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**ENVIRONMENTAL ASSESSMENTS OF
PROJECTS AND LOCAL PLANS IN THE
ENERGY AND WASTE SECTORS IN SWEDEN
- PRACTICE AND POTENTIAL FOR
IMPROVEMENT**

Sara Tyskeng

Environmental Technology and Management

Department of Mechanical Engineering

Linköpings universitet, SE- 581 83 Linköping, Sweden

Environmental assessments of projects and local plans in the waste and energy sectors
in Sweden — Practice and potential for improvement

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Department of Mechanical Engineering

Linköpings universitet

SE-581 83 LINKÖPING, SWEDEN

Phone: +46 13 28 10 00

Fax: +46 13 28 11 01

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TO MATHIAS AND HANNA

ABSTRACT

Early perspectives on environmental issues have in general focussed on local pollution from specific sources. However, in past decades there has been a shift in society's perspective on environmental management towards a focus on diffuse sources of pollution and long-term and global environmental issues. A systems approach to environmental issues has also been suggested in order to avoid overlooking important environmental issues. In this thesis, the potential of two Swedish legally regulated decision-making processes, the development permission process and the local planning process in the energy and waste sectors, to meet these emerging perspectives on environmental issues is explored.

As regards the development permission process, the results in this thesis show that in practice the potential to include the emerging perspectives on environmental issues for this process has been rather low in the past, since the environmental assessments reports submitted with the applications for development permission focus to a large extent on local and technical issues. This means that environmentally relevant issues such as global and long-term impacts and resource management issues tend to have been disregarded. However, studies of more recently made assessment reports reveal that such issues are beginning to emerge to some extent. Furthermore, the public adds to the potential for this decision-making process, as it tends to discuss the project from a systems perspective as well. The thesis further suggests that the institutional context of the decision-making process impedes the potential to include the emerging perspectives in some respects. For example, present legislative rules and guidelines do not include the new perspectives on environmental issues and do not allow decision-making authorities to take such issues into account.

The thesis also shows that the local planning processes do not have the potential - in practice - to include environmental issues from wide perspectives. The local plans tend to focus on environmental issues from a local and technical perspective and do only to some extent include wider perspectives. It is further indicated that the interests and power of the actors within the planning processes are important factors influencing which perspectives are applied when the plan is made. To increase the potential for the local planning process to meet the demands for wider perspectives on environmental issues, the thesis therefore suggests that it is important to raise the status of local energy and waste management plans so they can have an actual impact on the development of the local technical systems. Finally, in order to increase the potential for both of the two formal decision-making processes studied in this thesis, linking the two decision-making processes would enable local planners, project developers and decision-making authorities to address impacts from a wider perspective. Linking the two processes would leave only local and project-oriented environmental issues to be discussed within the project development permission process, and the local planning process could focus on the environmental impacts of a local energy system and proposed energy projects from wider perspectives. The two processes would therefore be able to take all environmental issues relevant from a systems perspective into account.

SAMMANFATTNING

Fokus på miljöfrågor har under de senaste decennierna skiftat från lokala punktutsläpp från olika verksamheter till utsläpp från diffusa källor samt globala och långsiktiga miljöproblem. Dessutom har det lyfts fram att olika systemperspektiv är viktiga för att kunna ta hänsyn till all potentiell miljöpåverkan av olika verksamheter och produkter, såsom långsiktig påverkan samt material- och resursflöden som är kopplade till verksamheten eller produkten. Denna avhandling syftar till att analysera, ur olika perspektiv, potentialen för två svenska lagreglerade beslutsprocesser - prövning av tillstånd för miljöfarliga verksamheter samt lokala planeringsprocesser - att möta de nya perspektiven på miljöfrågor. Analysen av potentialen hos dessa processer baseras på studier av miljöbedömningar som är en del av beslutsunderlaget i dessa processer. Studierna har berört energi- och avfallssektorerna.

När det gäller tillståndsprocessen, visar denna avhandling att potentialen i praktiken tidigare har varit liten. Miljöbedömningarna har fokuserat på frågor ur ett lokalt och tekniskt perspektiv. Viktiga frågor som t ex global och långsiktig påverkan samt frågor kring resurshushållning har inte tagits med i särskilt stor utsträckning. Emellertid visar studierna att de nya perspektiven på miljöfrågor börjar komma in i tillståndsprövningsprocesserna samt att det är allmänheten som till stor del för in dessa frågor i processen. Olika institutionella aspekter kring tillståndsprövningsprocesserna kan motverka möjligheterna att föra in de nya perspektiven på miljöfrågor. Riktlinjer och lagrum är inriktade på lokala miljöfrågor och uppmuntrar endast i liten utsträckning till att miljöbedömningarna ska ta med frågor ur ett vidare perspektiv. Dessutom ger lagstiftningen på området inte de beslutsfattande myndigheterna möjligheter att vidga perspektiven och inkludera även andra relevanta frågor i beslutet som t ex resurshushållning och indirekta aktiviteter.

Även miljöbedömningarna i de lokala planeringsprocesserna fokuserar på miljöfrågor ur ett lokalt och tekniskt perspektiv och inkluderar endast till viss del frågor som är viktiga ur ett vidare perspektiv. Detta tyder på att potentialen att få in de nya perspektiven på miljöfrågor i planeringsprocesserna är förhållandevis liten. Denna potential påverkas av de möjligheter som planeringsprocessernas aktörer har att påverka utvecklingen inom energi- och avfallssektorn genom den lokala planen, och därmed också deras intressen att beakta planens påverkan ur ett vidare perspektiv. Det är därför viktigt att höja statusen på de lokala energi- och avfallsplanerna så att de har en faktisk inverkan på utvecklingen inom de två sektorerna.

Genom att koppla de två beslutsprocesserna, den lokala planeringsprocessen och tillståndsprövningsprocessen, skulle potentialen att möta de nya perspektiven på miljöfrågor generellt kunna öka. Om processerna vore kopplade skulle planerare inom kommunerna kunna fokusera på att diskutera den miljöpåverkan som det lokala energi- eller avfallshanteringssystemet skulle kunna ge ur ett systemperspektiv. De myndigheter som beslutar om tillstånd för miljöfarliga verksamheter kan därmed hänvisa till planerna för att beakta frågor ur vidare perspektiv än de lokala. På så sätt skulle båda beslutsprocesserna ha möjlighet att ta hänsyn till alla relevanta miljöfrågor sett ur ett systemperspektiv.

LIST OF PAPERS

This thesis is based on the following papers, which will be referred to in the text by their Roman numerals:

- I Bruhn-Tysk, S. and Eklund, M. (2000). System boundaries in environmental impact statements for biofuelled energy plants in Sweden. In *Environmental Assessment in the Nordic Countries – Experience and Prospects*. Proceedings from the 3rd Nordic EIA/SEA Conference, Karlskrona, Sweden 22nd-23rd November 1999, H Bjarnadottir (ed.). Nordregio R 2000:3. Stockholm, Nordic Centre for Spatial Development. pp 31-38.
- II Bruhn-Tysk, S and Eklund, M (2002) Environmental impact assessment – a tool for sustainable development? A case study of biofuelled energy plants in Sweden. *Environmental Impact Assessment Review* 22(2): 129-144.
- III Bruhn-Tysk, S. and Eklund, M. (2002) The aspect of natural resources in environmental impact statements for Swedish Bioenergy Plants. *Journal of Environmental Assessment Policy and Management* 4(1): 67-82.
- IV Tyskeng, S. Do energy and waste planning practice in Sweden involve wider system boundaries and a more proactive approach? – Comparing environmental assessments of local plans and projects. (*Submitted*)
- V Tyskeng S. How are national policies and objectives reflected at local planning and project levels? - A study of environmental impact statements and local plans in the Swedish energy and waste sectors. (*Submitted*)
- VI Tyskeng, S. and Eklund, M. Environmental perspectives brought by different actors into the Swedish environmental impact assessment processes. (*Manuscript*)

MY CONTRIBUTION TO THE PAPERS

Papers I-III and VI were written by my supervisor Dr. Mats Eklund and me, and IV and V by me alone. The papers I-V are based on research studies, of which we both designed together. I collected and compiled all empirical evidence. The empirical evidence was analysed and presented in the papers, which were mainly written by me with varying degrees of assistance, support and feedback from Dr. Eklund. In Paper VI, some of the empirical evidence is based on the previous research studies. Other empirical evidence (regarding an analysis of which key issues the public focus on in an environmental assessment process and an interview study of which key issues environmental authorities focus on) was collected and compiled by the undergraduate students Elisabeth Tiensuu and Maria Grimert respectively for their graduate theses. The interview study was initiated by me and performed by Ms Grimert. The further analysis of the evidence for VI was however conducted by me and discussed with Dr. Eklund. Finally, it must be noted that during the period when the papers were written, I have changed my last name from Bruhn-Tysk to Tyskeng.

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This is the last section I write in this thesis and I write it with mixed feelings. On one hand, I am very proud that I have proved myself of being able to finally, finally finish this thesis. Sometimes I seriously doubted that the journey of being a Ph. D student, started in 1998 was ever going to end. On the other hand, I have become very skilled in being a Ph.D student and the end of this journey means that a new expedition will soon begin to perhaps new grounds. As I will soon stop travelling on this route, I would like to take the opportunity to say *Thank you* to my “travel-mates”.

First of all, I would like to thank my supervisor, *Mats Eklund*, who encouraged me to get on this ride in 1998. Since then, he has guided me through this process and always believed that I was going to pull this through. My colleagues at *Environmental Technology and Management* are all gratefully acknowledged for their support over the years and valuable comments on an early draft of the thesis. A special “Thank you” goes to *Sara Emilsson* for being such a good friend and former roommate. You make a “big difference”! Furthermore, credits go to *Per Viklund*, Jönköping International Business School and *Kristina Holmgren*, Division of Energy Systems at Linköpings universitet for their valuable comments which very much improved this thesis. In the last years, I have also had the opportunity to get to know the people at *Quality Management Division*. The pleasant lunches with you in the “fika-room” have provided much needed breaks from the academic stress.

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A heartfelt thanks also goes to my friends and family. I am blessed to have you all in my life! My friends have over the years supported me in various ways and have reminded me of other things in life than work. Thank you *Anna Green* for lunches, fikas and discussions regarding the life as a Ph D student (Good Luck with your own dissertation); *Pernilla* for pleasant fikas “at the usual place”; *Elin* for friendship and instant support on how the Swedish development permission process really works; *Kia* and *Jonas* for the enjoyable lunches and personal coaching over the years and *Monica* and *Henrik* for your invaluable friendship and support (both to me and Mathias) through this “ordeal”. My family has also supported me along the way (although I suspect that they sometimes wondered if I ever was going to finish “school” and get a “real” job). Thank you so much! I have appreciated it.

