current state-of-art and best practices are used in the new project. Many regional indicator practitioners have used the national work as a model and some regions (*e.g.* Hämeen seutu) find it important that local indicator sets include indicators in national use (Mirja Lumiaho-Suomi, personal communication 12.3.2008).

To summarise, the results indicate that the indicators have a wide potential group of users even though the results are not quantitative enough to reveal much about the volume of the use. The new indicators developed by the *Helsingin Sanomat* gave a new insight of selecting "in-your-backyard" indicators that appeal to their readers. Similarly the practitioners should consider the user needs and preferences more in selecting and communicating the SDIs (Table 2).

4 Discussion

4.1 Comparing the indicator processes

The previous chapters provided a framework of principles that a SDI process should meet to produce usable indicators, presented two indicator processes and provided information of the use and users of those indicator sets. The comparison in this chapter uses the framework in Table 2 (Section 2.1.1) to analyse how the two indicator processes fulfil the criteria. The findings will help to determine obstacles to indicator use in the latter part of the chapter.

4.1.1 Policy relevance

The comparison begins with policy relevance that is essential if the indicators are to be used in ways other than conceptual (Table 14). The comparison shows that policy relevance is one of the main weaknesses of both processes.

The national SDI set had weak links to the existing national strategy. Indicators such as greenhouse gas emissions and nitrogen oxide emissions included numerical targets in the graphs but most indicators were given a verbal target in the interpretations such as "people are given assistance to quit smoking through vari-

Table 14. Comparing the policy relevance of the cases using the framework presented in Table 2.

Specific criteria	National sustainable development indicators	Socio-cultural indicators to support the measurement of regional eco-efficiency
Link to existing strategy or goals (relevant)	Although mandated by a NSDS, the framework of the indicators was not explicitly linked to the strategy.	Mandate from a EU Life-project, people that draft strategies were involved in the work. No specific strategy.
Comprehensive: all important aspects have been included	Portrayed the issues relevant to SD to the best knowledge of the practitioners and experts involved.	Efforts to include all that was relevant to eco-efficiency from the socio-cultural perspective.
Linkages to sustainable development, causal relationships between the three dimensions	Indicators were not interlinked: this was left to the reader by indication of interrelated indicators between the dimensions.	Conventional socio-cultural indicators, references to other dimensions minimal.

ous programmes" or "the number of threatened species should not increase".

The regional eco-efficiency indicators were also developed without a strategy, although regional strategies and programmes were used to identify the main issues (The Regional Council of Kymenlaakso, 2001 and 2002). Issues such as the role of immigrants in the workforce emerged from these. Targets were not included in the graphs, although the inclusion of national data for comparison served implicitly as a threshold value.

The goal of the developers of the national set was to present a comprehensive view of sustainable development instead of monitoring the national strategy. There is no method to assess how the holistic approach succeeded in encompassing sustainable development. However, links between the issues were not explicit. An effort was made to record which indicators were linked to each other in the interpretations, but information on over-arching themes such as inter-generational equity was inconclusive. Furthermore, the indicators were categorized by problems or themes related to sustainable development (or the dimensions of it). With a hindsight the choice may have decreased the relevance of the indicators to those users that were more sector oriented, *e.g.* the ministries. Provision of a familiar sector breakdown with a sustainable development perspective could have been more useful.

For the regional socio-cultural indicators supporting the measurement of eco-efficiency the holistic perspective is even more difficult to assess. The aim was to include all the themes relevant from the region's point of view. Links to sustainable development that was the ultimate goal of increasing eco-efficiency were identified in connection to each indicator in the development phase, but they were left out of the final report.

To conclude, the policy relevance was very low for the national SDI set. This is partly due to the weak link between the sustainable development strategy and the indicators, but also to the overall weak political weight of sustainable development. The ECOREG Project had eco-efficiency as its main target and it succeeded better, especially by involving the local decision-makers in the selection process. Low policy relevance has had a strong impact on the usability of the national indicator set. Higher policy relevance through participation has accounted to instrumental use in the Kymenlaakso Region, whereas in the national set conceptual use has been the only one in practice.

4.1.2 Indicator quality

The results of my study show that despite many years of indicator development, the technical quality or content of the indicators were still not given enough consideration (Table 15). There are rules on how to best and most clearly present the graphs so that they are comprehensible (*e.g.* Kuusela, 2000). The results show the validity of these rules as the users complained of the readability of the indicator graphs (Section 3.1). My studies also show that the users have preferences on the information that the indicators should include that practitioners have failed to explore.

Table 15. Comparing the indicator quality of the cases using the framework presented in Table 2.

Criteria	National sustainable development indicators	Socio-economic indicators to support the measurement of regional eco-efficiency
Regional/local comparisons	No comparison	Constant comparison of the region to the national average values.
International comparisons	No comparison	No comparison
Forecasts	No forecasts	No forecasts
Framework	SD three dimensions and issues within them.	8 themes divided into 1) state of the region; and 2) attractiveness and potential of the region.
Number of issues	20	8
Number of indicators	83	21
Data available for the chosen indicators	Yes	Yes

The principle on indicator quality entails criteria of measuring the past and future over a longer time period to show trends and relating the variables to wider scope through *e.g.* regional comparisons. Inclusion of time series, comparisons and forecasts are inherent to the concept of sustainable development. Use of these attributes increases the usability of the indicators in presentations (legitimising use) and also facilitates understanding of the context or message (conceptual learning) (Olsthoorn *et al.,* 2001). Compliance with these criteria is likely to improve the information value of the indicators and also increases the attractiveness of the indicators as the decision-makers pointed them as the most desired criteria for useful indicators (Section 3.1 and Article V)

Time series also facilitate the interpretation of the information as the trends become easy to appreciate. Furthermore, politicians perceive the opportunity to monitor the effectiveness of the laws and regulations they have passed. In practice there are often time lags and the state of the environment reacts slowly (Article I).

Long time series was one of the criteria used when selecting the national indicators. The longest time series exceeded three hundred years (The ice-breaking date of the River Tornio) and population statistics also included considerable time series. In some cases the time series had to be cut shorter, because changing societal structures would have given misleading information, for example employment in agriculture and industry in the 1800s was not considered relevant although the data was available. Similarly, the time series of GDP can be traced for decades, but for a policy maker engaged in day to day problems only the recent past is generally significant. On the other hand, sustainable development is about long-term development and hence long time series are recommendable. Since the national SDI set lacks many attributes to be useful for instrumental use, characteristics that evoke conceptual learning become more desirable.

Many of the regional indicators lacked long time series and hence it was deemed more suitable to present all of them in a unified manner where most time series began in the 1990s. Furthermore, the main aim of the project was to develop the indicators for future monitoring use, not necessarily to collect the data. However, in order to identify data sources the data was also collected and presented. Despite the preference of the decision-makers for long time series, the 15-20 years time span seems to have been adequate and the local authorities that now regularly update the ECOREG indicators have not expanded the time series backwards (Toikka (ed.), 2006).

Benchmarking is a forceful tool in political debate (Hezri and Dovers, 2006). Regional politicians want to see how their regions are performing in relation to the other regions or the country and national politicians want to compare the development to other countries. The actual values become irrelevant and under these circumstances indices also find wide acceptance and all that matters is the end results, placement among the countries or regions compared. International comparisons such as

the PISA Study on educational systems have raised much more discussion in Finland than national education statistics (*e.g. Helsingin Sanomat* 27.2.2006, 1.3.2006). Benchmarking or comparison was used throughout the socio-cultural indicators of the ECOREG project, but the national indicator set lacked this information. International comparison was also deemed desirable, in fact this was acknowledged already in the development phase of the national SDIs but inclusion of such data for 83 indicators was considered unfeasible.

The regional indicators provided a reference to the national average for almost every indicator. There is no doubt that comparisons increase the informational value of the indicators and hence add to their usefulness. However, if the national/regional trend is better than the one it is compared to the conclusion of the reader may be that the situation is good, irrespective of the national/regional level. That is, even "if they are worse off than we are, then we are ok".

Over-generational focus is inherent in sustainable development and perhaps forecasts and future scenarios should be employed more. Politicians, especially the Committee for the Future, expressed a need for such information. Neither of the indicator sets used forecasts, although they are widely used in other works such as state of the environment reports (*e.g.* EEA, 2005b).

Since the purpose of indicators is to help decision-makers to overcome information overload, it is important that practical issues are considered in the development phase. Paradoxically lack of data has been one of the main constraints in making indicators operational (Hardi and de Souza-Huletey, 2000). Despite the massive data sets collected by various authorities, finding relevant and comparable indicators with longer time series often proves impossible. This is especially true on an international scale, where the key purpose of the indicators is to compare country performances.

The data collection exercises in both processes confirmed the common problem of data availability associated with indicators and the importance of verifying data existence before agreeing on indicators to be used. In fact, data was always collected for the discussion of proposals which helped the experts to assess the indicator better and also prevented a situation where there is no data for a chosen indicator. This approach may, however, result in skewed indicator selection. Focus on existing and accessible data may lead to neglect of important issues that are not measured (Allardt, 1973). Often the reason is that certain phenomenon cannot be exhaustively measured (*e.g.* happiness) or that the phenomenon is so recent that monitoring has not yet been organised.

Allardt (1973) also suggests that there may be political reasons to produce certain statistics and ignore other. Hence the procedure secured that feasible indicators were published but their ability to genuinely measure the objective (in this case sustainable development or eco-efficiency) was highly questionable. More efforts should have been given to further identify indicators to be developed, for example the Eurostat uses considerable funds to support improvement of indicators for its SDI set (Eurostat, 2007).

