Producing Multidisciplinary State of the Environment Reports: Two Tales from Finland

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Abstract: *Disseminating information produced by environmental research to decision-makers and the public is a prerequisite for effective environmental policy formulation and implementation. This paper explores the possibilities for improving the efficiency of producing national level State of the Environment (SoE) reports. The main focus is on practical problems related to preparation of SoE reports, such as co-operation between editors and between different stakeholders. The preparation processes relating to two recently published Finnish SoE reports are described. The cases presented here indicate that the key factors for successful preparation of a SoE report include experience gained with earlier projects, trust between editors and co-operation with various stakeholders. Social capital is proposed as a potentially useful concept when developing the practices of SoE reporting.*

Keywords: State of the environment, reporting, multimedia, textbook, integration of knowledge, participation, social capital

1. Introduction

State of the Environment (SoE) reporting is nowadays a well-rooted feature of environmental policy in most industrialized countries. In the European Union, the reporting directive (2003/4/EC) has recently been introduced to implement the United Nation's 1998 Århus convention on greater public involvement in environmental decision-making. The directive exhorts public authorities to make environmental information available to the public in the widest possible way. As a method for effective dissemination of the information the directive emphasizes the use of new information and communication technologies.

SoE reports have been published on a regular basis at international, national and local levels and many of the recent reports are available online (see e.g. . http://www.unep.org/GEO/; http://countries. eea.eu.int/SERIS; http://www.iclei.org/infoch. htm#publist). Corporate environmental reporting emerged in the late 1980's, and now there are over 1,000 environmental reports published annually, with growing tendency towards reporting in electronic format and incorporating environmental, social and economic reporting (Scott & Jackson 2002).

United Nations (UN 2001), Organization for Economic Co-Operation and Development (OECD 2001) and European Environment Agency (EEA 1999), among others, are developing frameworks for more harmonized reporting. Some 300 organizations are also issuing corporate sustainability reports referencing a common framework provided by the Global Reporting Initiative (see http://www.globalreporting.org).

These trends, namely the institutionalization of different forms of environmental reporting and the growing use of new information and communication technologies, are taken as a background for this enquiry.

2. Approach and Methods

SoE reporting has been widely studied from the perspective of data gathering and processing. Especially environmental indicators have raised considerable interest. Various studies have demonstrated how to collect the data, how to choose the indicators, how to aggregate indicators and how to integrate environmental and sustainability issues (e.g. Dale & Beyeler 2001; Moldan et al. 1997; Kuik & Verbruggen 1991). Corporate environmental reporting is another widely studied area of SoE-reporting (e.g. Lodhia 2004; Scott & Jackson 2002).

Here the focus is on national level SoE reporting providing descriptions about environmental issues and assessments about their severity needed in state-level policy-making. These reports are important tools for awareness-raising and educating the public. Mechanisms created for national level reporting can also serve as a basis for international, regional and even local level reporting.

There are various reasons to launch SoE reporting processes, including the need to inform policy-makers, to increase public understanding about an issue and educate students, to convince various stakeholders and to meet government requirements (Farrell et al. 2001; EEA 1999). The aim of the SoE report is on the one hand to give a coherent general picture of the state of the environment, and on the other hand to assess environmental conditions, pressures and responses to reduce environmental problems.

SoE reporting is a multidisciplinary process in the sense that it incorporates both the changes and conditions of the natural state of the environment and the human activities causing, mitigating or preventing harmful changes. The multi-causality of environmental problems is a serious challenge for SoE reporting. There are often several driving forces behind a certain environmental problem, as well as various possible solutions. Thus, gathering, harmonizing, aggregating and communicating data and knowledge from different sources is an important challenge for SoE reporting from scientific point of view. This also includes selecting the issues to be included or left out, and reconciling contradictory scientific results and value-based viewpoints.

SoE reporting is understood to include more than just an individual or a team collating environmental information. Besides the editors, various individuals and institutions are included, directly or indirectly. These include e.g. financiers that choose to finance the report, various scientists that produce the information, and the intended audience of the report.