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Linköping, December 30, 2005

EMERGING NEW PERSPECTIVES IN AND APPROACHES TO ENVIRONMENTAL MANAGEMENT

This introductory chapter aims to introduce and support the relevance of this thesis by describing the background in the form of emerging perspectives on environmental issues and the interests of including environmental issues into decision-making processes. The chapter ends with the aim, scope, contribution and outline of the thesis.

Early perspectives on environmental issues have in general focussed on local pollution from specific sources and measures have consequently concentrated on resolving these issues. Furthermore, in the past environmental and developmental problems have also been regarded separately. However, the Stockholm Conference in 1972 could be seen as one of the starting points for concerns in the developed world about the environmental effects of industrialisation, bringing to light the need for a synthesis between environmental and resource conservation and development (see for example Mather and Chapman, 1995). Fifteen years later, the publication by the World Commission on Environment and Development known as the Brundtland Report, brought together environmental and developmental issues, by integrating environmental aspects with economic and social aspects (cf Reid 1995). The report also emphasised sustainable development, which, in the view of the Commission, would “seek to meet the needs and aspirations of the present without compromising the ability to meet the needs and aspirations of future generations” (WCED, 1987). The long-term and global perspectives suggested by this view of sustainable development indicate the emerging new perspectives on environmental issues.

Along the long-term and global approach to environmental issues, different environmental system analysis approaches applying a systems perspective has emerged during recent decades. With the problems of point source pollution at least in the industrialised part of the world more or less solved, the focus has shifted from pollution from specific sources towards pollution of diffuse origin. The system perspective approach, such as expressed within the field of industrial ecology, is regarded as a response to this shift in focus and suggests a systems approach to environmental issues, in order to avoid overlooking important environmental issues (cf Lifset and Graedel, 2002). In the view of the systems approach, it is therefore not only the emissions of a producing plant that are considered important but also the environmental impacts of the products that the plant produces as well as energy and material flows connected to the production and use of the products. The systems approach further implies that the products, services and various activities must be considered together with possible co-products, processes and linked activities in order to take full account of possible environmental hazards (cf Weidema, 2001). Studying environmental issues from such perspectives could depart from an entire life-cycle of a product or service, as in life-cycle assessment (ISO14040:1997). Another point of departure could be the energy and material flows within a societal system, in order to be able to consider the total effects of the use of resources within a society (Garner and Keoleian, 1995). Moreover, implicit in the systems approach is the viewpoint that the outcome of a study, depends on how the system boundaries have been drawn and hence

which parts of the studied system are included in the study (Ekvall and Finnveden, 2001 and Weidema, 2001).

In addition there has been a growing interest during recent decades to include environmental perspectives into decision-making processes, both informal and formal. Informal decision-making processes could for example involve product development strategies within a company as a consequence of the emerging focus on the environmental load of products. The formal decision-making process entails decisions made by authorities on a regulatory basis regarding programmes, plans and projects concerning environmentally hazardous activities. Which formal decision-making processes include environmental issues varies of course between countries¹. Moreover, which environmental issues are included in the decision-making processes could be a result of the organisational context, that is the norms, values and standard operating procedures of decision-makers (see Hill, 1997), which in turn is formed by the organisation's traditional view of environmental issues. In order for the emerging perspectives on environmental issues to be implemented in society, these have to be perceived and implemented by the organisations and institutions that are responsible for controlling the environment and developing the society. The above reasoning suggests, however, that if the norms and values of the decision-makers stem from the early perspectives on environmental issues, the decision-making process would focus on local environmental problems from specific sources. If so, the gap between the focus of the decision-making process and the emerging new perspectives on environmental problems will be apparent. Likewise, if the norms of decision-makers also include environmental problems with a diffuse origin, the formal decision-making processes then have the potential to include such issues as well

AIM, SCOPE AND CONTRIBUTION OF THE THESIS

The overall *aim* of this thesis is to explore the potential for two of the formal decision-making processes in Sweden, the local planning process and the project development permission process, to meet the emerging demand for wider perspectives on environmental issues.

This potential is explored in this thesis through analyses of three perspectives on system boundaries: practice, context and improvement. The practice perspective is addressed through the first research issue:

- Which system boundaries are applied by the actors within the local planning and project development permission processes? (studied in I and IV-VI and partly discussed in II)

The context perspective is addressed in the second research issue of this thesis:

- How can the choice of system boundaries be explained? (I, III and IV)

Finally, the improvement perspective is addressed in the third research issue:

- How can the system boundaries be widened? (discussed in III-V)

¹ For an overview of different countries' approach to include environmental aspects into decision-making processes, see Wood (2003).

Scope of the thesis

The thesis is based on studies of development permission processes and local planning processes in the Swedish energy and waste sectors. These sectors have been chosen for various reasons. Two major reasons are the political background of these two sectors. As regards the energy sector, the Swedish government made a decision at the end of the 1990s, to change the Swedish energy system towards a system relying on renewable resources. The government was (amongst other things) concerned about global warming and therefore the decision aimed at decreasing fossil carbon dioxide emissions and increasing the use of renewable energy sources, mainly biofuel (Government Bill 1996/97: 84). For the waste sector, a national ambition has been the precedence given to recycling and reuse in order to decrease the use of natural resources (Government Bill 1992/93:180). In another Government Bill (see Swedish Government, 2001) concerning national environmental goals, strategies and measures concerning environmentally adapted products, energy- and material-efficient product cycles as well as decreasing the amount to landfill are mentioned. The Swedish Government also introduced a ban on the disposal of combustible waste starting in 2002 and on the disposal of organic waste starting in 2005 (SFS 1998:902 and SFS 2001:512). These political decisions and ambitions have led to an increase in the number of incinerator plants using biofuel and/or waste as fuel.

The two sectors also have an interesting time dimension since they entail large technical systems. Changing and developing a new energy and/or waste management system also means creating a technical system by using large investments that hence will be in place for a long time, built into the society (cf Summerton, 1998). The energy and waste sectors are also in some cases linked as some Swedish local authorities have decided to use waste incineration as a strategy to deal with some of the waste fractions and at the same time generate heat to be used within the municipality².

Furthermore, the energy plant projects are interesting because they cause environmental impacts at many spatial levels; at the local, regional, national and even the global level. The decision to convert the energy system might also aim at positive global impacts; however, at the local level, the impacts are negative in form of increased emissions of particles and volatile organic compounds (see Boman et al., 2003 and Wierzbicka et al., 2005). There is therefore an interesting tension between the global and local dimensions. Consequently, to be able to take full account of the environmental issues when components in a sustainable energy and/or waste management system are planned and developed, e.g. when building an energy plant or planning for a local district heating system, one has to consider environmental issues at the local, the regional as well as at the national levels.

² In this thesis I use the terms “local authority” and “municipality”. The local authority is referred to as the administrative and political organisation of a municipality, which in turn is considered to be the geographical area over which the local authority rules.

Contribution of the thesis

Research and literature on including environmental issues in decision-making processes mainly regard three fields. The first concerns the benefits of including environmental issues in decision-making processes. Benefits are mainly discussed when introducing the topic of environmental decision-making (e.g. English et al., 1999) and when arguing for the introduction of certain tools to aid in the inclusion of environmental issues in decision-making processes (e.g. Thérivel et al., 1992; Glasson et al., 1999; Bouman et al., 2000; Clark, 2000 and Breedveld, 2001). The second field concerns the discussion and evaluation of process methodology approaches, i.e. how to include environmental issues into decision-making processes (e.g. Miner and Lucier, 1994; Bojórquez-Tapia and Garcia, 1998; Morgan, 1998; Pasiaka and Jensen, 1998; Thérivel and Brown, 1999; von Seht, 1999; Brown and Thérivel, 2000; Finnveden et al., 2003 and Rauschmayer and Risse, 2005 to mention just a few). The third field that research and literature concentrate on concerns the impacts of the tools on the final decisions (Wood and Jones, 1992; Marsden, 1998; Lund and Hvelplund, 1997; Leknes, 2001; Cashmore et al., 2004 and Christensen et al., 2005) and reviews of the scope of environmental information that enters the decision-making process, that is, which environmental issues are brought into the decision-making process by different tools (see e.g. Hollick, 1986; Lee and Colley, 1990; Aramburu Maqua et al., 1996; O'Rourke et al, 1996; Burris and Canter, 1997; Hickie and Wade, 1998 and Barker and Wood, 1999). This thesis aims to further contribute to this field, as it will explore which issues are actually discussed in the formal decision-making processes.

Furthermore, the thesis will discuss and analyse the scope of environmental issues from a systems approach. The systems approach has in the past mainly been regarded from an informal decision-making perspective. However, in this thesis, the systems approach will be discussed from a formal decision-making perspective. From a tools perspective, research on tools to include environmental issues has also been discussed mainly from theoretical and methodological perspectives. This thesis will complement this, as it discusses the potential of one of these tools from an empirical and practice point of departure.

OUTLINE OF THE THESIS

In the introductory part of the thesis, the background to the thesis and its aim are introduced in the chapter *Emerging new perspectives in and approaches to environmental management*. Furthermore the *Environmental assessment as a tool to include environmental issues into decision-making processes* is examined in order to present the tool which this thesis focuses on. Moreover, the chapter *Formal decision-making processes for the Swedish energy and waste sectors* sets the scene for the later analysis of the potential for the Swedish formal decision-making processes to include the emerging perspectives on environmental issues. The second part of the thesis describes the studies, which this thesis is based on and the analysis approaches and methods used in order to meet the aim of this thesis. This is discussed in *Research process* and in *Analysis approach and methods*. The results of this thesis are then presented and further analysed in the third part of the thesis. The chapters *System boundaries applied in the project development permission process*, *System boundaries applied in the local planning process*, *How are national policies, ambitions and*

objectives reflected in the formal decision-making processes? and *Links between the decision-making processes* all present the results of the appended papers, which the thesis is based on and further analyses the potential for the studied decision-making processes to include environmental issues from a wide perspective in practice. The chapter *Explaining the choice of system boundaries* develop on some institutional aspects that may influence the potential. Finally, the thesis is concluded in *Concluding remarks*.