Participatory processes with many stakeholders easily lead to large number of indicators, as consensus is often reached in practise by adding on new indicators (Kates *et al.,* 2005). According to Farrell *et al.* (2005), the number of indicators needs to be as few as possible, and they suggest a number between 20 and 30. The number of indicators was rather large for the national set, 83, and this received both supportive and negative assessments from the interviewees. The parliamentarians generally said they prefer to choose which indicators they use and that they like browsing through many options. The Permanent Secretaries on the other hand said that the set should be much more concise in order to be useful for the politicians. The first indicator proposal in 1999 presented 99 indicators and that was considered too large in many of the responses of the comment-round. Those preferring many indicators probably considered their most likely use to be conceptual or legitimising in nature.

The number of socio-cultural indicators in the regional exercise was slightly smaller, only 21 compared to 33 socio-cultural indicators in the SDI set, and the number of the whole re-

gional set was 58. The size difference is not remarkable, but regular updates by the local practitioners of the whole indicator set indicate that its size is more feasible. The national indicators have never been considered suitable for yearly updating which clearly contrasts with the needs of the users for updated information and is likely to influence their use negatively. The decisive factor is more likely to be the resources to make the updates rather than the number of the indicators. Nevertheless, about 50 indicators appear to be more adaptable than over 80.

To summarize, the national SDI set included long time series and all the presented indicators had data. The indicators did not provide international comparison or forecasts and the number of the indicators was quite large. Reflecting on the responses from the policy makers, the indicators match their needs to some degree. The ECOREG Project met them better in producing a tangible set of indicators that had a very important component of national comparison. Because of the great appeal of the comparisons to the decision-makers, its inclusion supports all types of use. It especially facilitates instrumental use as drawing conclusions from such presentations is considered easy (Section 3.1).

4.1.3 Participation

Ideally, participation improves the quality of the indicators by increasing the intellectual capacity that develops the indicators and also by shaping the indicators or the way they were presented to match the needs and preferences of the potential users. Furthermore successful participation can engage the potential users to the project which helps in marketing and influences use. Both processes aimed at a participatory approach, although in the national process the underlying reason was mainly to develop the indicators in the spirit of Agenda 21 and not seriously consider what participation would engage.

The criteria and approach have been used in Article III to evaluate the national indicator project. However, the approach taken in this dissertation is more critical than it was in the Article III. Comparison of the two processes brought out more clearly the failures of the national process with regard to its success as being participatory (Table 16).

Representativity of the participants

Comparison of the national indicator process 1998-2000 (Article III) and the regional ECOREG Project on socio-cultural indicators to support measuring eco-efficiency (Article II) requires a common terminology to describe the participants as they all have specific interests, competencies, roles, and ambitions. Article III presents four main actor types in the participatory process according to Webler *et al.* (1995). They are the researchers that facilitate and organise the process, the experts with the scientific knowledge on the matter, the stakeholders with an interest to influence the outcome, and the general public defined as representatives of the population affected.

For the national SDI project the two main channels for engaging the participants were the indicator network and the FNCSD. The members of the network participated actively and supplied in theory a link to the civil servants that guide policy-making in their perspective ministries by providing information to top-level political decision-makers. The FNCSD provided a link to important interest groups in the Finnish society. Other channels were informal communication with various experts, the Internet for the public and a special meeting organised for NGOs.

Although the original participants of the indicator network represented the three dimensions of sustainable development quite well, the absence of the three ministries (Ministry of the Education, Ministry of Justice, and Ministry of Defence) that joined later was unfortunate (Section 2.2.1). The initial criterion for forming the task force was to include those ministries active in the field of indicators and thereby keep the group as compact as possible. Hence the main aim was to find expertise in developing indicators, not in sustainable development. In retrospect, the approach was not well grounded and could have seriously undermined the outcome. Furthermore, there

Table 16. Comparing the participatory processes of the cases using the framework presented in Table 2.

Criteria and elaboration	National sustainable development indicators	Socio-cultural indicators to support the measurement of regional eco-efficiency
Representativity of the participants *The extent to which the participants are representative of all stakeholders with a potential interest in the assessment of sustainable development.*	Working group with experts and civil servants, not all dimensions of SD represented, NGOs not present, intended users did not participate.	Experts were engaged, one NGO in the steering group, local actors could participate in the workshops, regional decision-makers participated in the steering group and workshops.
Transparency *The openness of the process, availability of all the background material and objectives to the participants, equal starting point with the organisers.*	Internet was used to disseminate information about the process, for example the preliminary list of indicators was available. Justification for the selection was not provided.	ECOREG had an Internet site during the project with documents about progress and results.
Early involvement *The stage at which a wider stakeholder-group is involved in the process, how much was decided before their involvement.*	Comments of those involved were sought early on, for example for the framework before the actual indicators were selected.	Comments of those involved were sought early on, for example for the framework before the actual indicators were selected.
Task definition *The clarity of objectives and targets set for the outcome of the public hearings, comment rounds etc.*	The task of developing a national SDI set was clear, but the methodology was developed ad hoc.	The task of developing indicators was clear, but their role to support the measurement of eco-efficiency was crystallized along the way. Methods and timetable was more fixed than in the national exercise.
Influence/compatibility *The extent to which the programme and the mandate for participation supported the objectives of those participating. This is an issue of the fairness and credibility of the process and ensures that substantive issues are not omitted from the discussion.*	Experts had significant influence on the indicator set. Other influences are difficult to detect.	The steering group (included foreseen users) had strong influence as well as the experts involved.
Degree of awareness and knowledge achieved *The level of awareness about the issues and the perspectives of the different stakeholders generated by the process. Optimisation of consensus requires that those taking part are equally well informed to reach a conclusion.*	The intended users were not widely reached, over hundred people became aware of the exercise through the workshops and seminars.	The concept of eco-efficiency has been incorporated into regional strategies.
Legitimacy of the product *Possible benefit to the decision process from participation and whether that can be shown (complaints afterwards, possible consensus in the end).*	Those that participated approved of the indicators, but the process was largely technocratic.	The indicators have been regularly updated in the region and accepted as tools to monitor the regional development.

was no quality control for the civil servants that attended the network meetings. The civil servants may not have been the correct people nor was there any evidence that they informed their respective organisation of the work in the network. In fact, a recent cooperation with the Prime Minister's Office showed that they govern a similar inter-ministerial indicator network to define indicators to monitor the government programme and all of the members are different from the SDI network. In other words, the members of the SDI network may have had sustainable development as their task and it is difficult to assess which expertise, sustainable development or indicators would have been more relevant to the network.

The network lacked representation from the interest groups (*e.g.* NGOs), although this had originally been envisaged. The reason was that the network could not decide who should be invited. Furthermore, there was a fear that too many interest groups might obstruct the process, *i.e.* finding appropriate indicators that all can agree on would be more difficult in a big crowd with many views. Naturally, this attitude contrasts strongly with the principles of democratic participation and openness and reflects time pressure and the poor understanding of the participatory approach on the behalf of the organisers.

For the ECOREG Project, the main channels for engaging people were the steering group and the three workshops. The steering group was a direct link to high level decision-makers in the region. Besides civil servants, the private sector was also represented and an NGO was invited from the nature conservation organisation. Furthermore, the three dimensions of sustainable development also relevant to eco-efficiency were represented by people from the regional administration.

The scientific community was represented in both projects, although the diversity was more pronounced in the national process as each indicator and its interpretation were commented by at least one expert in the publication phase. In fact, many scholars were also consulted already in the choice of the indicators, thus their contribution was considerable. The large number of scientists involved can be attributed to the broad subject matter and the lack of or limited expertise within the research group.

The ECOREG Project harnessed skilled scientists to undertake the task from the beginning and the need for additional support from external scientific community was small. The greatest need was for expertise on the local conditions in the Kymenlaakso Region. For the socio-cultural indicators, collaboration took place with researchers from the local polytechnic (Kymenlaakson Ammattikorkeakoulu) in addition to the workshops that the researchers also attended.

Representativity of the public was relatively weak in both projects. The national SDI project organised a special meeting with the public in the beginning, but it produced low attendance and no alternative ways to reach the general public in the process phase were considered. Furthermore, those present came solely from the metropolitan area. In the ECOREG Project the stakeholder workshop intended to involve citizens from various backgrounds, but they were still selected from networks of the steering group members. Otherwise the representativity of stakeholders from industry and R&D sectors was quite good (Table 6).

In summary, the representativity in the ECOREG Project was more diverse although the comment round of the national indicators reached representatives of both NGOs and industry who would otherwise have been absent. The civil servants were, however, a majority in the comment round as well (Table 3) which points towards an expert driven bureaucratic process. Furthermore, there is a marked difference between participating in a workshop or in a steering group and merely being asked to provide written comments. More importantly, in the ECOREG Project the people engaged represented the prospective users of the project outcome. Comparison of the people who participated in the two processes reveals a big difference in users' recognition of the outcome: in Kymenlaakso most of the prospective users knew about the process and had been given the opportunity to influence it. On the national level, the politicians and the public were handed a report prepared by the state administration. In-

deed, politicians in the Environment Committee were given a chance to shape the outcome through the comment round, but the Committee Counsel of the Committee had decided it did not have time to comment. In the hindsight, a presentation to the Committee should have been given already at the time.

Based on this criterion, the national SDI project had poor representativity that has been directly linked to who has used the final product. In Kymenlaakso the broader representation has been a strength that carries the indicator set still today. The broader representation has likely affected the types of use as well: instrumental use is supported by the inclusion of the decision-makers in the development phase. Furthermore a wider group has been introduced to the subject which increases the scope of conceptual learning (here it would be also process learning, Section 2.1.2).