The main task here is to explore the possibilities for improving the efficiency of producing a SoE report. The focus here is on the SoE reporting as a social process. This perspective can fruitfully illustrate the variety of the challenges related to different phases of preparing a SoE report. These challenges include very practical problems such as how to find the best possible people to do the job and how to organize the report's compilation, but also problems of more theoretical or scientific nature, such as how to determine the objectives, define the structure, choose the content, design the publication and evaluate the publication process (Denisov & Cristoffersen 2001; Scott 2000; EEA 1999). In this article, the focus is on practical problems, such as co-operation between editors and between different stakeholders. These questions are also relevant to science communication in general.

The paper builds on author's own experiences and insider knowledge gained during the preparation of two recently published SoE reports focusing on the state of the environment in Finland. The book reviews describing these reports are also used to review the success of the reports. A framework drawn from Farrell et al. (2001) is used to contrast the experiences and to draw wider lessons.

The first case explored here is an extensive CD-ROM publication (Hallanaro et al. 2000). The second case is a textbook describing environmental trends and development within different sectors of the Finnish society (Hakala & Välimäki 2003). The main features of the two reports are summarized in Table 1.

Table 1. Comparison of the Nature in Finland CD-Fact (NFCD) and the State and the Protection of the Environment in Finland (SPEF). See further explanations from the text

	NFCD	SPEF
Time of preparation	1996-2001	2000-2003
Core persons involved in preparation	5 editors, 4-6 technical editors, 0-2 assistants	2 editors, 2 co-editors, 1 technical editor, 1 trainee
Main features of the report	Approximately 900 text pages, 1000 figures, 1500 photographs, visual and sound effects, glossary, teacher's guide, help and search functions	446 pages, 166 figures, black-and-white layout
Format of the report	2 CD-ROM disc	Book, available also as a PDF-file
Language versions	Finnish and Swedish	Only Finnish
Main target audience	The public, schools	Universities, the public
Resources used (person-years, approximation)	22	2,5
Topics included (by chapter)	The Earth; Europe; areas neighbouring Finland; water resources; shores; mires; forests; arctic fells; rural areas; urban areas; landscapes; biodiversity; climate change; ozone depletion; acidification; eutrophication; toxic substances; waste; noise; health; consumption; land use planning; housing and building; traffic and transport; energy; industry; forestry; agriculture; environmental policy; environmental research	History of environmental protection; characteristics of environmental problems; dimensions of environmental protection; eutrophication; acidification; climate change; ozone depletion, radiation; toxic substances; biodiversity; natural resources; noise; energy; traffic and transport; agriculture; forestry; industry; consumption; waste; information society; assessment of environmental protection in Finland

3. Multimedia-format: Exciting and Expensive

3.1. Background of the report

Nature in Finland CD-Fact (Hallanaro et al. 2000; hereafter NFCD) is a CD-ROM publication that includes 30 main chapters, structured under four main perspectives: The Earth, Ecosystems, Environmental Concerns and People & Society (Fig. 1). It has a strong emphasis on visual dissemination of the information and an appealing audio-visual appearance. The NFCD was published in Finnish in October 2000, after four years of intense preparation. The Swedish language version was published in 2001. The NFCD followed two other previously published SoE reports (Wahlström et al. 1993; Wahlström et al. 1996) and used partially the same datasets.

Planning for the NFCD started immediately after the 1996 book was published. At that time there were a variety of positive expectations connected to the potentials of an electronic publication (see Denisov et al. 1998). In Finland the "hype" about new information technology was emerging (Castells & Himanen 2002). After the initial two books there was also a feeling among the editors, continuing with the planning of a new report, and the funding agency, the Ministry of the Environment, that it would be worthwhile to try something completely new.