The thesis is based on six papers, which are attached as appendices at the end of the thesis. The papers' role in and contribution to the thesis are summarised in Table 1.

Table 1 Papers included in the thesis with regard to key issues, which perspective on system boundaries they correspond to (in relation to the aim of the thesis) and their contribution to the thesis.

	I	II	III	IV	V	VI
Papers	System boundaries in environmental impact statements for biofuelled energy plants in Sweden	Environmental impact Assessment – a tool for sustainable development? A case study of biofuelled energy plants in Sweden.	The aspect of natural resources in Environmental Impact Statements for Swedish Bioenergy Plants?	Do energy and waste planning practice in Sweden involve wider system boundaries and a more proactive approach? – Comparing environmental assessments of local plans and projects	How are national policies and objectives reflected at local planning and project levels? – A study of environmental impact statements and municipal plans in the Swedish energy and waste sectors	Environmental perspectives brought by different actors into the Swedish environmental impact assessment processes
Key issues in papers	-Scope -System boundaries	-Scope -EIA as a tool contributing to sustainable development	-Scope with special regard to resource management issues. -Environmental management tools to widen perspectives on environmental issues	-Scope - System boundaries and proactive approaches	- Scope -Environmental ambitions and goals - Tiering	-Scope - Project developers -Public -Regional authorities
Perspectives on system boundaries	Practice and context	Practice	Context and improvement	Practice, context and improvement	Practice	Practice and context
Role in thesis	Analyses the system boundaries applied by project developers and decision-making authorities.	Discusses the scope of environmental assessments for projects with regard to global and long-term environmental issues.	Analyses the potential to include resource management issues and indirectly the potential to include indirect activities.	Discusses and analyses the system boundaries applied by project developers and local planners in the decision-making processes regarding of plans and projects	Contributes to the discussions on which national policies, ambitions and goals that are reflected in the studied local planning and development permission processes.	Illustrates which issues different actors bring into the decision-making process regarding individual projects.

ENVIRONMENTAL ASSESSMENTS AS TOOLS FOR INCLUDING ENVIRONMENTAL ISSUES INTO DECISION-MAKING

In this chapter, environmental assessments as tools to include environmental issues into decision-making are introduced by an examination of two of the more common types of environmental assessments; environmental impact assessment and strategic environmental assessment. Furthermore, the Swedish environmental assessment context is described.

When it comes to including environmental issues into formal decision-making processes, that is decisions made on a regulatory basis, one of the more widespread tools is the environmental assessment. Among the major contributions of environmental assessment to the decision-making process found in literature (see e.g. Morgan, 1998; Glasson et al., 1999 and Partidário, 2000) are the systematic evaluation of the environmental implications of a proposed action, plan, program or policy and sometimes also the alternatives to the proposals before a decision is made. Environmental assessments also help clarify some of the trade-offs associated with a proposed development action, which lead to more rational and structured decision-making and serve as a basis for negotiation between different stakeholders.

ENVIRONMENTAL ASSESSMENTS FOR INDIVIDUAL PROJECTS

Environmental assessments for individual proposed actions or projects are often referred to as Environmental Impact Assessment (EIA). EIA is based on the notion that whenever a project is developed, there will always be impacts on the environment. There are many definitions of EIA and to summarise the definitions (cf Glasson et al., 1999 and Modak and Biswas, 1999), EIA is a process where the impacts of a planned project development are identified, predicted and assessed. The aims put forward for EIA differ between formal and informal. As Morgan (1998) describes it, a formal aim of EIA is when it is legally required as a basis and serves as an aid for, decision-making with regards to environmental aspects. Informal aims could be, according to Morgan (ibid.), to bring environmental awareness into bureaucracies where this kind of awareness is low, to bring in the opinions of different stakeholders and also to help project developers evaluate the environmental aspects of the project parallel to the evaluation of economical and technical aspects.

The steps of the EIA process vary between countries depending on the requirements of a country's EIA system. Nevertheless, Wood (1999) and Glasson et al. (1999) have distinguished stages that can be found in most EIA systems in one form or another: (i) Determining whether EIA is necessary for the project (screening); (ii) clarification of which issues will be covered (scoping); (iii) consideration of alternatives; (iv) description of the proposed project and the environmental baseline; (v) prediction of impacts and assessment of their magnitude; (vi) preparing an assessment report based on findings of the impact analysis; (vii) review of the assessment report to evaluate its aptness as a basis for decision-making; (viii) making a decision; (ix) post-decision monitoring of impacts; and (x) auditing whether the project meets its objectives. An additional part of the EIA processes is the consultation and participation of different

stakeholders, for example the public. This consultation and participation could take place during several stages of the EIA process.

Reviews of the reports that according to many legal environmental assessment requirements should sum up the assessment process and the impacts of the proposed project (Glasson et al., 1999), reveal, however, that many EIA processes and systems are inadequate when it comes to serving decision-makers as a basis for decision-making from an environmental perspective. Reviews from Australia, the U.S. and Europe that address projects such as motorway construction, river construction and nuclear waste depositories (Hollick, 1986; Lee and Colley, 1990; Aramburu Maqua et al., 1996; Burris and Canter, 1997; Hickie and Wade, 1998 and Barker and Wood, 1999) show relatively thorough descriptions of the technical details of the planned development and the surrounding environment; however, the environmental scope is usually confined to the immediate area of the planned project. Furthermore, there are seldom any assessments of the impacts of the proposed projects. Different alternatives of project design are inadequately considered and the scoping process of potential impacts is seldom included. In addition, mitigating measures are often not discussed. Moreover it has been discussed whether or not EIA actually has an impact on decisions. As Glasson et al. (1999) summarise, studies of the effectiveness of EIA have indicated that the EIA starts too late and results in poor integration of the project development process. This is also suggested in Thérivel et al. (1992). In addition, Wood and Jones (1997) show that the impacts on decisions by EIA concern the improved input of information about the environmental impacts rather than modifying proposals. Furthermore, Glasson (1999) adds to the discussion some aspects that influence the impacts of EIA on decisions. Glasson suggests that trade-offs between different impacts could hamper EIA's impact on decisions as well as stakeholders' views on EIA. If for example, in a specific decision-making situation, socio-economic impacts were perceived as more important than environmental impacts, EIA would likely have little impact on that decision. Likewise, if some stakeholders regard EIA as an obstacle, the end contribution of EIA would be rather limited as one would expect the EIA process to be regarded as something necessary but no extra effort will be put into the process.

ENVIRONMENTAL ASSESSMENTS IN STRATEGIC DECISION-MAKING PROCESSES

In order to complement environmental assessments for individual projects and partly also to come to terms with some of the flaws discussed in such assessment systems, applying environmental assessments to strategic decision-making processes has been suggested. Although different forms of such assessments have emerged, such as policy impact assessment, sectoral environmental assessment and programmatic environmental assessment, to mention a few, Partidário (1999) and Verhem and Tonk (2000) mean that these forms all originate from the concept of strategic environmental assessments (SEA). An often used definition of SEA is given by Thérivel et al. (1992):

“the formalised, systematic and comprehensive process of evaluating the environmental impacts of a policy, plan or programme and its alternatives, including the preparation of a written report on the findings of that evaluation, and using the findings in publicly accountable decision-making”

The word *strategic* in SEA implies characteristics, which in turn could be used to describe the basic concept of SEA. Noble (2000) has summarised the explanations of strategic discussed in relation to SEA. First he indicates that SEA leads to a strategy for action. Furthermore, it seeks to analyse strategies to accomplish particular goals and objectives. SEA moreover looks into a broad range of option alternatives, based on a vision, and then predicts the outcomes of each option. In the discussion by Noble (ibid.) it is further put forward that SEA is characterised as proactive in that it

“acts in anticipation of future problems, needs or challenges and creates and examines alternatives leading to the preferred option.”

Furthermore it could be characterised as not being project specific and having a broad focus and hence a low level of detail.

As in the case of environmental assessments for individual projects, the requirements of an SEA system may differ. Thérivel (1999) indicates however some procedural stages that constitute the core of the SEA process: (i) setting objectives and targets of the policy, plan or program (PPP); (ii) identifying alternative PPPs; (iii) describing the PPP; (v) scoping for key issues to address; (vi) establishing environmental indicators for measuring and representing environmental trends; (vii) describing the environmental conditions that could be affected; (viii) predicting and evaluating impacts and comparing alternatives; (ix) mitigation to minimise any negative impact of the PPP; and (x) monitoring of whether the PPP achieves its set objectives and targets and whether any negative impact requires attention.

The stages of the SEA process, discerned in the definition by Thérivel et al. (1992) and suggested by Thérivel (1999) may lead to the perception that SEA is just EIA applied at a strategic level and initially this is how SEA was perceived when discussions on SEA emerged (cf Partidário, 2000). Furthermore, SEA has been suggested to meet some of the mentioned problems of EIA (e.g. Thérivel et al., 1992; Feldmann, 1998; Thérivel and Partidário, 1999 and Alshuwaikhat, 2005). Some of the advantages of SEA mentioned (see for example Thérivel et al., 1992 and Wood and Dejjeddour, 1992) are that it is a way to be more proactive against environmental problems as it enables decision-makers and planners to plan from a long time perspective. It makes possible a more thorough assessment of cumulative, synergistic and indirect impacts as well as deals with alternatives that are often ignored in the EIA processes. The SEA process could also help to set the frames for subsequent environmental assessments, e.g. for projects, and help to decide suitable locations for projects and which impacts subsequent environmental assessments should cover. However, another notion of SEA put forward is its important role in implementing sustainable development by promoting the integration of environmental concerns into policy and planning processes (see e.g Thérivel and Partidário, 1999). Thérivel et al. (1992) propose that in order to promote sustainable development, environmental aspects have to be considered from a long-term perspective at early stages of formulating development objectives. SEA plays an important role in including such issues into decision-making.

Criticism of SEA has also been put forward. Thérivel et al. (1992) list some of these criticisms. For example, one problem suggested is the fact that SEA should deal with high-level decisions that generate a large number of subsequent potential decisions.

Moreover, the high-level decisions also generate a large number of potential developments over a physical and policy area. This, as indicated by Thérivel et al. (1992), implies a complex analytical context. It also implies that it will be difficult to specify the nature, scale and location of the environmental impacts due to the vast physical areas a high-level decision could concern. Another problem indicated is that SEA tend to mirror the EIA process and do not take into account how decisions actually are made. It hence has limited influence on decisions (cf Nilsson and Dalkmann, 2001).