Transparency

Neither of the projects made an attempt to provide all stakeholders with the same starting material that the organisers at SYKE had. This is a shortfall of the processes, at least as far as it hindered the stakeholders from making feasible suggestions for new indicators during the comment rounds and seminars. In other words, the stakeholders were provided with the material as it became available as reports and final products, but in order to influence the process with the same starting point, they would have had to find the material for themselves.

As for transparency in terms of sharing material as it became available, both projects used the Internet as the main tool to disseminate results and information during the project phase. Transparency in the national project was displayed by compilation of the comment-round results into a table and posting it in the Internet. The results of the final seminar were also compiled into a table and circulated to the participants with explanations for rejected suggestions.

Likewise, all the ECOREG Project phases and results have been accessible at the project Internet site. The site has served both the public and the project members by storing the documents for further use.

Comparison of the success is difficult, as the Internet culture of 1998 differed markedly from that of 2002. The project site of the ECOREG Project was indeed professional, presenting workshops, publications and presentations in an orderly manner.

Although the transparency within the projects was not quite what the criterion means, it was still in the spirit of open policy and sharing results with others. The criteria contribute to credibility of the indicators which is considered important by many users (Section 3.1.). Credible information is important to both instrumental and legitimising use, as in the latter one the user wants to convince others with the information he/she uses.

Early involvement

The early involvement of various participants ensures that their views are taken into account from the very beginning and prevents overlapping work. It is important that the stakeholders are allowed to participate in the planning phase and that their positions influence the direction that the project takes.

The national indicator project proceeded in two phases, first by the identification of the themes, and, once they were agreed on, the indicator selection continued. The development of the socio-cultural indicators for Kymenlaakso followed the same method. In both processes people were involved to comment on the framework, which assured that all relevant aspects were included on the issue level.

The subsequent indicator selection was also similar in both projects: a preliminary set was presented in seminars and modified according to the feedback received. Early involvement of the actors reduced the need for double work and thereby contributed to the efficiency of the process.

Neither of the indicator sets received much criticism from other experts which was understood as success. However, this outcome may also suggest that neither project had direct impacts on any of the stakeholders and the issues themselves were so diffuse that few bothered taking time to complain. Example of a direct impact could be new monitoring and report-

ing responsibilities. Furthermore, the indicators did not present any new objectives or targets that any stakeholder would find unjust or threatening to their sector.

The fact that wide acceptance was understood to be one of the goals of participation in the national process shows again, that the purpose of engaging stakeholders was largely consensus seeking. Real inputs were genuinely wanted as well, so in that sense the process was not a façade, but only experts were consulted and hence the type of input was pre-selected.

Task definition

The task definition was clear for both indicator projects, but the planning differed considerably. The ECOREG Project had a definite project plan where the number of workshops was predefined and deadlines for different tasks were explicit. The national project did not have a distinct deadline, in fact the indicators were originally planned to be published in summer 1999 for the Finnish EU presidency.

Although task definition is important for the stakeholders and helps to coordinate a project, strict boundaries may also limit the creativity of the end result. In retrospect, neither of the projects had a clearly defined view of what the end result should look like. Given the ambiguous nature of sustainable development and eco-efficiency, it is not surprising.

A profound difference in the task definition was that the national work aimed to produce the first set of SDIs for Finland and it was understood that the work would continue to improve them. As the regional work was an EU funded project that had a clear ending, a more finite set was envisaged. The regional indicators were also intended for further use and possible alterations by the local users, but the researchers involved in the initial project would not continue to work with the indicators in the future.

The fact that the national task definition included an assumption that this is the first version and the indicators will be further developed if needed, may have aided the national process considerably as the participants knew that there will be more chances to influence the sets. Hence the process was not paralyzed by difficulties of identifying ideal indicators and proxies were accepted.

Influence of the objectives of the participants

Inputs from participants for the national SDIs came through two channels: there were specific occasions when comments were requested (official comment round and a seminar) and a continuous exchange of views between experts and the organisers at SYKE to develop and select the indicators.

On the whole, the expert contributions were somewhat more feasible than those from interest groups or the public and therefore had more influence on the outcome. This is because the non-experts were not familiar with data availability and resources for collecting new data and tended to suggest indicators that the network felt could not be measured. The recent thinking is that it is important to develop statistics to better measure progress and data availability should not have as much influence as it had in these two processes (OECD, 2008).

The final proposal for the national indicators changed as a result of the written comments. Out of the 99 indicators, about one third was changed or omitted as the final number was 83 indicators. Ambiguous indicators such as the number of contaminated sites that leaves out the area and volume were deleted. New indicators suggested by experts included dioxin in mother's milk and commercial fisheries.

The strongest influence on the socio-cultural indicators of the ECOREG Project came from the steering group and the workshops. The major impact came from the first workshop where the most important socio-cultural themes were identified and prioritized. In the ensuing work, most of the decisions were made within the project team and the steering group and the following workshops did not lead to significant changes. Hence, after the early involvement of the stakeholders and their strong initial impact, the process served mainly as engagement and dissemination for the socio-cultural indicators and the latter workshops had more implications for other parts of the ECOREG Project.

To summarize, those that participated in the indicator development processes influenced the outcome considerably. However, as noted above, the participation in the national indicator process engaged mainly experts and researchers making the processes largely a technocratic exercise. This kept the awareness of the indicators within the same crowd and did not support any other types of use among the decision-makers that were the original target user group.

Degree of awareness and knowledge achieved

The degree of awareness or knowledge achieved can mean two things in both projects. The first goal would be to increase understanding of the issue being measured, in this case either sustainable development or eco-efficiency. However, awareness could also be awareness of the indicator development process, i.e. the project raises awareness of its existence. Since SDIs provide a lot of information by nature, active participation is likely to increase understanding of sustainable development as well. Indicators can therefore define what is measured if the concept is not otherwise clear (see Chapter 1).

For the national indicator project, some evidence came from public reactions that the concept of sustainable development is more understandable when one sees all that it can comprise in the form of indicators. Furthermore, a series of articles in *Helsingin Sanomat* (Section 3.3), showed that journalists attached importance to the concept and in theory the readers' knowledge was increased as well.

The national process was likely to increase the awareness and knowledge of sustainable development and the indicators among the participants. However, evidence of whether the knowledge has spread beyond this group of people is difficult to find. Interviews with politicians and high-level civil servants showed that the indicators had not reached most of them, although the Internet use statistics, newspaper coverage and the hits by the search engine demonstrate some use.

A third form of increase in awareness was that the stakeholders learned to appreciate the limits (*e.g.* data availability), which led to a better understanding of what is feasible. For example, biodiversity raised most controversy between scientists and interest groups, but it became clear to all in the process how difficult it is to measure. This type of process learning supports consensus seeking, but does not improve the quality of the set.

The ECOREG Project provides more explicit proof of the awareness and knowledge that was generated. The concept of eco-efficiency has been incorporated into the vision of the Regional Strategy for Kymenlaakso 2005-2015 by stating that the Kymenlaakso Region will be "an attractive and eco-efficient, internationally interactive area" (Regional Council of Kymenlaakso, 2006a). Another impact is discernable in the Regional Programme 2007-2010, where eco-efficiency is included throughout the text and the ECOREG Project indicators will be used to monitor it (Regional Council of Kymenlaakso, 2006b). The monitoring data and summaries produced by the ECOREG Project are also used in the latest Regional Development Report. With regard to different types of use, awareness increases all types of use but if knowledge is achieved among the users it clearly affects instrumental use.

Legitimacy of the product

If legitimacy of the product is assessed by the degree of consensus reached and by the number of complaints, both projects were legitimate. For the national indicators, the number of complaints was minimal after the publication of the book. The inclusion of leading Finnish experts in the pertinent fields gave the indicators credibility and the communication with environmental interests groups that were members of the FNCSD prevented the most likely dissatisfaction as they had an opportunity to influence the outcome through written comments.

Besides the indicator graphs and interpretations, the national indicator publication described the process behind the indicator work and also listed all the experts involved (more

than 90). This gave the indicators added credibility, as people tend to appreciate the involvement of scientists and experts (Eckley, 2001).

The outcome of the ECOREG Project was similar. The participation steered the choice of indicators in the desired direction of the users and at the same time the stakeholders learned the limitations and reasons for certain choices. Hence the final consensus was easily reached and no complaints were received.

In both projects, the main stakeholders were civil servants, experts or people with an interest in the matter through their jobs. Their future use of the indicators is most likely to be conceptual, although civil servants can also make instrumental decisions or at least provide the indicators to those preparing decisions in their ministries (legitimising use).

The general public was approached only through a limited number of environmental NGOs and the media in both processes. Such limited participation by the general public and also other stakeholder groups does not give a full picture of the democratic legitimacy of the process, although those who participated mainly accepted the proposed underlying values of the process. The reason may be either that the values concurred with their own views or that they lacked means to put forward their views. The wide acceptance of the indicators is due to the compromise reached, but another explanation may be that neither sustainable development nor eco-efficiency itself raises critical discussion in Finland and sector-oriented issues are more important. The indicator work may be considered either irrelevant or uninteresting to those who participated and the media. A further point could be that the public and the media usually raise negative news more easily, *i.e.* good news is no news. When the media uses indicators to report on some issues, it is a form of legitimising use for their cause. The regional indicators were actually used to analyse the local situation, but it was not to prove a point of the newspaper but rather to increase general knowledge and learning. The point of the *Helsingin Sanomat* was to increase public awareness of sustainable development and indicators in an interesting manner.

Summary

Analysis of the two indicator processes shows that both processes attempted to engage people outside the project team to participate in the development of the indicators. The main impetus for involving others was to receive input to improve the outcome. Hence the main participants were experts and civil servants. The national process failed to include the foreseen users of the indicators, whereas the regional process had local decision-makers included in the steering committee.