One of the main reasons to favour the electronic format was the possibility to incorporate a great deal of information. This was considered important especially because of the proliferation of environmental information, provided by extensive environmental monitoring and research (see Niemi & Heinonen 2002). However, it was not only how to put all the relevant information into one package that was challenging, but also how to make the right information easily accessible. With electronic search engines finding the right information can be made quick and easy.

The extra cost of producing a report full of pictures and special effects was accepted because it was considered important to keep the environmental reporting up to date with the development of communication practices elsewhere in Finnish society. Making the report more appealing using moving visual and sound effects was considered to be a promising way

of gaining the interest of younger audiences. However, the report was also aimed to the wide audience and for the environmental professionals.

Electronic media was considered to be especially suitable for educational purposes. The National Board of Education financed the making of a separate teacher's guide, including general advise of how to use the NFCD, questions for students and pointers how to find information from the CD-ROM to solve the questions.

In such a wide-ranging report it is a challenging task to point out all relevant connections between issues or themes. With interactive hyperlinks this task can be fulfilled in a manner that leaves room for the user to follow their own interests without compromising the integrity of the report. In order to illustrate the multicausality of environmental problems, a tree-like structure was used in the CD-Rom. Instead of linear structure NFCD include four main perspectives and a lot of opportunities to leap from one branch to another and move between different themes.

3.2. The Production and Publication Process

During the five years of preparation, including translation and publication, there were over twenty people closely involved with the NFCD. Five people had the main responsibility for editing and writing the manuscript. Based on earlier experiences, priority was put on the reliability and high quality of the text. Because it is more difficult to read text from the screen than it is from printed paper, extra effort was given to making sure that the text was concise and easy-to-read.

A technical team of four to six individuals was responsible for the technical and visual design. The communication between the editors and the technical team changed during the process from formal to more informal practices. For instance, the weekly meetings soon became unnecessary and were abandoned as more informal ad hoc communication – e-mails, phone calls and face-to-face contacts –evolved.

The original plans changed substantially during the preparation process. At an early stage, the NFCD was planned to include four CD-ROM discs and a DVD-version. Several chapters were combined together, and a main perspective describing environ-

mental values were left out. The number of figures was initially underestimated to be approximately 500 and the amount of photographs 200. The English language version was left out for financial reasons and because it was felt that the substance of the report would have to modified according the needs of an international target group.

In order to save costs, it was crucial to make the best use of the experience gathered during the project. For example, the editorial team was able to carry out the technical editing of the Swedish version, based on lessons learned during the preparation of the Finnish language version.

The publication of the NFCD gained substantial coverage in Finnish media: several news stories were published based on press releases, and at least 30 reviews in newspapers and magazines appeared. The publication was also referred to on the national TV and radio channels. Despite this positive public attention, and a marketing campaign directed to the schools, the number of copies sold remained modest. This was perhaps because of the unfamiliarity of the electronic format among the target group, and a relatively high price compared to the book format. It was also technically easy and legally permitted to copy the NFCD for personal use, which may have affected to the number of copies sold.

4. Back to the Roots: Black and White Textbook

4.1. Background of the Report

The State and the Protection of the Environment in Finland (Hakala & Välimäki 2003; hereafter SPEF) includes four main sections: introduction describing environmental history, main sections describing environmental problems and different sectors in society, and a concluding chapter assessing environmental protection in Finland (Fig. 1.). The preparation of the SPEF started against a very different background compared to the NFCD. The main difference was that there was no formal mandate from the environmental administration to publish the report.

Instead the motivation and the opportunity to prepare the SPEF came from several other sources. There was an obvious need for a new book describing environmental matters in Finland. No such books had been published for several years. Also the experiences gathered during the preparation of the NFCD and previous reports helped to initiate the SPEF. The access and knowledge on how to use the data from the environmental administration was also available, because one of the two editors of the NFCD was also the editor of the SPEF. The other editor of the SPEF had experience of university teaching. With these personal backgrounds, the idea was to combine the tradition of the national SoE reporting and the tradition of textbook based teaching in the academic community.