ENVIRONMENTAL ASSESSMENTS IN SWEDEN

As indicated in Wood (2003), environmental assessments are very much influenced by the system of which they are a part. In the context of this thesis, this would imply that the scope of the information that is used as a basis for decision-making is reliant on the scope and aim of the legislation and the decision-making processes. This section therefore aims at describing the Swedish environmental assessment context.

In Sweden, the major part of the formal decision-making processes, including environmental issues, concerns decisions on local plans and decisions on development permission for various activities. Environmental assessments³ were introduced into the Swedish legislation parallel to the existing decision-making processes of local planning and development permission. One important reason for this was that there was growing insight that decisions were sometimes made with major uncertainties regarding the environment and the possible risks (Michanek, 2003). The reasons for the later, general call for environmental assessments were, to protect the environment, manage natural resources in a sound way and deal with current environmental deterioration (Government Bill 1990/91:90).

In Sweden, environmental assessments for individual projects have generally been performed when a project with significant impact on the environment (in legislation referred to as environmentally hazardous activities) is about to apply for development permission, first according to the Environmental Protection Act (SFS 1969:387) and since 1999 according to the Environmental Code (SFS 1998:808); however, it has been required in other situations as well. Environmental assessments for individual projects were first introduced in Sweden in 1981 when the Environmental Protection Act (SFS 1969:387) called for a description of the impact on the environment. The general call for environmental assessments was implemented in 1991 as the call was

³ In order to use a consistent terminology, this thesis will henceforth refer to environmental assessments in the Swedish formal decision-making processes, as environmental assessments of projects and environmental assessments of local plans respectively. Environmental assessments of projects concern the environmental assessment process required when applying for development permission for a project and could be regarded as a mirror of EIA in general. Environmental assessments of local plans concern the environmental assessment process applied to local planning processes, and specifically in this context the municipal energy and waste management planning processes. In the Swedish context, these local planning processes could not be considered to reflect the general concept of SEA. Instead such environmental assessments merely mirror EIA, although applied at a more strategic decision-making level in comparison to individual projects. This is also the reason for the choice of the terminology.

expanded and a request for “an overall assessment of the impacts of a planned installation, activity or measure on the environment, on health and on the management of natural resources” was implemented in the Act on the Management of Natural Resources (SFS 1987:12). With the extensive implementation of environmental assessments, the Swedish Government wanted to develop and use more environmentally oriented decision-making procedures. Decisions on projects and measures, which would affect the environment, should according to the Government Bill (1990/91:90), only be made where the impacts on the environment are considered and described. According to the Government Bill 1990/91:90, environmental assessments were introduced in Sweden to create environmental awareness in decision-making. However, no new formal procedures were introduced because the regional authorities, the County Administrative Boards, already applied formal procedures for decision-making on projects (Swedish Board of Housing, Building and Planning, 1996). This has led to that the environmental assessment and the development permission processes are directly linked in practice.

The steps in the Swedish environmental assessment process for individual environmental hazardous projects follows the process of application for development permission for the same projects. The process could in general be regarded as consisting of seven areas: (i) the scoping stage; (ii) public hearings; (iii) preparation of the assessment report; (iv) review of the assessment report; (v) consultation by authorities and the public; (vi) decision on project development permission; and (vii) possible appeal of the decision by different stakeholders (cf Swedish Environmental Protection Agency, 1995 and Swedish Board of Housing, Building and Planning, 1996). The steps are illustrated in figure 1.

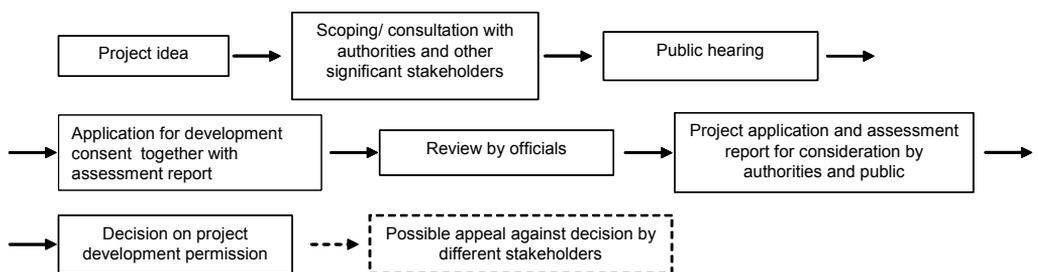


Figure 1. *The general steps of the Swedish environmental assessment process for individual hazardous projects and the parallel development permission process. The last box in the figure concerning the appeal against decision by different stakeholders is dashed in order to illustrate that this step does not take place in every process.*

In the new and extended rules of environmental assessments for individual projects that were introduced with the Environmental Code in 1999 (SFS 1998:808), an additional step was explicitly stated, the decision by the County Administrative Boards regarding whether or not the project would have significant environmental impacts. This step decides if the environmental assessment needs to be a full-scale assessment or could be limited.

The actors within the environmental assessment process (and development permission process) for environmentally hazardous projects are several (cf Swedish Board of Housing, Building and Planning, 1996). First, the project developer is responsible for making the environmental assessment and the assessment report. Throughout the process, the County Administrative Board officials have several roles. During the initial stages they contribute to the scoping phase and help outline which environmental issues should be addressed in the assessment report and during the whole process. The officials also decide whether or not the project will have significant impacts. When the application for development permission and assessment report are sent in to the County Administrative Board, the officials review it, in order to see if the assessment report is adequate. Local and national authorities also have an important role as they function as consultation partners during the process. Finally, the public and interest organisations bring in their view at various meetings during the process.

Until the introduction of the Environmental Code, there were not many legislative guidelines for what an environmental assessment report should include. Legal guidelines on the content of the assessment report of a project could be found in the Environmental Impact Assessment Ordinance (SFS 1991:738) and in the Act on the Management of Natural Resources (SFS 1987:12). In the Act on the Management of Natural Resources, the aim of environmental assessments for projects was specified and in the Environmental Impact Assessment Ordinance, the kinds of alternatives to be addressed in the assessment report (no-action alternative, alternative project designs and alternative project locations when appropriate) were specified. Guidelines from the Environmental Protection Agency were in place, based on legislative demands and international EIA practice according to the Espoo Convention (UN/ECE, 1991). With the Environmental Code, demands on the content of the assessment report were included in legislation and adapted to the EC Directive on EIA (EC Directive 85/337/EEC and 97/11/EC). The content of an assessment report should according to the Swedish Environmental Code (SFS 1998:808) include a technical description of the project along with a description of which measures will be taken in order to mitigate environmental impacts. Furthermore an assessment of the impacts on the environment, public health and the management of resources is needed, as is a description of alternative project designs and project locations. Finally, a non-technical summary is called for as well.

Reviews of the Swedish environmental assessment system both before and after the introduction of the Environmental Code have shown that both the processes and the reports have flaws. The guidelines for the assessment report seem to have had little effect on the report. Early reviews of the environmental assessment system for individual projects in Sweden (Kvarnäck, 1995 and Swedish National Audit Office, 1996) have shown that the Swedish assessment reports have shortcomings similar to the reviews made of environmental assessment systems in other countries, mentioned above. These reviews indicate that the scope of the reports is relatively limited and the environmental impacts are rarely assessed. Timm and Rydén (2001) found that at least in the early years after the introduction of the Environmental Code, its extended guidelines on environmental assessments of individual projects had little effect as well. Most assessment reports both before and after the introduction of the Environmental

Code merely included a description of the emissions of different substances to air or water. Alternatives were also sparsely dealt with in general, which indicates that environmental assessments were often introduced too late in the project planning phase. Furthermore, issues concerning public health and management of resources were rarely discussed in the assessment reports (Kvarnäck, 1995, Swedish National Audit Office, 1996; Bruhn-Tysk, 2001 and Timm and Rydén, 2001).

As regards environmental assessments of local plans, calls for environmental assessments were introduced in 1994 into the Planning and Building Act (SFS 1987:10) which calls for an environmental assessment for so-called spatial plans whenever such a plan implies significant impacts on the environment, health or the management of resources. There have not been specific procedural rules on the environmental assessment process included in legislation. However, Jonsson and Palm (2000) provides a rather detailed discussion on this. Another local plan that has required an environmental assessment is the local energy plan. Local energy planning is further discussed in the next chapter. Moreover, in July 2004, the EC Directive (2001/42/EC) on the assessment of the environmental effects of certain plans and programmes was implemented into Swedish legislation. This means that plans and programmes with assumed significant impacts must be environmentally assessed. Plans and programmes that without exception will be environmentally assessed are for example comprehensive and spatial plans, local energy and waste management plans and regional transport plans. The implementation of the EC Directive has also entailed specifying the content of the assessment report of the plan, which is (i) a description of the plan or programme and its aim; (ii) a description of the environment assumed to be affected; (iii) a description of the environmental objectives and other relevant objects that are considered in the plan/programme; (iv) an assessment of the environmental impacts; (v) a description of the mitigating measures; (vi) a summary of choices made on option alternatives and of uncertainties; (vii) monitoring and measures for follow-up; and (viii) a non-technical summary (SFS 1998:808).

THE FORMAL DECISION-MAKING PROCESSES FOR THE SWEDISH ENERGY AND WASTE SECTORS

The formal decision-making processes for the Swedish energy and waste sectors mainly concern local planning and development permission processes. In this chapter, the organisational contexts of these formal decision-making processes are described in order to set the scene for the later analysis of the potential for the Swedish formal decision-making processes to meet the wider perspectives on environmental issues.

THE ENERGY SECTOR

For the energy sector in Sweden, environmental assessments are called for in at least two decision-making processes: local energy planning and development permission processes for individual (and environmentally hazardous) projects. As regards the development permission processes for individual projects, project developers (in the context of this thesis, developing an energy plant) need to apply for development permission, according to the Environmental Code (SFS 1998:808) (or in the case of the biofuelled energy plant projects discussed in this thesis, the former Environmental Protection Act (SFS 1969:387)). An environmental assessment of the project needs to be included in the application. Most of the time, the application and assessment are decided upon at the regional level, by the County Environmental Permits Boards or the Environmental Courts. As mentioned in the previous chapter, the scope of issues to be included in the assessment report was previously stated in the Environmental Impact Assessment Ordinance (SFS 1991:738) and in the Act on the Management of Natural Resources (SFS 1987:12) but is now stated in the Environmental Code (1998:808).