A secondary motive for wider engagement of the stakeholders was a quest for consensus in the choice of the indicators. Selection of indicators easily raises controversy and therefore the practitioners saw wide participation as a tool to reduce conflicts. In this light it is fair to say that the national indicator process did not fulfil the requirements for a participatory process as it included many elements that participation has been criticized for. For example, the organisers wanted the stakeholders to support their existing views.

Successful participation of the high-level decision-makers can be difficult in the national level, but it can certainly influence the use of indicators considerably in the local level. This can also be concluded from the process, where the ECOREG Project involved the end users during the whole project span and also mobilized locals to the workshops. They learned conceptually during the process but awareness of the indicators also led to instrumental use in regular assessments of the regional eco-efficiency (Toikka (ed.), 2005, 2006 and 2007).

Investigation of the actual use of the indicator products shows that the regional indicators have been used as intended: both in regional programmes by the decision-makers and they are also updated regularly by the local practitioners. The simple reason is that both groups were involved in the process. Hence the engagement of the users can support their consequent use.

4.1.4 Dissemination

This section assesses the quality of communication and dissemination of the indicator proc-

esses (Table 17). Making the product accessible to the users is essential in getting it used.

The first criterion links to the transparency of the final output, which is something that the national indicator project has overlooked almost completely for the past ten years. Data for the indicators were never made available in any format. This was largely because the main part of the data was from the Statistics Finland and it was considered inappropriate to distribute their data as they charge for some of it themselves. However, since the data series were compiled into a widely used spreadsheet programme, data has been sent to people upon special requests. Furthermore, an official dissemination of the data would have needed more resources to presentation of the data in an orderly and clear manner. Hence the option of distributing data that environmental administration had an ownership of was not considered either.

To make up for the lack of openness in this regard the data sources of the national SDIs were carefully recorded. This also promotes the assurance of data quality, which is of the utmost importance (Morrone and Hawley, 1998). However, critical assessment of data and more details of the data sources were not included in either of the indicator sets, which may have impaired the credibility of the indicators for some users. This type of assessment was not deemed necessary as all of the data was retrieved from well-known data producers.

The ECOREG Project presented the data behind the indicators. Data was also included in the CD-rom that contained a spreadsheet based monitoring tool for regional eco-efficiency. This was possible, since data for the selected indicators came from data sources that were open to the public or the municipalities (FINSTAT –Internet database of Statistics Finland and SOTKA- database of National Research Centre for Welfare and Health (STAKES)). The original idea was not that we thought the users would need the data, instead we thought that the practitioners that would continue using the indicators in the Kymenlaakso area would benefit from the readily collected data.

Both indicator projects made efforts for products that would be attractive for the foreseen users. The focus was on those users who may make instrumental use of the indicators. The ECOREG Project succeeded quite well with full-colour indicator graphs and a cd-rom

Table 17. Comparing the dissemination efforts and their success in the cases using the framework presented in Table 2.

Criteria	National sustainable development indicators	Socio-cultural indicators to support the measurement of regional eco-efficiency
Availability of methods and raw data for other users	No	Data was distributed in the report, reports also in the Internet.
Critical assessment of data (reliability)	None	None
Design the indicators for users Emphasis on availability as suitable products (presentation material, Internet)	Size of the publication was smaller than the standard, comprehensive edited Internet pages .	The indicators were published as part of a traditional report, but a CD-rom with the indicators was produced that was available in the Internet as well.
Simple and clear indicators	Graphs difficult to read due to 1+1 colour scheme, Internet PDF-quality in graphs was poor. Graphs with two axis, avoided indices. Multiple variables in one graph.	Good quality graphs with colours and carefully designed display. Focus on single variables, no indices.
Present the indicators to decision-makers	During FNCSD meetings and afterwards to 2 parliamentary committees (also re-visit in 2005 to Environment Committee).	Decision-makers present at the steering group and invited to seminars.
Timing	The indicators were launched when they were ready. Dissemination has been ad hoc.	The indicators were published when ready and also part of the final seminar.
Timeliness	The indicators were not updated regularly and the time lags are 1-3 years in average.	The indicators were not updated after their development during the project. The current indicator team updates them yearly with time lag of 1-2 years.

publication to disseminate the indicators (also available in the Internet). The national process was less successful. The main reason was that the means to do that were quite limited. This was partly due to the inexperience of the researchers and the failure to engage professionals from the communications department. At the time, a report was foreseen as the most obvious platform to publish the indicators in. Internet was not considered in the original planning and the pages actually realized because I had the skills to do them. However, advantage of publishing indicators in full colour in the Internet was not taken. As said before, the graphs were taken directly from the publication that was of different shades of green and grey. This reduced the usability of the Internet site significantly.

Efforts to present the indicators to decision-makers were made in both processes, although at different phases. The regional ECOREG indicators were presented early on, as the decision-makers were present at the steering group meetings. In fact, a brochure about the Project was produced and disseminated widely in the beginning of the project. The national indicators were presented to the FNCSD upon their publication, but the larger policy-making crowd was not approached until a year later in connection to the interview research.

Both projects produced press releases that resulted in newspaper articles. The regional indicator project held press conferences all along the process which showed genuine grasp of having a dissemination plan.

The print of the paper copies was modest in both processes, about 300 for the ECOGREG Project and 700 for the national SDIs. The dispersion of the publication was different in that the national SDIs were distributed through the common environmental administration's channels and hence enhancing the idea that sustainable development belongs to the environmental sector. Similarly the politicians who received a copy were either from the Green Party or part of the Environment Committee. Besides the same traditional channels, the ECOREG Project deliverables were also given for the local partners for further distribution as well as to project beneficiaries in the EU.

Neither of the indicator sets was published with certain timing in mind. As said earlier, there was an idea to publish the national SDIs during the Finnish EU presidency, but the deadline was not even seriously attempted. The ECOREG Project had a project plan and the indicators were ready well in time before the final seminar where they were presented.

Timeliness was not a key criterion for the indicator sets. In Kymenlaakso the main purpose was to develop the indicators and data was solely collected to test and present the indicators, *i.e.* the project team did not aim to have timely indicators as the future use and updates were left for the local environment centre.

The national SDI set was criticised already upon its publication about old data (Kari Rissa, personal communication in the press conference). While some of the criticism was unfounded due to unclear presentation, care was not taken to present the most recent data in the publication. Neither was there a clear plan for updating the indicators regularly, although several attempts were made to define when certain data comes available annually. However, calling data producers for 83 different indicators is quite ineffective. Since their publication, the indicators have been updated at irregular intervals and the latest set in 2006 was updated already in 2007.

4.1.5 Institutionalisation

Both indicator sets are still in use and the projects are on-going (Table 18). That in itself is already a sign of institutionalisation. However, the degree of institutionalisation differs markedly.

A clear strength of the national SDI work has been the steady support and financing by the Finnish Ministry of the Environment. The Ministry has provided sufficient funding to the Finnish Environment Institute not only to update the indicators, but to further develop them and to attend international meetings on the subject. However, this work has been carried out by mainly one person which means that real institutionalisation has not taken place as the organisational memory of the good practises has not been shared with others.

Table 18. Comparing the institutionalisation of the cases using the framework presented in Table 2.

Criteria	National sustainable development indicators	Socio-cultural indicators to support the measurement of regional eco-efficiency
Responsive to change Flexibility to changing political priorities and new knowledge	The indicators were shuffled into new framework (in 2004). 83 indicators are difficult to manage with the resources available.	The technical set up was simple (spreadsheet), so that changes in content and framework was feasible. 21 indicators are easily managed.
Plans and funds for updating the indicators	The Ministry of the Environment has provided steady funding that has enabled the further development and updating of the indicators. The updating is not regular.	The updating has been institutionalised on the regional level and the indicators have been updated and published annually.
Assigned responsibility for updating and dissemination	Responsibility assigned to SYKE. In reality only one person in charge which jeopardized organisational learning. No dissemination plan	Responsibility within the regional environmental authorities. Dissemination plan existed.

Although the timeliness of the indicators has been considered of the utmost importance to politicians, a decision has been made not to update the national indicators on-line because the task would be too vast even for the current set of 34 headline indicators and 48 supporting indicators. Hence the update will only take place upon assessment of the strategy. The decision hampers the effective use of indicators because especially those using the indicators legitimisingly to influence others will want updated information. If the user cannot trust that this is the latest update, they will find another source and probably continue with that. Therefore the current role of the national SDIs is to monitor sustainable development strategy and to serve as a definition of sustainable development.

Despite the on-going funding to the Finnish Environment Institute, the SDI work runs on a rather ad hoc basis. It is not a project that has a plan or a deadline. Instead, the indicator work supports closely the FNCSD work and products are produced upon requests. This approach can also be seen as strength since a light organisation can experiment with new ideas and not be involved in continuous heavy updating process. However, this type of product can lead to mainly conceptual use since reaching the users is also rather ad hoc.

The regional eco-efficiency indicators were designed to be a working tool and changes to the composition by the local experts were expected. After the project, the responsibility for updating was moved to the local environmental authorities who receive funding for the work and publication. In addition, the local authorities also provide an assessment of the state of eco-efficiency based on the indicators. The institutionalisation has secured the use of the indicators as the users have learned to expect the updates and know where to access the indicators. The resources for regular updates support both instrumental and legitimising use. However, even conceptual use may be supported by proper institutionalisation as it allows more pedagogical approaches to display *etc.*

4.2 Main deterrents of use

The framework in Table 2 and comparison of the two indicator processes has helped to tease out the main deterrents of indicator use. Many of the reasons apply universally to other SDI sets as well.