The original idea for SPEF was to update a previously published textbook (Berninger et al. 1996). It soon became clear that updating the old book would require at least as many resources as writing a new book because of the amount of outdated data and the emergence of new concepts. For example, the discussion about material flows emerged in Finland at the end of 1990's (see Hoffrén 2001).

The funding proved to be the most difficult problem to solve. Eventually, the Finnish Environment Institute provided most of the resources. Because of the strict resource situation some work had to be done combined with other projects. This made it more difficult to keep the process organized and on schedule, but also brought additional insights into the book. For example, a chapter describing the environmental implications of information society was added as an input from a separate research project (see http://www.tukkk.fi/tutu/etieto/english.htm).

The main target group was defined to be university teachers and students. The secondary target groups included: the public, environmental lobbyists and professionals and civil servants. With these target groups in mind, a black and white textbook, with soft cover paperback, was the selected format. Cost was the main criterion for choosing this format. The use of colour photographs was abandoned as too expensive and unnecessary. Not using the photographs also made the production process simpler and easier to coordinate. The Finnish Environment Institute, being a research organization, had no objections to this rather stark layout. However, some book reviews were very critical of the black-and-white layout.

4.2. The Production and Publication Process

First ideas for the SPEF emerged in the spring 2000 and active planning phase started at the end of 2001. The writing process lasted from autumn 2002 to the December 2003. Thus, the active production phase of the SPEF was short compared to the four years of writing of earlier SoE reports (Wahlström et al. 1993, Wahlström et al. 1996, Hallanaro et al. 2000). This was partly because the SPEF was technically relatively easy to edit and less extensive as these publications. The availability of the data gathered for previous reports, especially for the NFCD, was an essential factor. These data were coherent and when updated could be easily used for the new publication. Some resources were saved by utilizing the overall structure of an earlier book (Berninger et al. 1996). Two of the writers of this earlier book also agreed, voluntarily, to edit certain chapters.

Close collaboration with the publishing company from the beginning of the project proved to be highly useful. The editor from the publishing company commented intensively the language of the final draft version. This situation was very different from the NFCD. The writing and editing work of NFCD was completed without any substantial input from the publishing company as the publisher influenced only the formulation of the title of the report.

The SPEF was published in March 2003, and the second edition was taken already in September 2003. Based on the number of copies sold, the SPEF is a more successful product that the NFCD, despite the fact that the publication of the book gained much less publicity than the NFCD. Also an electronic version of the book was published in a PDF-format, suitable especially to library use and education. So far, the number of the electronic copies sold remains low. In 2004, the SPEF was used in several universities and polytechnics across Finland.

5. Discussion

SoE reporting is not only a matter of description of environmental conditions but it is also a matter of environmental assessment. For example, SoE reports describing the state of the environment implicitly include a policy performance assessment even when they do not explicitly evaluate the effectiveness of environmental policy. By selecting certain issues to be treated, the reports value them as important. The

environmental assessment can be defined to include the entire social process by which expert knowledge related to a policy problem is organized, evaluated, integrated, and presented in documents or otherwise (Farrell et al. 2001). The two cases of SoE reporting described here can be understood as an integrated environmental assessment, combining several issues and policy problems.

Farrell et al. (2001) identifies four under-appreciated elements of design for environmental assessments, based on experiences gained from five international assessment processes. The under-appreciated elements they identify are: assessment context and initiation, science-policy interaction, participation in assessment processes, and assessment capacity. These elements provide a useful framework for learning from the cases presented above. Using them as a starting point, the experiences from national level SoE reporting can be reflected on with reference to the experience of international environmental assessments.

5.1. Assessment Initiation and Context

The cases studied here show that even when the underlying reasons for initiating the reporting procedure are the same, the methods and the results can vary substantially. The general aim of both the NFCD and the SPEF was to produce reports summing up the latest knowledge about environmental developments in Finland. In both cases emphasis was put on producing a publication understandable for wide audiences and on usability for educational purposes.