As regards local energy planning, Swedish legislation calls for each municipality to have a local energy plan (Local Government Energy Planning Act, SFS 1977:439). Michanek (1990) indicates that the aim of the local energy planning legislation is two-fold. First, it aims at energy efficiency, that is: decreasing energy use from a long-term perspective. Second, it aims to coordinate energy issues in several societal sectors, such as the building, industry and traffic sectors as well as in physical planning. The local energy plan should cover the supply and use of energy within the municipality. Legislation has also called for an assessment of the impacts on the environment to be included in the plan. However, there are no specifications in the Act of which issues the assessment should include. The explicit call for an environmental assessment has now been removed and changed to call for an environmental analysis instead. The aim of coordinating energy issues among societal sectors implies, according to Michanek (1990), the interaction between the local authority and other local authorities as well as other stakeholders, such as process industry and energy companies within the region. It is the local authority itself that is responsible for making the plan but it is in practice made in cooperation with energy companies and internal local authority organisations, as well as property owners. It must be noted however, that due to the fact that many local energy supply systems have been sold to private companies or the local energy supply functions have been turned into companies partly owned by the local authorities, the influence of local authorities on the actual development of local energy systems has decreased (cf Palm, 2004). In relation to this, criticism of the Local Government Energy Planning Act has also been put forward (e.g in the review by the

Swedish National Audit Office, 1990), with concern that the Act is rather toothless and without sanctions. Moreover, it is indicated in the same review that the Act seems to have little impact in practice on the development of the energy sector.

At the national level, there have not been any official environmental assessments of energy policies and decisions but various research projects have studied different energy scenarios and projects from a national and environmental perspective (see e.g Nilsson et al., 2001 and Nilsson et al., 2005).

THE WASTE SECTOR

Similar to the energy sector, the Swedish waste sector involves two formal decision-making processes, local waste management planning and the development permission processes for individual projects such as building a waste incinerator plant, creating a new landfill or depositing environmentally hazardous waste.

For the individual projects, the environmental assessment process does not differ from the environmental assessment process for the energy sector. As regards local waste management planning, each local authority must, according to the Environmental Code (SFS 1998:808), make a waste management plan which should include information on amount and waste fractions within the municipality together with the local authority's intentions and measures to decrease the amount of and hazards associated with waste (SFS 1998:808). This call for waste management planning was introduced in Swedish waste management legislation in 1991 (SNFS 1991:3) and aimed at reducing the amount of waste and hazardous substances. Furthermore, the legislation aimed at providing conditions to increase reuse and recycling and to ensure a safe final treatment of waste. The local authority is responsible for organising the waste management within the municipality. However, this does not necessarily mean that the local authority has to own or operate treatment plants or manage the waste flows itself. This can be outsourced to waste management entrepreneurs. This means that there could be stakeholders involved in the local waste management system other than the local authority. Waste management entrepreneurs constitute one such important group. Another stakeholder group is energy companies, at least in regions where waste is recovered for energy.

Until recently, there have been no calls whatsoever for an environmental assessment of waste management plans. However, as guidelines on waste management planning issued in 1991 (Swedish Environmental Protection Agency, 1991) suggest, the local authority should during the planning process analyse future development from the perspective of promoting an environmentally oriented society. Furthermore, the guidelines suggest that an important part of local waste management planning is the analysis of the environmental and economic impacts of possible options for future waste management. There are no explicit procedural suggestions in the guidelines, though, on how to perform an analysis of these impacts. However, the guidelines include suggestions for how to analyse different waste management options through scenario- and systems analysis. The guidelines issued in 1991 were abrogated in 2003 (NFS 2003:7). Nonetheless, the introduction of the European Council Directive on the assessment of the effects of certain plans and programmes (Directive 2001/42/EC) into

Swedish legislation will add a call for environmental assessments of local waste management plans.

RESEARCH PROCESS

The ideas behind this thesis have developed during an almost eight-year-long process. During this time, I have been involved in various research projects that in different ways have shaped the studies on which this thesis is based. This chapter describes and discusses the research process in order to illustrate how this thesis and its research issues have developed as well as how the studied environmental assessments were selected.

ANALYSING THE SCOPE AND SYSTEM BOUNDARIES OF ENVIRONMENTAL ASSESSMENTS OF INDIVIDUAL PROJECTS

The research process resulting in this thesis started with a review of the 55 assessment reports and applications for development permission regarding biofuelled energy plants that were submitted to authorities according to the Environmental Protection Act (1969:387). The main reason for the review was to analyse to what extent legal and informal requirements on environmental assessments of projects were implemented in the Swedish environmental assessment system (see Bruhn-Tysk, 2001) in order to point out parts of the system that could be improved. The assessment reports and applications reviewed were made from 1995 to 1998 and represented the major part of the assessment reports and applications regarding biofuelled energy plants that were submitted to the authorities during this period.

The answer to one research question during this research process has continuously led to a focus on new questions. In this case, the results of the review revealed a rather narrow and technical focus on environmental issues and the project, which triggered a focus on the scope of the assessment reports to be able to analyse and discuss the environmental issues considered and further which system boundaries are applied by project developers and decision-making authorities⁴. Papers I and III are results of this research focus. Furthermore, as indicated in the introductory chapter, biofuelled energy plants have an interesting spatial implication as they cause environmental impacts at many spatial levels: at the local, regional, national and even the global level. The use of biofuel might imply positive implications at the global level but at the local level the impacts are negative in the form of increased emissions of particles and volatile organic compounds. The tension between the global and local dimensions led to the subject of sustainable development in relation to environmental assessments for

⁴ As discussed in an earlier chapter regarding environmental assessments in Sweden, the decision-making authorities in the context of this thesis could be regional Environmental Courts and Environmental Permits Boards. From hereon, the view of the decision-making authorities will in this thesis be represented by the view of officials at the regional County Administrative Boards (to which the Environmental Permits Boards are connected). As regards the case of the biofuelled energy plants, these officials made the actual decision on development permission. However, after the introduction of the Environmental Code, this task was transferred to the Environmental Permit Boards. This means that in the case of the studied waste incinerator plants, the officials do not make the final decision on development permission for the waste incinerator plant. However, they either assist the Environmental Court in reviewing the assessment report or sometimes assist the Environmental Permit Boards by suggesting which decision should be made. Hence, in this thesis, the view of these officials has been regarded to represent the view of the decision-makers.

individual projects. As a result of this, paper II was written in order to analyse how environmental assessment for projects could be a tool contributing to sustainable development.

WHICH ENVIRONMENTAL ISSUES ARE INCLUDED IN OTHER DECISION-MAKING PROCESSES?

The academic tradition of discussing the results of research on various occasions has generated input into the research process as well. When presenting and discussing the results of the initial review of biofuelled energy plant assessment reports with researchers and actors within the Swedish environmental assessment system, one frequently heard opinion was that environmental assessments of individual projects was not the right place to discuss and assess the missing issues (e.g regional and global impacts and the management of natural resources). This opinion triggered the question whether the missing issues are discussed and assessed in other decision-making processes at higher levels. An opportunity to address this question presented itself when I became involved in the research project “Better environmental decisions in the energy and waste sectors”. This project aims, from an environmental perspective, at a better correspondence between national, regional and local environmental goals on the one hand and local planning, decision-making and implementation on the other. Another perspective within this project is the participatory perspective, which aims at improving public participation in the environmental assessment processes for individual projects. This project also extended the technical sectors being studied to involve the waste sector as well.

In order to analyse this question, a second review considered the scope of environmental issues in assessment reports and applications for development permission according to the Environmental Code (SFS 1998:808) as well as in local plans, to examine whether the scope of the environmental assessments within the two decision-making levels differed. The assessment reports and applications considered six biofuelled energy plants and five waste incinerator plants. The local plans regarded an equal amount of local energy plans (6) and local waste management plans (5). One general criterion for the selection of study objects was that the municipality where the proposed projects would be localised should have a local energy or waste management plan as well, in order to analyse differences in scope in the environmental assessments and possible links between the two decision-making processes. For the energy sector, the selection of study objects departed from the list of assessment reports and applications for development permission from the first review. It was hence desirable that the municipality in which an energy plant project was proposed between 1995 and 1998 should have a local energy plan made during this period. As regards the waste sector, the selection of study objects was made due to the agenda of and partly to meet the aim of the participatory perspective within the research project “Better environmental decisions...” Hence, the choice of waste incinerator plants and associated waste management plans was made according to the degree of controversy. Some of the projects studied in the review have been subject to debate between different stakeholders, including the public, whereas other projects have proceeded with no controversy at all. As regards the local waste management plans, the selection was made in a way similar to the selection concerning the energy sector. The local

waste management plans related to the municipalities in which the selected waste incinerators were proposed.

Another intention was that the local plans should come prior to the projects in order to be able to see tiers between the planning and the project levels. This was not accomplished in the energy sector case. Local energy planning in Sweden has been criticised for not being actively performed and updated (cf Swedish National Audit Office, 1990). These plans seem not to be an active planning tool and in some studied cases it has been indicated that municipalities change the plans to fit the projects. This is the reason why some energy plans in the study were actually made after the projects were given development permission. The results of the review were then used in the analysis of the system boundaries applied by local planners, which are discussed in IV and V.

HOW ARE NATIONAL ENVIRONMENTAL POLICIES, AMBITIONS AND OBJECTIVES REFLECTED?

The local energy and waste management plans and the biofuelled energy plants and waste incinerators studied in this thesis are at least to some extent products of the national ambition to promote ecologically sustainable development and the decisions to convert the national energy system. This notion, together with the Swedish Government's expressed wish to implement these ambitions and decisions (e.g 1996/97: 84), gave birth to the idea behind the second research issue of this thesis: Which national ambitions, policies and objectives are discussed in the local planning and development permission decision-making processes? This was analysed during the second review as one of the review areas. The analysis of the review results regarding this, is illustrated in paper V.

FOCUSSING ON THE ENVIRONMENTAL ASSESSMENT PROCESS

During the latter part of this research process, the environmental assessment process also came into direct focus. When discussing the results of the first review, it was felt appropriate and necessary to complement the results with interviews with different actors within the environmental assessment process. The scope of the assessment report might to some extent be a result of informal discussions between the project developers and decision-making authorities, notes from which are usually not included in the assessment report (Kvarnbäck, 1995 and Bruhn-Tysk, 2001). An analysis of the scope based only on assessment reports may therefore be somewhat uncertain without analysing the actors' view on which issues the environmental assessment process should address. Two master theses made within the research project "Better environmental decisions..." regarding the views of officials at County Administrative Boards (through a series of eight interviews with officials involved in development permission processes concerning both biofuelled energy plants and waste incinerator plants) and regarding the view of the public (through an analysis of public meeting protocols) gave me the opportunity to analyse which environmental issues different actors bring to the environmental assessment process (see VI).