4.2.1 Interesting but irrelevant

Astleihner and Hamedinger (2003) identify the insufficient processes to develop the indicators and an ambivalent relationship between the researchers and the decision-makers as the two main reasons for why indicators have failed to influence policy. Due to this tenuous relationship the needs of the decision-makers have not been sufficiently understood and researchers have had unrealistic expectations of linear and logical use of the available and "right" information (Hezri, 2006). In reality, research and even indicators developed for specific pur-

poses, are seldom used instrumentally (Weiss, 2005) although that is what the developers of indicators often appear to expect (*e.g.* Guy and Kibert, 1998).

Millions of people use search engines daily to find a specific piece of information. SDI sets cannot and should not compete with them, *i.e.* it is unlikely that anyone would check the national SDI set to see how the GDP or the greenhouse gas emissions have evolved. Hence the role of a general indicator publication such "Signs of Sustainability" is to provide an overall picture of sustainable development and the individual indicators should have a strong link to each other and the overall theme. In my experience, many governmental indicator exercises produce sets of compromises where the interests of different sectoral actors (i.e. ministries) are accommodated. However, when we have a central theme, the challenge is to find people and decision-makers that need that. The interviews showed that when asked more specific questions about sustainable development, the interviewees had no answers. This shows that among potential users (especially politicians in the two committees) virtually no one had thought of sustainable development issues previously. Thus conceptual use precedes the other uses, but can indicators alone achieve this?

Here we are faced with the original problem of the ambiguity of sustainable development. How to make something so vague appealing to users? Especially when it is not very high on a political agenda? The interviews showed that many decision-makers considered sustainable development to belong to the environmental administration and this notion was unintentionally fortified by publishing the indicator book with Ministry of the Environment's logo and green colours.

How far should the relevance of the indicators be tailored to the user needs and where should a line be drawn? The holistic approach to sustainable development aims at informing the decision-makers not only about the trends but also about what constitutes sustainable development. And this role of the indicators is strengthened when consensus on the term sustainable development itself is missing.

SDIs cannot and should not compete with statistical yearbooks with the approach of "something for everyone". Hence it is impervious that the users are reached through a participatory process because it will both inform and engage the foreseen users and also give better understanding to the developers on what is expected. On the other hand, the Internet provides access to users that probably have not been engaged in the process.

An analysis of the indicators that were given most attention by the media, shows that indicators that are "close" to everyday lives or so-called "backyard indicators" were mostly reported on. The indicator that was given most attention was the ice-breaking date of the River Tornio (Table 12). It is a powerful indicator of climate change where the message that springs have become warmer, is easy to understand. Further support to this type of indicator was received from a centre party politician, who claimed calculated data (*e.g.* emissions) from the environmental administration to be less trustworthy than this type of "real data". Awareness of this kind of preferences can also guide in the selection of indicators and influence use.

Indices were also mentioned as effective indicators. The Minister of the Environment called for an environmental indicator to combat often used GDP and unemployment rates. She suggested ecological footprint as a promising indicator. There were also many politicians, who could not name any other indicators or indicator sets, which is not very supportive for the indicator works. This shows the problem to be generic and the key maybe the lack of context: indicators become useful and used only in specific circumstances.

To overcome the existing prejudice that the policymakers may have for the information presented by the SDIs, in addition to context care must also be given to their presentation and communication with insights to user preferences. It is important to convey the credibility of the indicators, because it plays an extremely important role when the information is otherwise contradictory to the user's earlier experiences and existing views (Florio and De Martini, 1993). Saliency of the indicators with

the worldviews of the decision-maker influences significantly their use (Section 2.1.3). Decision-makers have wide ranging interests, ideologies and capacities to intake and process information. This makes the development and presentation of the indicators so challenging and the issue is in the heart of the problem of little use.

4.2.2 Shortcomings in the technical quality

The technical shortcomings of the national SDIs emerged quite clearly when comparing with the ECOREG Project. The indicators were not only poorly presented, but they were incomprehensible to some degree because of many variables in small print and undistinguishable colours. Besides an appearance, a major shortcoming was lack of timeliness and the other one was unavailability of the raw data. Other clear weaknesses were the lack of comparisons, forecasts, quality of the interpretations, and lack of coherence within the set.

The user needs are seldom considered adequately and this applied especially to the national process. A good example of this is the failure to provide data together with the indicators. A recent study by the Prime Minister's Office (Rosenström, 2008) where 20 potential users of indicator-like information were interviewed, showed that nearly all wanted to see the data behind the indicators. The need for raw data came indirectly from the interviews (Section 3.1) by claims that the decision-makers would like to extract the graphs to their own presentations or even to re-draw the pictures (with for example better colour schemes). The result suggests that the use of SDIs may have been seriously deterred by the lack of data. Although data was sent upon request, this service was not marketed in the Internet site or in the publication and hence only the most active could think of asking for it.

Openness contributes to the credibility of the information in the eyes of the users, as expressed by the interviewees. Presentation of raw data increases legitimising use. People who use indicators to persuade others want to be certain of the quality of the indicators and to have a possibility to alter the graphs using the raw data. The availability of the data may affect all types of uses, but perhaps in particular legitimising use where there is a need to make the indicators part of one's own coherent argument. Again, participatory process could have identified this need early on and led to the inclusions of raw data.

Although scientists consider interpretations important and crucial for communicating messages correctly, the main emphasis has been in the selection process of the variables. It is common that the main bulk of work in indicator processes is devoted to the choice and development of the indicators and the subsequent data collection and drawing of the graphs. Much less time and effort is given to the actual interpretations of the indicators. Also consultation rounds are more focussed on the produced set of indicators than to the message that the indicators convey. For example, the choice of indicators for the national SDIs took nearly two years and writing interpretations only four months (with two researchers) (Section 2.2.1). The most recent national SDIs were published without interpretations (Prime Minister's Office 2006, www.environment.fi/indicators). Furthermore, there are cases that the interpretations simply repeat what is obvious from the indicator graph, without going into detail about the underlying reasons or impacts (*e.g.* DEFRA, 2007).

4.2.3 Superficial participation

It is very common for public administrations to produce information for decision-making without consulting the decision-makers themselves. This leads to one-way communication where the civil servants believe that having information available is enough and the question of access is ignored. The national SDI process involved hundreds of experts which the organisers thought was sufficient participation. However, this large number of people involved was more likely to lead to shortcomings related to participatory processes such as compromises that lead to uncontrollably large selections and the true value-added of involving the users was missed.

The ECOREG Project proved that involvement of the foreseen users of the indicators does increase the use partly by assuring awareness of the indicator project. Apart from this obvious strength, the early involvement of all potential user groups or those that influence their use, is the fact that indicators can be tailored to better suit their needs.

The three attributes (Section 2.1.5) that are recognised to influence the use are all strengthened through wide participation. Credibility of the end product gains from a wide representativity of scientists and experts and from transparency of the process. Legitimacy of the indicators is increased by involving users in the process, likewise transparency of the changes made added to the knowledge that the end-product reflects the views of the participants. The regional indicators succeeded in becoming legitimate to the local decision-makers. Salience is increased by listening to the users during the development process, this way the policy relevant issues can be brought forth early on. Early involvement re-enforces the policy relevance.

It is important to note that participation of the users does not mean that they are allowed to choose the indicators or that the product will be specially tailored to the needs of the parliamentarians. The main choice of the SDIs should be the responsibility of the experts, however, listening to the needs of the users will lead to more effective ways of reaching the users. This can be done by providing the indicators in formats that the users are most likely to use. And as said before, participation will lead to process learning and serve as pre-advertisement of the up-coming service or product.

4.2.4 Poor dissemination

A problem identified with current indicator sets is the difficulty to find them. Besides participatory process, the best remedy would be more efforts to the dissemination of the indicators.

An inherent problem in the dissemination is a lack of a comprehensive plan and a wrong focus. The "marketing" is often focussed on how many indicators are involved, who made them *etc.* when the focus should be on the overall message and on how the indicators could be used by different users. For example, an indicator feature story in a newspaper with a real decision-maker telling how and when he uses a certain indicator set is likely to be more effective than simply listing the contents of the reports.

Besides the lack of proper dissemination that would inform the users about the indicators, the fact that there are so many competing indicator sets adds to the confusion and decreases their chances of being used. The original idea that indicators condense information overflow has turned into an indicator overflow (Rydin *et al.,* 2003).

Figures 2 and 4 depict the national and the regional indicator processes. Both time lines end with the publication of the project. In reality, that is only the mid-way and after that the practitioner should begin (at the latest) communicating the outcome to the users.

The interviews showed that despite having received the SDI publication upon its publication, the members of the Environmental Committee only made a notice of it after my presentation and request for interviews. The notion was strengthened by the parliamentarians' and their assistants' description of the vast amounts of reports that are regularly received by the politicians. Perhaps regular updates for several consecutive years would bring better results, as was shown by the wide recognition among the interviewees of a publication "The Natural Resources and the Environment" that was regularly published for over ten years and distributed to all members of the Parliament in conjunction to the state budget. Regular publishing is possible only by institutionalisation of the product.

There are various ways that the indicators can be disseminated and users have different preferences for information sources (Table 9). The Internet provides an efficient forum for dissemination and its importance was stressed by the politicians and their assistants as the main source of information. It provides a good platform for instrumental use, as data can be retrieved in seconds. It means, however, that the indicators must be named clearly and the search engine finds what the user seeks. A fur-

ther channel of dissemination is direct communication in workshops and special events.

Timing of the indicators is important and relates to the interest of the policymakers at the time the indicators are provided. It makes sense and relates largely to getting the indicators used: if indicators are available at the right time and the information is new and timely, they also attract the politicians.