However, although a common purpose, the actual ways of working with the preparation processes and format of the publications was different. This can be examined by different "frames", through which the processes were looked at. The frames can be understood as perceptual and interpretative lenses, assumptions and understanding about the nature of the processes related to the SoE report (Farrell et al. 2001).

The Ministry of the Environment officially mandated the NFCD and resources were secured to complete the project. Thus, a formal governmental institutional background and adequate funding characterized the initiation frame. This, together with the very optimistic view towards the new com-

munication technology, opened up the possibility of risky experimentation.

The initiation phase for the SPEF was characterised by a bottom-up and incremental approach compared to the more top-down, pre-planned approach of the NFCD. The SPEF started on a voluntary basis with insecure financing, which made insecurity a substantial part of the frame of the project. Because of this, a traditional, well-known and low-risk format for dissemination was selected. Lack of government sponsorship and insecure financing was balanced with a low-risk information dissemination method. High personal dedication and voluntary work were also important compensating mechanisms. However, the concern about the sufficiency of the budget remained a general frame during the whole project.

5.2. Science-policy Interactions

With respect to cases described here, the science-policy interactions are not as relevant as other three under-appreciated elements of environmental assessments. In the cases presented here, the aim was to produce a report based on scientific knowledge, without any direct involvement by policy-makers. However, indirect political influence is unavoidable. Even though no formal approval was needed for the data sources used, viewpoints taken into account or for conclusions made, the style and substance of the reports was influenced by the various implicit expectations. For example, reports were expected to update earlier reports, which influenced the issues selected.

The science-policy interactions are less relevant here also because, in contrast to the environmental assessments of certain contradictory issues, the main problem was not how to maintain the integrity and validity (Joyce 2003), but rather how to make sure that all the relevant knowledge is included and the results reach the target group.

5.3. Participation

The people participating in terms of commenting on the manuscript may be vital for guaranteeing the validity and usability of the report and providing additional insights and fresh perspectives to the report (e.g. Eckley 2001; Morrone & Hawley 1998). Comments for manuscripts were sought from scientists and various other experts, including officers from the environmental administration and non-governmental organisations. The commentators were chosen on the basis of their personal expertise and their known, or alleged, ability to give useful comments.

The critical question is how to find the right people to give comments. Previous experiences proved valuable here. The editor-in-chief of the NFCD was an experienced senior writer who was also a co-author of the previous SoE reports. This experience was highly useful, not only because of her knowledge of the substance and the editing process, but also because of the contacts with suitable experts to ask advise or make comments. These experiences were also partially passed into the preparation of the SPEF.

Participation by key people can make the report known. It can also enable the development of a sense of ownership, which increases the chances of the report being used (Eckley 2001). However, incorporating the different knowledge and different value orientations can make the editing process slow. It may be impossible to take all perspectives fully into account. The people giving critical comments to the report may well be reluctant to use the final report, especially, if their comments are not taken fully into account.

The lack of face-to-face communication easily causes misunderstandings and mistrust. This is especially evident when people outside the editorial team are asked to comment on controversial issues, such as forest protection in Finland. Rather than written comments, a seminar or other face-to-face interaction may be useful to build understanding about manuscripts dealing with these issues. A successful seminar can also serve as a marketing tool for the report.

There seems not to be any simple answer on how to combine all relevant information and insights from different sources into coherent form. As discussed by Huang and Newell (2003) an organization's embedded practices, past integration experiences and social capital play a key role in the efficiency of knowledge integration.

Social capital may provide an useful new conceptual tool to develop SoE reporting. Social networks and the interaction between individuals form the basis

for social capital (e.g. Rydin & Holman 2004; Pretty & Ward 2001). Moreover, collaborative learning and communication are important for the development of social capital. Based on the experiences from the NFCD and the SPEF, these are highly relevant for the developing the SoE reporting also. Social capital can help to collect the most important information, to manage the information flows efficiently and to build a shared understanding in a constructive manner.