EXPLAINING THE CHOICE OF SYSTEM BOUNDARIES

When analysing and discussing the system boundaries applied within the studied environmental assessment processes, possible contributory aspects influencing the results have been sought. Such factors are discussed in e.g. I, III, IV and VI. The suggestion that the formal and informal institutional structures shape the context of how decisions are made and the outcome of a decision-making process (see Tonn et al., 2000 and Hill, 1997) has, when it comes to meeting the aim of this thesis, put the focus on how institutional structures influence the potential of formal decision-making processes to include emerging perspectives on environmental issues.

ANALYSIS APPROACH AND METHODS

This chapter describes and discusses the analysis approach and analytical methods used to meet the aim of the thesis, specifically the first and second research issues regarding the practice and context perspectives on the applied system boundaries on environmental issues. The practice perspective has been analysed through different studies of which system boundaries on environmental issues are applied by the different actors within the environmental assessment processes. An explanation model for the choice of system boundaries is also discussed and departs from the context perspective. A summary of analysis approaches and methods is given in table 2. For a more specific report of the methods used in this thesis, please see I-VI.

ANALYSING THE SYSTEM BOUNDARIES APPLIED IN ENVIRONMENTAL ASSESSMENTS BY THE DIFFERENT ACTORS

The practice perspective on system boundaries has partly been approached by an analysis of the system boundaries applied by different actors within the decision-making processes. This analysis departs from three different studies regarding which key issues the different actors find relevant. The view on relevant key issues have been examined through (i) a study of the scope of assessment reports and applications for development permissions regarding biofuelled energy plants and waste incinerator plants, which reveal the view of project developers and the decision-making authorities, and a study of the scope of local energy and waste management plans, which reveal the view of local planners; (ii) interviews with officials at County Administrative Boards, which further examine the views of the decision-making authorities as regards environmentally hazardous projects; and (iii) analysis of protocols from public meetings held during the environmental assessment process, which aim to illustrate the view of the public. In order to analyse the system boundaries applied, the results of these studies were further analysed from three perspectives: the temporal, the spatial and the resource perspective.

The view of project developers and decision-making authorities

The approach of focussing on the scope of assessment reports originates from the notion that the scope of an assessment report expresses which environmental issues are considered relevant by project developers and decision-making authorities as regards the project development permission process and the local planners as regards the local planning process. This notion is due to the fact that the environmental assessment process includes a scoping process, in which the key issues to be addressed are identified (Morgan, 1998; Jones, 1999 and Thérivel, 1999). The identification of which issues are most important and relevant in relation to the project or plan are, in ideal cases, discussed among the actors involved in the process. The results of this discussion should be a focus on the main issues and impacts together with a justification of why other issues are not considered important. As Jones (1999) discusses, scoping is important

“as it aims to identify and ‘narrow-down’ all the potential environmental impacts so that the assessment focuses on the key issues.”

If the scoping process focuses on the key issues, then the scope, i.e. the issues, which the assessment report focuses on, can be considered an indicator of which issues the actors find relevant from an environmental perspective. In line with the above reasoning, environmental issues discussed in the environmental assessment reports of proposed biofuelled energy plant and waste incinerator projects as well as local plans would therefore reflect how relevant they are to project developers, decision-making authorities, the public and the local planners, and consequently which system boundaries these actors apply. Accordingly, the indicated relevance of environmental issues also implies the potential in practice for the different decision-making levels to include a wider scope and hence meet the emerging demands for wider perspectives on environmental issues.

In order to study the scope, assessment reports regarding the energy plant projects and local plans were reviewed. The review phase of the environmental assessment process provides an opportunity to ensure that all relevant information is included, to evaluate the significance of the impacts of the planned project or plan, and to decide if the assessment report can provide a basis for decision-making (see Elkin and Smith, 1988 and Tomlinson, 1989). Within the evaluation of whether all relevant information is included, is an implicit focus on the scope, which is why the review approach has been considered appropriate. For details on the review, see I-IV as well as Bruhn-Tysk (2001).

The environmental assessment report regarding an energy plant project submitted to the authorities is the “end result” of a long process involving discussions between the project developers and officials at the County Administrative Boards. However, the assessment reports studied rarely include notes from these discussions. Therefore, the review studies were complemented by interviews with officials at County Administrative Boards regarding their opinion on which key issues are relevant to address when it comes to biofuelled energy plants and waste incinerator plants. The interview approach was due to the conception that the views of the officials are socially constructed and also formed by the traditional view of environmental issues within the organisation (see e.g Hill, 1997). This social structure and view is of course spelled out indirectly during the scoping process, in which the officials take part through consultation meetings. Even though this view would be directly spelled out during the scoping process, it would be difficult to study through a review, especially when notes from discussions regarding the scope are seldom included in the assessment reports. The interview approach will however allow a qualitative analysis of the social processes and context that form the actors' view on environmental issues (see Holme and Solvang, 1997).

For the purpose of analysing which system boundaries the officials apply, I have used transcriptions from the interviews with a particular focus on the areas covered in the interviews concerning (i) which key issues the officials considered most relevant regarding biofuelled energy plants and/or waste incinerator plants; (ii) their view on resource issues; (iii) the officials' view on which geographical scale the environmental assessment should cover; and (iv) whether indirect activities related to the proposed projects are concerned. The interview study is also described in VI.

The view of the public

The study of the public view on which key issues are most relevant is based on an analysis of documentation (protocols, etc.) from public consultation meetings made by Tiensuu (2004). In that analysis, she categorised the environmental issues brought forward by the public in two environmental assessment processes regarding waste incinerator plant projects. The categories concerned emissions, land use, resource issues and impacts on people and their health. One category also concerned miscellaneous issues. These categories were derived from the results of the analysis. For this thesis, I have used these results, compiled and distributed into categories in order to further analyse which system boundaries are applied by the public. For a full report on the original study, and for a more detailed report of the further analysis of the public view, see Tiensuu (2004) and VI respectively.

The view of local planners

When analysing the system boundaries applied by local planners in local plans, the methodological approach and point of departure have been the same as in the analysis of the system boundaries applied in the assessment reports for the proposed projects. During the second review, the scope of the environmental assessments of the local energy and waste management plans was studied as well. For a more detailed description of this study and its analysis approach, see IV. The scope has then been further analysed to discern the system boundaries.

The analysis of system boundaries

To analyse the system boundaries, the results of studies that examine the view of different actors are further analysed from three perspectives: the time perspective, the spatial perspective, and the resource flow perspective. The time perspective influences both the phases of a project as well as the impacts of the project or plan. Project developers have to consider each phase of the planned project during the environmental assessment process in order to assess the impacts during construction, operation, and demolition phases. Likewise, the short, medium, and long-term impacts have to be addressed as well in order to evaluate the impacts of a project or plan to its full extent (EC Directives 97/11/EC and 2001/42/EC). Furthermore, the spatial perspective entails that a proposed project will affect the environment locally, regionally and globally. This emphasises the importance of the spatial boundaries that are applied since projects and plans could be predicted to affect the environment differently, depending on what scale is considered (João, 2002). The third perspective regards how issues on resources are dealt with from a cradle-to-grave perspective. This perspective is considered important, as there have been an increased number of biofuelled energy plants and waste incinerator plants due to the decision to change the national energy system towards an increased use of biofuel and due to the ban on the disposal of combustible and organic waste. An increased use of biofuel may, in turn, affect the long-term production capacity of the forest ecosystem and if an increasing part of the waste goes to incineration instead of recycling, this may have indirect impact on the use of various resources as well. Russo (1999) also indicates that environmental assessments of energy projects (such as biofuelled energy plants and waste incinerator plants) have to focus on the entire lifecycle of the plant, which

certainly includes the fuel cycle with its extraction of fuel resources. Thus, a cradle-to-grave-perspective on the project is necessary to address these issues, when developing biofuelled energy plants or waste incinerator plants. This reasoning could apply to local plans as well, as they too could have an influence on resource flow through the development of local technical sectors.

ANALYSING WHICH NATIONAL POLICIES, AMBITIONS AND OBJECTIVES ARE REFLECTED IN THE DECISION-MAKING PROCESSES

In addition to the analysis approaches mentioned above, the system boundaries applied in practice have also been analysed through a study of which national policies, ambitions and objectives are reflected in the decision-making processes.

The political decision to change the national energy system towards an increased use of renewable energy sources and the political decision to promote recycling and reuse (Government Bill 1996/97: 84 and Government Bill 1992/93: 180 respectively) could be seen as part of the earlier stated aim for ecologically sustainable development (Government Bill 1990/91:90). These decisions also had both national and global environmental implications. In addition, the Swedish Government also presented new revised national environmental objectives in 1998, which were partly formulated from the aim for ecological sustainable development (Government Bill, 1997/98:145). Considering the environmental impacts of energy-related projects in particular, some of these objectives are of special relevance: clean air, no eutrophication, natural acidification only, sustainable forests, a good urban environment, a protective ozone layer and finally limited influence on climate. The local energy and waste management plans as well as the biofuelled energy plants and waste incinerators studied in this thesis could to some extent be seen as products of these national decisions and would hence be expected to reflect these decisions (in one way or another) as well as other important decisions influencing the project. Moreover, the projects and plans will probably lead to a development of the energy and waste sectors that influence the potential to reach these environmental objectives. The national decisions and environmental objectives deal with environmental issues that could, at least to some extent, be regarded as relevant key issues in the view of national policy-makers. Hence, the extent to which national policies, ambitions and objectives are discussed in the studied environmental assessment reports and local plans could therefore be regarded as illustrating the potential for the formal decision-making processes to include environmental issues from a national systems perspective. In this thesis, the analysis of how national policies, ambitions and objectives are reflected in the studied decision-making processes has been approached by reviewing the assessment reports and local plans with a special focus on which policies, ambitions and objectives are discussed. This focus was one of the areas covered during the second review (see also V for a further description of the review and analysis).