The providers should be aware of the practical needs the users have. The consideration of the user needs in the indicator projects varied. Although the national indicator process did not involve users, choices such as smaller than the standard environment administration report layout size (A5 instead of A4) and the Internet pages did take users into consideration. The regional process involved users and the CD-rom with monitoring tool application was designed for various uses from presenting the region to assessing eco-efficiency.

A successful indicator format to reach high-level decision-makers are the indicator leaflets that the FNCSD has produced since 2004 for its meetings four times a year. The leaflet combines successfully what the decision-makers communicated in the interviews in 2001-02 about timing, timeliness, quality of the graphs, accessibility and the policy relevance. Each leaflet contains 8 indicators (which also forces the process to be extremely selective) that best measure the meeting theme from the sustainable development point of view. The selection process is technocratic, mainly because the time span is often less than a month. The resulting product is policy relevant to the meeting theme, timely and with latest updates, the graphs are of high quality and the participants of the meeting are handed the leaflet on top of all the other material on the meeting table. The interpretations are left as short messages above the indicators as the product is intended for immediate digestion at the meeting. These leaflets are not tools for long-term monitoring of sustainable development, but certain elements from them should be adapted to larger indicator projects as well.

Resources to disseminate the indicators are important. The national SDIs were published with a print of less than 1,000 copies supported by the edited Internet pages. In comparison, representative of the United Kingdom recently reported that they had distributed 54,000 copies of their latest SDI publication since July 2007 (Presentation by Stephen Hall 8.4.2008). The Internet should not be used as an economic solution for distributing publications. Instead, its full potential should be used but it involves expensive web-design as well. Furthermore, in order to seriously promote the use of indicators, the practitioners should set targets to use, for example by monitoring the Internet downloads. The existence of an indicator site could be given a three-year mandate and its use and usefulness could be assessed after the time period.

SDI sets are often miscellaneous collections of variables ranging from commonly known and used GDP to very country specific indicator like the ice-breaking date of the River Tornio. Hence the use of the indicators within the set can vary considerably and the choice of individual indicators can contribute markedly to the use of the whole set. This heterogeneity can be turned into a strength in communication strategies of highlighting different indicators to different users.

4.2.5 Weak institutional capacity

Institutional capacity building is essential for further development of the indicators and their subsequent updates. Also promotion of their use requires people to present them. The national process relied largely on one person, although continuity has been secured through adequate funding. However, regular updating mechanisms were not established and the project has been vulnerable to staff changes. In the ECOREG Project the indicator set was adopted by the local environmental authorities for updating and further updates which assures regular updates and publication.

SDI projects are often carried out as projects, especially in the local level and the projects end with the ready product. Money for further promotion of updating is seldom reserved. It is also common in the local level that the projects have been very reliant on a certain person and their absence ends the project (Rydin, 2004).

Institutionalisation has three aspects: adequate funds to continue updating and dissemination as well as establishing structures that are not reliant on one person only. The latter also involves careful records of the processes, data sources and experts. A third aspect would be a link to procedures such as the state budget that "The Natural Resources and the Environment" has been attached to (previous section).

Lack of timeliness is an inherent problem to all indicator publications nationally and internationally (Article I). It is often explained by the process of selecting, collecting and interpreting which takes time, but the national network has also considered that an indicator set describes a phenomenon and hence rigorous updating is not necessary. However, the users highlight this in their direct answers and also indirectly by naming the media as their main source of information. Of course media raises issues that are politically important, but media is also often updated. The information centre of the parliament also confirmed timeliness to be of outmost important. Furthermore, timeliness was the most important problem that my study at the Prime Minister's Office identified in spring 2008 (Rosenström, 2008).

The reason why timeliness is a problem that should be solved is that indicators by definition make a promise of a timely and often updated piece of information. Indicator reports are supposed to be smaller and hence quicker and easier to update than larger monitoring reports. The truth is, however, that conventional paper reports cannot be updated in a speed that would satisfy users of the modern Internet society (Article I). Hence the most reasonable solution is to link the indicators into data registers of statistical offices for instant updates (*e.g.* Eurostat www.ec.europa.eu/eurostat/sustainabledevelopment).

Timeliness affects particularly instrumental and legitimising use. Politicians need up-to-date information on the effects of their policy which is difficult with 2-3 year time lags. Similarly politicians using the information to support their own causes want to look credible and hence seek for the latest information.

4.3 The necessity of a broad view of use

Besides looking at the different shortcomings in the indicator sets and in processes to develop them, it is important to recognise that there are different types of use (section 2.1.2). The principles and criteria that support use may differ considerably depending on the type of use in question. In the current public sector management, the role of indicators is seen as means of enhancing policy effectiveness by increasing the government's accountability. Hence instrumental use is related directly to the idea evidence-based policy-making that uses indicators to measure policy performance. However, my research shows that SDIs are more likely to be used conceptually and legitimisingly according to the needs and interests of the users.

The reason that conceptual and legitimising uses are more likely to take place is partly because the characteristics of the users and also because the ways indicators are currently developed and presented do not support instrumental use. The potential users of SDIs are a difficult and diverse group, because the users generally comprise all sectors and especially political decision-makers represent a wide array of backgrounds and ideologies. Table 19 explores the interrelationship between types of use and factors that influence use.

Instrumental use

In contrast to the common belief, instrumental use is an exceptional type of use. In order for it to occur the indicator set must match with several criteria (Table 2). Instrumental use is most likely to happen when the indicators are clearly linked to an existing strategy or policy that can be measured. High policy relevance is important to operationalise the indicators.

Data availability is a practical matter that says nothing about the importance of an issue, but it is trivially a condition for instrumental use. A policy performance measurement needs concrete numbers. Interpretations are also pertinent for instrumental use, otherwise the expert evaluation cannot be used. Accessibility

Table 19. How different indicator and user characteristics of decision-makers influence the types of use.

Factors that influence use		*Types of use*		
		Instrumental	*Conceptual*	*Legitimising*
Principles of indicator development	*High political relevance*	Essential for indicators to be used directly	Not necessary, aids in getting the indicators noticed	There must be indicators that match the user needs
	Sound indicator quality	Congruence with political agenda is the most important issue, quality is essential	Indicators must be of high quality (clear presentation, contain appropriate metadata)to catch attention	Professional looking presentation and inclusion of data is important when the user chooses which indicators to use in his own work
	Developed through efficient participatory process	Ensures relevance of the indicators and feeling of credibility among the users	Promotes learning among the participants	Little impact, may encourage use if actor has first hand experience
	Disseminated effectively	Direct use is impossible unless there is awareness of the indicators	Dissemination that concentrates on the messages can make an impact over time	Those that seek indicators to prove their points will find if available (search engines are important tools)
	Institutionalised for regular updates and further development	Critical to ensure timeliness and availability of the indicators.	Not so important, but may support learning if presented regularly over time	Active seekers will go elsewhere if the data is not updated.
User characteristics	*Political ideology*	Indicators must match user's political ideology in order to be used	Quite important, although learning may take place even if opposed ideology to SD	Matching ideology likely to promote use, but "negation" may also lead to use
	Interests	Indicators must be in line with the user's political agenda	Probably not very important	Strong link as the indicators are selected for use according to needs
	Prior understanding	Essential basis for understanding the message of the indicator	Supports further use	Supports use

and active dissemination of the indicators are vital for instrumental use.

Participation can enhance instrumental use.The technocratic national process involved many civil servants and researchers in the process. Consequently the indicators have been recognised and used by research and educational sectors (Section 3.4). This can indirectly lead to use by decision-makers as well, as the indicators may have influenced works and views of the civil servants and experts working for the decision-makers. The inclusion of users in the regional process clearly supported instrumental use. Involvement of the high-level policy-makers is, however, often difficult on the national leve.

Institutionalisation secures regular updates and constant dissemination of the indicators. These are qualities that are needed for all use types, because otherwise the indicator set is a single static publication that raises little interest after its publication.

Uses also vary in the different stages of the policy cycle (Figure 1). In the policy cycle instrumental use of indicators takes place most clearly in the policy evaluation, as the indicators show whether the policy has been executed and what impacts it has had. Instrumental use is also expected in the policy formulation and implementation. Indicators help to set targets and they are tools to monitor policy implementation.

Hence, for instrumental use of indicators to take place in the policy cycle, they must not only be policy relevant but they must appeal to the user in other ways as well. The threshold to use indicators that measure an explicitly formulated policy may not be so high, but for indicators that measure a value-laden concept of sustainable development the indicators face even greater obstacles from the user's own perspective on the issue. Although there are politicians that cannot be influenced by any new data on a certain issue if they have made

up their mind, it may still be worth trying to produce as credible and reliable indicators as possible. There are also options to produce indicators that are more likely to appeal to those decision-makers that regard statistics unreliable. For example, average temperatures or number of bad air-quality days may be more neutral and hence more likely to match with user's ideology and interests.

Conceptual use

Conceptual use was frequently referred to by the interviewees (section 3.1) as learning about sustainable development. This type of use was identified from answers such as "indicators are a help tool "and "indicators are best to raise awareness". Similarly, the parliamentarians felt that the public can learn about sustainable development from the indicators. In the national process conceptual use occurred with the stakeholders in terms of learning about feasibility and data availability. The Permanent Secretaries also considered the main use of indicators for decision-makers to be conceptual. This result matches well with the notion that in general indicators are meant to indicate and highlight important issues.

In the ECOREG Project, the recognition of eco-efficiency as an important concept and inclusion of it in the regional strategies is form of conceptual learning in the part of the regional policy makers. The media coverage in the regional newspapers contributed to conceptual use by the readers. The ECOREG Project used the opportunity to share the process with the users and local actors and some process use must also have occurred as well.