Rydin and Holman (2004) introduce a new notion of "bracing" social capital into often-identified typology of bonding and bridging social capital (e.g. Putnam 2000). Bonding social capital is primarily concerned with links within groups of actors while bridging social capital is concerned with links between different groups or actors. In addition to these, bracing social capital is primarily concerned to strengthen links across scales and sectors, but only operates within a limited set of actors.

How could the concept of social capital be applied when developing the practices of SoE reporting? At least following possible applications can be listed, based on the experiences from the NFCD and the SPEF cases:

- Bonding social capital is essential for the effective participation by core people. Promoting the relationships within the editorial team serves as a vital asset for the efficient editing and compiling of the report. The role of bonding social capital in helping to coordinate the project, using various resources available and motivating the participators was pivotal especially in the SPEF case.
- Bracing social capital may be a useful tool to generate fruitful participation by people commenting the report. Bracing social capital may enable the participation of people from different sectors, including scientists, politicians, environmental activists and the public, and thus bring together different viewpoints in a constructive manner. This brings bracing social capital near to the notion of "public ecology" (Robertson & Hull 2003) that does not expect environmental science to be complete but asks that knowledge be constructed in collaboration with non-specialist peers.
- Bridging social capital may serve as a marketing tool by introducing the report to target groups. In particular, schools are not using the NFCD as

widely as was hoped for. The reasons include at least: the lack of suitable computer resources; lack of knowledge and traditions on how to use the electronic report; and lack of time and motivation to learn new skills (Loukola et al. 2002). Bridging social capital formed by intensive co-operation with schools, starting from the planning of the report, would probably have been valuable to overcome these problems.

The usefulness of the concept of social capital in SoE reporting seems to be worthy of further investigation. However, it must be noticed that this multi-faceted concept is usually used to describe the communities of hundreds of people (e.g. Rydin & Holman 2004; Pretty & Ward 2001; Putnam 2000), not small editorial team. The concept becomes useful when all people participating in the reporting process are understood to be active agents, not only passive providers of material or comments, or passive receivers of the messages delivered by the SoE report.

5.4. Assessment Capacity

The case studies presented here indicate the importance of the ability to make use of past experiences. One problem regarding SoE reporting is that when the report is completed, the project team is often disbanded and the experiences and social capital formed during the process is lost. The cost of rebuilding this lost capacity may be high compared to the costs of maintaining the capacity (Pollit 2000). Basically this is no different from any form of collaboration, but the wide-ranging and multidisciplinary character of environmental reporting makes it especially important to make use of the past successes and failures.

If the social capital is lost, the ability to learn from past experiences may also diminish. It seems that SoE reporting can serve as an example of institutional amnesia as described by Pollitt (2000): While the new information technologies have provided us with the ability to store, retrieve, manipulate and communicate more data, faster than before, many institutions seem to be losing their ability to access and make use of possibly relevant past experiences.

6. Conclusions

SoE reports are the outcome of different communication and information gathering and processing practices involving several people and institutions. SoE reporting inevitably includes the reconciling of opposing opinions and varying interpretations about the value positions, scientific facts and statistical data describing the state of the environment. Several editors usually prepare reports with various forms of interaction between them and stakeholders, such as scientists providing information, lobbyists trying to influence and target audiences hoped to be reached by the report. Paying enough attention to the communication practices within editor team and between editors and stakeholders is vital to guarantee the efficiency of the reporting.

The cases presented here indicate that the key factors for successful preparation of a SoE report include experience gained with earlier projects, trust between editors and co-operation with various stakeholders. Producing a SoE report is not only about the technical and financial aspects of environmental information management. It is also about the personal and institutional relationships that make efficient information management and communication possible. The case studies illustrate that success relies on tacit knowledge embedded in the experience of earlier practices as well as technical knowledge and monetary assets.

SoE reporting is an important mechanism for incorporating people and institutions that possess scientific information about the state of the environment and those that may wish to use it. The concept of social capital seems to provide a useful tool to study and develop the processes of SoE reporting, but the applicability of the concept requires further studies.

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