EXPLAINING THE CHOICE OF SYSTEM BOUNDARIES AND ANALYSING THE POTENTIAL FOR IMPROVEMENT

Explaining the choice of system boundaries

As suggested by Tonn et al. (2000) and Hill (1997), formal and informal institutional structures shape the context of how decisions are made and the outcome of a decision-making process. The decision-making process outcome could be seen as a result of three factors: (i) the interests of the actors within the process; (ii) the power of different actors; and (iii) the limits imposed by the rules of the decision-making process (March and Olsen, 1989). In this thesis these ideas have been used in order to further analyse possible contributory aspects that influence the potential of formal decision-making processes to include the emerging perspectives on environmental issues. This has been approached by relating the results of this thesis to the scope of the legal rules and degree of discretion⁵ and the interests and power of the main actors within the two studied formal decision-making processes (see I, III and IV and VI).

Analysing the potential for improvement

A theoretical point of departure for extending the review approach, to cover local energy and waste management plans as well, is the tiered view on environmental assessment processes. The idea of tiered environmental assessment processes departs from the idea of a decision-making hierarchy where one level (or tier) (policy-making or planning level) sets the action frames of the subsequent decision-making levels (cf Thérivel et al., 1992; Fischer, 2002). An environmental assessment at a high tier could therefore address environmental issues from a wider, more general and less detailed perspective, leaving the details and more local issues to the lower tiers. According to Thérivel et al. (1992), Partidário (1999), and Fischer (2002) tiered decision-making processes are important for sound decision-making. Furthermore, tiering different planning and decision-making levels is essential to integrating environment into decision-making as the links contribute to communication processes and agreement between different levels of decision-making as indicated by Sheate et al. (2003).

In this thesis, the tiering approach is related to the third research issue: How can the system boundaries be widened? The tiering approach is used to illustrate and discuss whether the local plans address issues from a wider perspective compared to the assessment reports of individual projects (the energy plants) and whether connecting the two studied decision-making processes would improve the potential for the processes to meet the new emerging perspectives on environmental issues. In order to discuss this, the links between different decision-making processes have been examined in two supplementary studies. The first study considers to what extent the studied assessment reports and plans make references to other related local plans and projects. This was evaluated during the second review. The second study regards how officials at the County Administrative Boards take different plans into account when

⁵ Discretion is in Ham and Hill (1993) and Hill (1997) discussed in terms of the limits within which an official can do what he or she likes. In the context of this thesis, this means the legislative limits the decision-making authorities have to act in accordance to.

deciding upon development permission. This was evaluated as one of the focus areas of the interview study (see also V, for a further description of the review and analysis). When discussing the idea of tiered environmental assessments, it has yet to be acknowledged that this idea is based on the perception that all decision-making levels are linked together and that policy, plans and programs are made sequentially. However, as Arts et al. (2005) indicates, this is not always the case. In this thesis, though, the analysis has departed from the view that the local planning process comes prior to the proposed projects.

SUMMARY OF ANALYTICAL APPROACHES AND METHODS

The analytical approaches and methods used to meet the aim of this thesis are summarised in table 2.

Table 2 *Analytical approaches and methods used to meet the aim of the thesis.*

Aim	Perspective on system boundaries	Research issue	Analysis approach	Method
<i>Explore the potential for the two decision-making processes to meet the emerging demand on wider perspectives on environmental issues</i>	Practice	Which system boundaries are applied by different actors?	Studies of the scope to evaluate the view on key issues of different actors	Review (studies the views of project developers, decision-making authorities and local planners)
				Interviews (studies the view of decision-making authorities)
				Analysis of the categorisation of issues brought forward by the public at public consultation meetings (studies the view of the public)
			Studies of which national policies, ambitions and objectives that are reflected in the decision-making processes	Reviewing assessment reports and plans with respect to national policies, ambitions and objectives
	Context	How can the choice of system boundaries be explained?	Discussing institutional aspects	Relating analysis results to scope of legislation and the interests and power of actors
	Improvement	How can the system boundaries be widened?	Do the local planning processes address wider perspectives on environmental issues?	Comparing system boundaries applied in the project development permission and the local planning processes
			Can links between the two processes improve the potential to include wider perspectives on environmental issues?	Review for assessment reports and plans with respect to references to different tiers
Interviews regarding how decision-makers take plans into account when deciding on projects				

SYSTEM BOUNDARIES APPLIED IN THE PROJECT DEVELOPMENT PERMISSION PROCESS

In this chapter, the system boundaries applied by the different actors within environmental assessment processes concerning biofuelled energy plants and waste incinerator plants, are analysed in order to illustrate the potential in practice of the formal decision-making process concerning environmental hazardous projects to include environmental issues from a wide perspective. The results of the different studies of the actors' views on which key issues are relevant are first summarised and then further analysed from three perspectives: time, space and resources, in order to illustrate the system boundaries. For a further discussion on these results, please refer to I, IV and VI.

SYSTEM BOUNDARIES APPLIED BY PROJECT DEVELOPERS AND DECISION-MAKING AUTHORITIES

Key issues

The views of project developers and decision-making authorities on key issues have been studied through a review of environmental assessment reports and applications for development permission concerning biofuelled energy plants (representing the energy sector) and waste incinerator plants (representing the waste sector). As regards the energy sector, the general scope of the studied environmental assessment reports include, in general, a relatively thorough description of the proposed project in terms of the capacity of the plant, the planned mix and amount of fuel as well as the estimated number of fuel transports and in one case transports of ashes. Furthermore, emissions to air and water are specified and estimated. The emissions to air mainly specify carbon dioxide, sulphur dioxide, and nitrous oxides. Particle and volatile organic compound emissions are mentioned too. Moreover emissions from transports are estimated from a regional perspective in two cases. Issues concerning noise, odour and dust from the plant are also considered in general. The technical description additionally includes an estimate of the amount of ashes generated within the plants. The description of the environment at risk to be affected generally concerns the physical surroundings, like schools, industry and housing areas and covers only in a few cases the natural environment as well. The description tends to be limited to the immediate vicinity of the energy plant. However, in one case the national resource potential is estimated. Although the studied assessment reports include an adequate description of the technical issues of the proposed project, it stops in many cases at a description of the emissions to air and water. There are in general few further assessments of impacts other than the impacts on the natural environment. Such impacts are assessed in terms of acidification, changes in traffic intensity, nitrogen deposition, eutrophication and acidification. Global warming is mentioned indirectly in three assessment reports. Impacts on public health and the management of resources are rarely considered. Health impacts mainly regard impacts on people living in the vicinity of the plant and in one case health impacts due to ozone depletion are assessed concerning the society as a whole.

Similar to the energy sector case, in general the scope of the studied environmental assessment reports regarding waste incinerator plants include a thorough technical description of the proposed plant. The need for resources is discussed in terms of the estimated amount of chemicals to be used and the estimated amount and mix of fuel that will be incinerated. Furthermore the fuel used in the local energy system and the waste flows within the municipality are discussed as well. Problems of noise, odour and dust are also considered as are the generation of ashes, sludge and other rejects. Emissions to air and water are specified and estimated, e.g regarding carbon dioxide, sulphur dioxide, nitrous oxides, particles, volatile organic compounds, dioxin and metals. The number of transports into the plant is estimated as well as the emissions these cause. Transports of ashes out of the plant are estimated as well, but no emissions are considered. As regards the description of the environment at risk of being affected, the assessment reports have in general included a description of the physical surroundings and natural environment (in terms of sensitivity) within a 1-km radius. The cultural environment is also considered in some reports. Furthermore the local, regional and national waste supply potential and municipal air quality are described as well. The assessment of the environmental impacts of the waste incinerator plants concern changes in emission levels, impacts on land use and landscape scenery, impacts on nutrient uptake in plants as well as problems due to methane production. Moreover, environmental impacts are assessed in terms of eutrophication, acidification, ground-level ozone formation, the increase of ozone in the stratosphere and global warming. Public health problems due to emissions and an impaired living environment are discussed as well. In addition, two of the studied environmental assessment reports concerning waste incineration include issues regarding whether the waste incinerator plant contributes to sound resource management from a societal perspective.

The views of the decision-makers regarding key issues were supplemented through interviews with officials at the County Administrative Boards, one of the responsible decision-making authorities as regards biofuelled energy plants and waste incinerator plants. The interviews show that the officials focus very much on the technical description of the plant, concerning issues such as fuel mix and storage, ashes and transports and their estimated emissions. It is also considered to be important to address noise, odour and dust in the assessment report. Furthermore, emissions, mainly to air, seem to be regarded as a crucial key issue. Risk management is also mentioned in terms of breakdowns and accidents. In the view of one official, the environment that could be affected by the plant should be described, as well as areas of national interests. When it comes to impacts, the key issues mentioned in the interviews concerned impacts on the people in the vicinity of the plant, and impacts on health and environment caused by emissions. The view of officials on resource issues mainly concern fuel transport and storage as well as management of ashes. In this context, it should also be noted that some of the officials thought that legislation did not allow them to call for an inclusion of such issues, even though the officials found the issues to be relevant. Moreover, the officials were asked about their view on the environmental assessment's boundaries in time and space. Not surprisingly many of the respondents answered "it depends" since each specific plant has its own conditions as a point of departure. Nevertheless, some of the officials seemed to have a clear

opinion on this: noise and odour should be regarded from a project or municipal perspective, impacts on housing areas should be assessed from a municipal perspective and emissions should be assessed from a regional perspective. It was furthermore stated that the construction phase of the plant and its environmental impacts were seldom considered. As indirect activities are concerned, transports is the main issue mentioned by the respondents. As in the case of resource issues, many officials find it difficult to find legal support to call for an inclusion of such activities in the environmental assessment.

System boundaries

As regard system boundaries applied by the project developers and decision-making authorities, these will be discussed from the three perspectives of time, space and resources. As regards time, the system boundaries on environmental issues seem to be considered mainly from a short-term perspective, such as noise and odour problems as well as some impacts of emissions. However, some environmental impacts are described from medium and long-term perspectives as well, such as acidification and global warming. The spatial system boundaries applied differ from being project-oriented and local (as regards the description of the environment and plant-related environmental issues) to regional and global (when it comes to transports and environmental impacts). An analysis from a resource perspective reveals system boundaries that mainly focus on the resource flow into the plant but also to some extent regard the outflow from the plant in terms of ashes. Resource extraction potentials are also assessed. However, no impacts of the resource flows are assessed. In general, the system boundaries applied do not differ between the energy and waste sectors. Nonetheless, there is one important difference. The spatial boundaries applied in some of the waste sector assessment reports also concern an additional societal perspective, which concern an environmentally sound management of resources.