As for the indicator characteristics, attractive presentation with clear messages and well-drawn graphs, interpretations, and comparisons are important. The idea is that even if the user is not searching for new information, they are attracted by the indicators. Conceptual use relies on accidental acquaintance of the user and the indicators, hence participation and dissemination is very important. Furthermore, since they are learning from the set, it is important the layout supports conceptual use which also means well-written interpretations.

Sustainable development indicators which are less policy relevant but comprehensive in scope are most likely to be used conceptually. It is then important that the indicators are actively promoted and easily accessible with emphasis on the technical qualities. Inclusion of many perspectives leads easily to a large set of indicators, which may not be useful for direct policy-making. The decision-makers liked the variety because they found many stakeholders to increase credibility and the wide number of indicators meant more to choose from.

As for the user characteristics, the interviews with policy politicians suggest that those with a higher level education are more willing to collect and digest new information and possibly also willing to let new information influence them. The parliamentarians differed in that those longer in office were more fixed in their opinions, despite the fact that they were interested in new information (Table 9). Higher education contributed to their skills in reading research findings and hence conceptual use of indicators was more likely to take place. Furthermore, high education makes it likely that they have prior information on the subject and that can support learning.

In the policy cycle conceptual use of indicators takes place continuously as indicators are published and presented. Mostly learning takes place in the public awareness raising. Also, if the policy is difficult to articulate such as sustainable development, then indicators contribute to learning about the concept.

Legitimising use

Legitimising use generates from active quest for suitable information and hence well presented and appealing indicators increase the likelihood of use. The presentation is significant to legitimising use as the users adapt the indicators in their own presentations. Data availability can be important although weak indicative data may often be sufficient for legitimising use. Larger sets are attractive, as it provides more options to pick pleasing indicators.

Although participation was used in the indicator exercises mainly to receive expert inputs and achieve consensus of the most suit-

able indicators, participation also enables the participants to strongly advance their own interests. This is one of the problems related to participation: the influence of the participants varies due to their capacities and interests. Therefore legitimising use of the indicators may take place in the development phase if certain parties strongly demand their issues to be taken aboard.

Moldan (1997) emphasises the role of the public in the policy cycle. In order to engage the public, he calls for appealing and effective indicators of persuasion. In the policy cycle legitimising use is practised by those who want to draw attention to a new problem (e.g. scientists, stakeholders) and to raise public awareness to support the policy formulation.

Politicians with mainly secondary level education and possibly a profession such as nurse or farmer were much more troubled about the amount of information that they are constantly provided with. They wanted to stress that their views and beliefs are promises to electorates and hence the main use of information to persuade others. Here political ideology and interest have a big role in influencing which indicators are used. Prior understanding will further support the use.

To summarise, information is used in many ways and contrary to earlier beliefs about the instrumental use of indicators their most likely role is different. This is particularly true for SDIs that struggle to find their role among the decision-makers. The material on the use of the two indicator processes shows that the role of indicators in the policy cycle presented by Moldan (1997) is quite theoretical and most use takes place among researchers and the public trying to influence the decision-makers. The indicators serve as background material which means that their main role is awareness-raising among the decision-makers and the public. Furthermore the indicators have been used by the media and researchers to communicate about sustainable development issues. In the international forum the case is very similar because of the problems to find universally applicable and acceptable sets of SDIs and hence a more suitable role for them could be to raise discussion and serve as a communication tool as well (Hukkinen, 2003a). The question is whether the civil servants and practitioners that are responsible for the indicator projects are willing to accept this type of lower profile role.

Finally, although it is justified to examine the characteristics of the different uses separately for analytical reasons, one should note that they are closely related and linked (Figure 5). Conceptual use is the most common type of use and can be considered to be a prerequisite for any other use to take place, as the indicator must placed in a cognitive framework. If the information provided by the indicator cannot be grasped in any way and not linked to anything meaningful for the potential user the indicator will simply be discarded. Weiss and Bucuvalas (1980) have argued that the user will test its suitability to his/her own views and needs upon receiving the indicator information, but this can only happen after a basic conceptual use has taken place. The use may not go any further than the learning, but it may also lead to instrumental and or legitimising use immediately or later in the future. Legitimising use may follow instrumental use to justify decisions or actions, but indicators may also be used to legitimise issues that are not directly related to any specific instrumental use of the information. Thus the user may move directly from grasping the issue into using it in his/her own work to persuade others and hence use them legitimisingly.

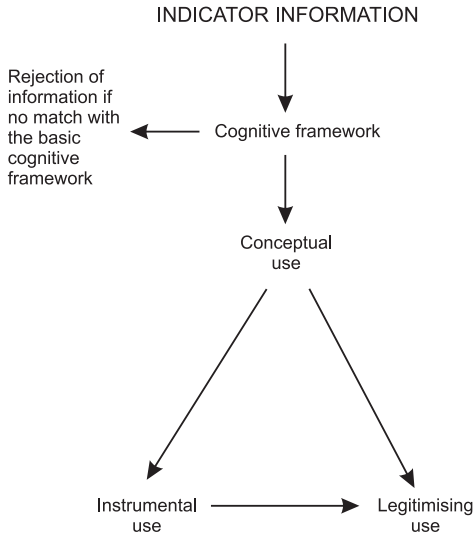

Figure 5. *The general model of indicator use.*

5 Conclusions

This dissertation has explored the different situations, users and types of SDI use. It has also identified the main obstacles and underlying processional reasons that have deterred the use. The reasons include characteristics of that make certain indicators more popular than others.

The findings link closely to ongoing research (*e.g.* Gudmundsson, 2003; Hezri, 2004; Lehtonen, 2008 and EU 7th Framework Programme themes) and adds an important perspective of a practitioner to the academic debate. The recent literature on indicator often focus on certain aspect of indicator use such as the need for better participation processes (*e.g.* King *et al*., 2000; Eckeberg and Mineur; Turnhout *et al*., 2007), institutionalisation (Rydin, 2004) or questioned the policy influence of SDIs (*e.g.* Gahin *et al*., 2003). Bauler (2007) and Hezri (2006) have written doctoral dissertations of indicator use, but their focus was more on policy influence and they personally had not participated in indicator development. The novelty of this work is attributed to first hand experience of indicator development and attempts to increase their use. The following findings provide SDI practitioners with new insights that can structure and improve the future works of SDI development considerably.

The evaluation use research recognises three major types of research use that are instrumental, conceptual and legitimising use. Instrumental use is what most researchers and practitioners expect, but in reality conceptual and legitimising uses are more common. The most likely use for a SDI set by policy-makers is conceptual due to the low and ambiguous policy relevance of sustainable development. This type of use is also common for other user groups, namely the media, civil servants, researchers, students and teachers. Policy-makers themselves considered the most obvious use for the indicators to promote their own views which is a form of legitimising use. Most mentioned speeches and presentations as concrete examples.

There are interesting tensions between the uses. Specific tailoring of the indicators for a certain type of use may diminish the other types of use. High policy relevance is a prerequisite for instrumental use but it narrows down the holistic approach inherent to sustainable development and conceptual learning. Instrumental and legitimising uses are highly dependent on the political agendas of the users and if these types of uses are wanted, the practitioners will have to compromise what they deem important.

Although the content of the indicator sets defines largely their use, it is influenced by other factors as well. These include the user characteristics and the political situation that the indicators are intended for. The following key criteria for the different types of use were identified in this dissertation (Tables 2 and 19):

Instrumental use:
- High political relevance
- Participation
- Timing and timeliness
- Good availability and access
- Match user's ideology and interests
- Data availability
- Interpretations
- Institutionalisation

Conceptual use:
- Attractive presentation with clear messages and well-drawn graphs
- Participation increases learning effectively
- Interpretations
- Comparisons and forecasts
- Larger sets

Legitimising use:
- Must match the user needs and interests
- Attractive presentation with clear messages and well-drawn graphs
- Data should be available, although quality not so important
- Timeliness
- Larger sets

The SDIs have different types of use in the policy cycle and instrumental use is not very likely or even desirable at all phases. Stages of persuading the public and the decision-makers about new problems as well as in formulating

new policies employ legitimising use. Learning by conceptual use is also inherent to policy-making as people involved learn about the situation and act on it. Instrumental use is most likely in policy formulation, implementation and evaluation.

Exploration of the use of the SDIs also widens the concept of the expected users. Although it is important to focus on decision-makers, it is essential to acknowledge that teachers, journalists, researchers, students, civil servants and consultants also benefit from the information the indicators provide. This result is evident from analysing the policy cycle and from the research results of the national Internet page use and citations of the national publication. The findings should be used for both better tailoring of the indicator products and for considering the different user types in the dissemination strategies.

The user point of view on the types of indicators that they prefer and that are most likely to influence them is based on the interviews and on the indicators that the media highlighted in their press cover of the indicator sets. The interviewees wanted the indicators to exhibit reliability by using only official data sources, use simple presentation techniques that ensure correct and quick understanding of the message, include longer time trends that provide the whole picture and enable interpretation of the direction of change, and finally to contain comparisons to other regions and countries. This quality would further help in understanding and interpretation of the development that the indicator communicates. Policy relevance and timeliness of the indicators were also of key importance to those working with policy-makers.

The media attention was caught by indicators such as the ice-breaking date of the River Tornio that can be characterised as a "down-to-earth" indicator that the public can relate to. The development of mean temperatures and number of days of bad air quality are further examples of such indicators. The indicator series in *Helsingin Sanomat* also chose indicators that people can relate to such as life expectancy and numbers of grey seals. The interpretations that the journalists wrote were also much closer to everyday lives and probably serve better conceptual learning. The conclusion is that practitioners should develop indicators that the users can relate to, especially for SDIs that aim to increase enlightenment about sustainable development.

A framework to analyse and highlight the main issues provided a way to identify the key obstacles to use. The two immediate problems with current indicator sets are that the users are unaware of them and the indicators are often unsuitable to the user needs. The reasons for these major flaws are irrelevance of the indicators to the policy needs, technical shortcomings in the context and presentation, failure to engage the users in the development process, non-existent dissemination strategies and lack of institutionalisation to promote and update the indicators. The importance of the different obstacles differs among the users and use types.

The main deterrent to instrumental use is the low policy relevance of the SDIs. This is a problem that is inherent to sustainable development and it may be impossible to solve due to the ambiguity of the concept. Hence bringing SDIs to political agenda requires work beyond the indicator selection. A possible solution here would be to aim at the learning potential that the SDIs provide rather than aiming at the hard core of the political decision-making. However, to ensure use, mechanisms to bind the indicators to national sustainable development strategies are well argued for. The first set of Finnish national SDIs failed in this respect and that was the main reason for little use.

Despite many years of work on the technical aspects of the indicators, they still often fall short of the crucial criteria that affect use. The interviews show that raw data and metadata should be provided with the indicators. Timeliness of the indicators is of outmost importance to indicators that are presented for instrumental and legitimising use, an issue that has been ignored due to large sets and low resources to update them. Plans to develop indicators should have a longer time span that also identifies the updating responsibilities and resources. Other shortcomings included insufficient interpretations and the low quality of the graphic presentations.

Policy relevance and congruity with the user needs can be significantly increased with adequate participatory process. If the users or those closely working with them (*e.g.* political assistants) were involved in the development process, the selection could match better the user needs, their preferences for data and display of the data, as well as identifying the best marketing channels and updating frequency. Inclusion of only experts and civil servants led to the pitfalls of technocratic process that produces large sets of compromised indicators without a direct link to the user needs.

The dissemination of the indicators has also been a bottleneck that deters use. The resources for dissemination have been small and a plan to market them was not developed. Furthermore, the point of the marketing was in the context of the indicator publication and not in the use that might follow. Also, the Internet pages need to be promoted if we want to enhance the concept of sustainable development and not just find any use for the indicators. Indicators are tools to aid decision-making by definition and hence they cannot be static reports waiting for someone to find them. It should also be noted that different user groups may prefer their information in other than electronic formats and that should be considered as well.

The last handicap to use, mainly to instrumental use, is the improper institutionalisation of the indicators. Institutionalisation means adequate structures, plans and funds to regularly update, disseminate and further develop the indicators. Funding to organisations that are responsible for the indicator work is not enough. Attention should also be given to institutional memory.

To conclude, the lack use of the SDIs can be attributed to the difficult concept of sustainable development, the numerous shortcomings with the sets and the processes to develop them, and also in the practises and preferences of the decision-makers to use information. Indicators are good tools to support decision-making, also for sustainable development, and hence improvement of the indicators according to the principles presented here and awareness of the use types, policy phases, and user characteristics is worthwhile. Lastly, a greater sensitivity to the context of the indicators is needed.

It is also important to accept that instrumental use is not the highest form of use. All forms of use are important and those developing indicators are well advised to be aware of the different requirements these put on indicators. The different types of use do not exclude each other and different types of uses may follow each other. Furthermore, conceptual use is a base for all use as the indicators are best left unused if the user does not understand them.

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My girlfriends have all provided me with great models of intelligent and successful women. I am proud to have them as friends

and want to keep up this good-sister-network in the future!

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Annex I. Members of the Finnish National Council for Sustainable Development in 1999-2003.

1. Sami Parliament in Finland
2. Åland provincial government
3. Parliamentary Committee for the Future
4. Parliamentary Environment Committee
5. Parliamentary Foreign Affairs Committee
6. Ministry for Foreign Affairs
7. Ministry of Agriculture and Forestry
8. Ministry of Justice
9. Ministry of Transport and Communications
10. Ministry of the Interior
11. Ministry of Trade and Industry
12. Ministry of Defence
13. Ministry of Social Affairs and Health
14. Ministry of Finance
15. Ministry of Labour
16. Ministry of Education
17. Ministry of the Environment
18. Council for Natural Resources
19. Association of Finnish Local and Regional Authorities
20. Statistics Finland
21. Finnish Environment Institute
22. Finland Futures Research Centre
23. National Forest Research Centre
24. Finnish Game and Fisheries Research Institute
25. The Finnish National Board of Education
26. Government Institute for Economic Research
27. Finnish Academy
28. Helsinki University Institute of Development Studies
29. National Research and Development Centre for Welfare and Health
30. The Central Union of Agricultural Producers and Forest Owners
31. Central Union of Finnish Trade Unions SAK
32. Finnish Forest Industries Federation
33. The Finnish Confederation of Salaried Employees STTK
34. Confederation of Finnish Industry and Employers TT
35. Trade Union of Education in Finland OAJ
36. Federation of Finnish Commerce and Trade
37. Confederation of Unions for Academic Professionals
38. Federation of Finnish Enterprises in Finland
39. Service Centre for Development Cooperation Finnish Youth Co-operation Allianssi
40. Coalition of Finnish Women's Associations for Joint Action NYTKIS
41. Finnish Consumers Association
42. UNICEF Finland
43. Finnish Association for Nature Conservation
44. Environment Journalists
45. WWF Finland
46. Friends of the Earth Finland
47. Natur och Miljö
48. Luonto-Liitto ry
49. Jaakko Pöyry group

Annex II. The interviewees

Name	Title
Salme Kandolin	Committee Counsel
Rakel Hiltunen	Member of the Parliament (Environment Committee)
Olli Lehtonen	Assistant to Rakel Hiltunen
Susanna Huovinen	Member of the Parliament (Environment Committee and Committee for the Future)
Sari Rimmi	Assistant to Susanna Huovinen
Tarja Kautto	Member of the Parliament (Environment Committee)
Jaana Leppäkorpi	Assistant to Tarja Kautto
Jari Leppä	Member of the Parliament (Environment Committee)
Pia Viitanen	Member of the Parliament (Environment Committee)
Jarkko Auvinen	Assistant to Pia Viitanen
Pentti Tiusanen	Member of the Parliament (Environment Committee)
Sauli Hievanen	Assistant to Sauli Hievanen
Satu Hassi	Minister of the Environment
Heidi Hautala	Member of the European Parliament
Antti Rautava	Head of the Parliament's Information Centre
Martti Tiuri	Member of the Parliament (Committee for the Future)
Kalevi Olin	Member of the Parliament (Committee for the Future)
Jouni Backman	Member of the Parliament (Committee for the Future)
Christina Gestrin	Member of the Parliament (Committee for the Future)
Leea Hiltunen	Member of the Parliament (Committee for the Future)
Ulla Juurola	Member of the Parliament (Committee for the Future)
Kyösti Karjula	Member of the Parliament (Committee for the Future)
Jyrki Katainen	Member of the Parliament (Committee for the Future)
Markku Markkula	Member of the Parliament (Committee for the Future)
Petri Neittaanmäki	Member of the Parliament (Committee for the Future)
Juha Rehula	Member of the Parliament (Committee for the Future)
Esko-Juhani Tennilä	Member of the Parliament (Committee for the Future)
Pekka Vilkuna	Member of the Parliament (Committee for the Future and Environment Committee)
Antti Satuli	State secretary, Ministry for Foreign Affairs
Kirsti Rissanen	Permanent secretary, Ministry of Justice
Kari Häkämies	Permanent secretary, Ministry of the Interior
Raimo Sailas	Permanent secretary of State, Ministry of the Finance
Jarmo Vaittinen	Permanent secretary, Ministry of the Agriculture and Forestry
Juhani Korpela	Permanent secretary, Ministry of Transport and Communications
Erkki Virtanen	Permanent secretary, Ministry of Trade and Industry
Markku Lehto	Permanent secretary, Ministry of the Social Affairs and Health
Markku Wallin	Permanent secretary, Ministry of Labour
Sirkka Hautojärvi	Permanent secretary, Ministry of the Environment

Annex III. The interview questions

The structure of the interview
First a short presentation of "Signs of Sustainability"- publication (especially to the Permanent Secretaries) The questions

1. "Signs of Sustainability- Finland's sustainable development indicators 2000"
- Are you previously familiar with the publication?
- What are your primary feelings about the publication (e.g. clarity of the graphs, length of the interpretations, number of indicators, the targets, readability, lack of key indicators)?
- How can the publication be improved?
- Would you like to have a small set of key indicators (e.g. 15 indicators)?
- What is the right role for the indicators (e.g. tool to promote sustainable development or a source of general information)?

2. Usability and characteristics of indicators in general
- Under what circumstances are indicators particularly useful in your work?
- What kind of indicators are useful for your work?
- What are most important criteria for indicators in order to be useful?
- Are you aware of any other indicators/ indicator publications?

3. Use of environmental information in your work
- Do you use environmental information in your work? Especially when?
- Where do you get environmental information?
- Who provides reliable environmental information and what makes it reliable?
- How do you assess reliability?
- Are you familiar with publications of the Environmental Administration?
- The role of the media to produce environmental information?
- What kind of (environmental) information suits decision-making?
- Can politicians be influenced by information, what steers information gathering processes?
- Should there be more international comparisons?

4. Meaning of the different dimensions of sustainable development in your work
- What is the value of environmental monitoring data in comparison to GDP or unemployment rates? What is the most important dimension?
- How should the different dimensions be measured?

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