These analysis results are similar to those discerned in reviews of e.g Kvarnäck (1995), Hickie and Wade (1998), Barker and Wood (1999) as well as Bruhn-Tysk (2001). However, the system boundaries illustrated here also indicates that in contrast to the reviews mentioned, project developers and decision-making authorities in this study also include an assessment of national and global impacts in some cases. Additionally, these actors also to some extent apply a system perspective on waste management, which has not been shown in the reviews referred to above.

The supplementary study of the view of key issues as regards the decision-making authorities, reveals a short- or medium-term perspective on environmental impacts e.g on emissions Furthermore, the spatial boundaries applied when it comes to different impacts seem to be local and regional depending on which impact is being considered. System boundaries applied concerning resources focus on the flow of resources into the plant (in terms of fuel transports and storage) and out from the plant (in terms of management of ashes).

SYSTEM BOUNDARIES APPLIED BY THE PUBLIC

Key issues

The key issues focussed on by the public are illustrated in this thesis by the results of a study made by Tiensuu (2004) regarding which issues the public brings to the environmental assessment process through public consultation meetings. Tiensuu's results show that the key issues focus on emissions, traffic, direct impacts of the plant, exploitation of the surrounding environment and resource issues. The focus on emissions concerns emissions to land, air and water, e.g. ashes, dioxin, heavy metals, nitrous oxides and sulphur oxides. Traffic issues concern noise, odour, emissions and alternative ways to transport waste to the plant. Direct impacts of the plant mainly concern noise and odour from the plant and infestation by vermin. Exploitation of the surrounding environment is only of general concern; however, some explicitly mention the countryside, forest clearance and the cultural environment. Furthermore, possible impacts mentioned concern health, such as impaired living conditions and emission-related diseases. Furthermore impacts on animals are brought up as an important issue in the view of the public. Finally, key issues concerning resources are other heating options (in terms of different energy sources), other ways to manage the waste flows (recycling, composting, etc.) and the amount of waste (concerns for the content in imported waste fractions, ashes and whether the need for energy will match the planned amount of waste to be incinerated).

System boundaries

The key issues indicated in Tiensuu's study illustrate temporal system boundaries concerning a short- and medium-term perspective. Furthermore, the spatial boundaries are mainly local as regards emissions, traffic issues, and the description of the environment and health impacts. However, there is a small indication of a regional perspective as well in the discussions of alternative ways to transport the fuel. The system boundaries applied regarding resources mainly concern inflows of fuel (indicated by the public concern about traffic) and discussion of different energy sources. Furthermore, a systems perspective on resources is also indicated in the results of Tiensuu by a discussion of other ways to manage the waste flows than incineration. The system boundaries applied resembles the public perspectives brought forward in Upreti and van der Horst (2004) who among other things discuss issues concerned by public opposition regarding a biofuelled energy plant development in the UK. However, even though the focus may be on local issues, the results of this thesis show that the public also add a system perspective on waste management issues.

SYSTEM BOUNDARIES APPLIED IN THE LOCAL PLANNING PROCESS

In this chapter, the system boundaries applied by local planners are analysed in order to illustrate the potential in practice of the local energy and waste management planning processes to include environmental issues from a wide perspective. The results of the study of the local planners' view on which key issues that are considered relevant are first summarised and then further analysed from three perspectives: time, space and resources, in order to illustrate the system boundaries. These results are further discussed in IV.

Key issues

The view of local planners has been studied through a review of the focus of environmental assessments of local energy plans and local waste management plans. The studied local energy plans include a rather thorough description of technical issues within the local energy system such as fuel mix, waste flows and emissions to air. Moreover, energy use within the transport sector is estimated as are the need for resources within both the local and national energy systems. The environmental conditions are described in terms of local physical settings, the degree of sensitivity of the regional natural environment and in terms of local, regional and national resource potential. The impacts of the plan on the environment are assessed in terms of change in emission levels and traffic intensity, eutrophication, acidification, ground-level ozone formation as well as global warming. In the energy plans impacts on health are discussed in terms of health problems due to emissions and ozone depletion. Finally, resource issues are expressed through discussions of nuclear storage problems, impacts on plants and animals as well as on the production capacity of the forest ecosystem.

The studied waste management plans also reveal a rather technical focus. Technical waste management issues such as local waste flows, waste reduction and increasing the number of waste fractions are discussed, as are national recycling rates. Furthermore, key issues also seem to include generation of waste from energy production, hygiene and littering and the appearance of collection depots. Issues such as regional waste transports and emissions to air and water are included as well. In terms of environmental conditions, only the local physical settings are described. The impacts on the environment caused by the local waste management system are assessed in terms of problems due to traffic, landfill or recycling depots; problems due to methane production; and finally, global warming. One issue on resource management is included: the generation of new waste fractions when managing waste flows. In addition, issues regarding the general use of resources, closing the material cycles and reducing the use of resources are discussed in a societal context.

System boundaries

The system boundaries applied in the studied local plans are, when it comes to the perspective of time, short-term (e.g. emissions from the energy system or littering and the appearance of recycling depots), medium-term (as regards the energy sector and in terms of e.g. eutrophication and acidification) as well as long-term (nuclear storage, global warming and production capacity of the forest ecosystem) perspectives on

issues and impacts. The spatial boundaries applied mainly concern the local perspective; however, issues (such as resource potential and assessed impacts) are discussed from the regional and national perspectives as well. As in the case of the studied project decision-making processes, the system boundaries in the energy and waste sectors do not differ much. However, the waste management plans also include a societal perspective on resource issues in terms of ecocycling and the use of resources.

HOW ARE NATIONAL POLICIES, AMBITIONS AND OBJECTIVES REFLECTED IN THE FORMAL DECISION-MAKING PROCESSES?

This chapter analyses the extent to which environmental issues from a national systems perspective are included in the studied decision-making processes. This is analysed through a review of the extent to which national policies, ambitions and objectives with environmental implications are reflected in the environmental assessment reports. A further elaboration of these results is found in V.

NATIONAL POLICIES, AMBITIONS AND OBJECTIVES REFLECTED IN THE DEVELOPMENT PERMISSION PROCESS

The studied environmental assessments of the biofuelled energy plants (representing the energy sector in this thesis) merely consider policies and ambitions regarding management of resources and materials, such as an ecocyclic society and producer's responsibility. Objectives considered in the assessment reports concern national goals for reuse and recycling along with waste management and treatment methods.

As regards the waste sector, the studied environmental assessment reports regarding waste incinerator plants discuss policies and ambitions concerning the ban on disposal of waste, EC Directives on waste incineration and management, the EC waste management hierarchy and environmental and waste management legislation. Different means of control, such as landfill tax and control of waste management and flows are included as well. Moreover, secure, safe, domestic energy supply is considered and one assessment report also includes a discussion of the decision to prioritise recycling. National objectives included in the assessment reports concern environmental goals and environmental air quality standards. These national objectives are also considered from a regional perspective. Regional goals for the energy sector are also discussed, as are goals for closed ecocycles. As regards local objectives, Agenda 21 and sustainable society, products and waste, contaminated areas as well as energy production are discussed. Specific resource management goals concern environmentally sustainable use of resources.

To sum up, the assessment reports of the biofuelled energy plants seem to mainly consider national resource and material flows. However, they do not include any discussion of the decision to shift the national energy system towards an increased use of renewable resources. The studied assessment reports of waste incinerator plants seem to apply a national systems perspective and discuss material and resource flows, energy supply and pollution. Also discussed is the ban on disposal of organic and combustible waste, which many of the waste incinerators studied are built to meet. There are also discussions of products and sustainable development. To conclude, as regards the energy sector, the project development permission process does only to some extent include environmental issues relevant from a national policy perspective. As regards the waste sector, the project development processes also include environmental issues relevant from a national policy perspective, but to a larger extent compared to the energy sector. These results indicate that the project development permission processes have not taken full account of the societal ambitions to steer the

development of the societal technical systems in accordance with the aims for ecological sustainable development. However, as the results of the waste sector indicate, the societal ambitions might further on be included to a higher degree. These results indicate that the system boundaries applied by the project developers and decision-making authorities include a societal perspective as well.

NATIONAL POLICIES, AMBITIONS AND OBJECTIVES IN LOCAL PLANNING PROCESSES

As regards the energy sector, the studied local energy plans include policies and ambitions regarding refrigerant phase-out and economic and legislative means of control. Furthermore the plans include discussions on the national ambitions on energy supply and national preferences of the use of different materials. The transition of the national energy system and the national levels of carbon dioxide emissions are national policies and ambitions that are also mentioned in the energy plans. In terms of different objectives, national goals discussed in the plans concern oil reduction and reduction and/or restrictions on ashes. Reduction and/or restrictions on sulphur oxide, nitrogen dioxide and carbon dioxide emissions are discussed from a regional and local perspective. Furthermore, the use of different energy sources is discussed from a regional and local perspective as well. Peat harvesting and recirculation of ashes are regional objectives mentioned as well. Local objectives discussed in the local energy plans mainly concern energy use and efficiency, environmental management issues, sustainable societies and biological diversity. Goals for the local transport system are included as well, as are closed material cycles. Furthermore, goals regarding the use and management of resources and waste reduction are discussed too.

The waste management plans studied for this thesis involve policies and ambitions concerning the EC waste management hierarchy, issues of sustainable development as well as waste management and treatment methods. Moreover, ambitions and decisions on ecocycling and producer's responsibilities are included as well. One plan also includes national strategies for restoration of contaminated areas. Objectives reflected in the waste management plans concern national goals for reduction of environmentally hazardous substances in waste fractions and recycling. Ecocycling and an environmentally sustainable use of resources as well as clean waste flows are discussed from a local perspective. Furthermore, local objectives regarding waste treatment methods and environmental strategic management of the waste management system are also included in the studied waste management plans. Local goals for Agenda 21 and sustainable societies are discussed too.

To sum up, the national policies, ambitions and goals discussed or mentioned in the studied local energy plans mainly concern reduction of emissions, material and resource flows and sustainable development. Furthermore, the national ambition to shift the energy system towards an extended use of renewable energy sources is discussed as well. The studied waste management plans include issues regarding national material and resource flows as well as national and international legislation. Pollution and sustainable development are discussed from a local perspective. To conclude from the results, the local energy planning process seems to include issues relevant from a national environmental policy perspective. The local waste

management planning process includes nationally relevant environmental perspectives as well, but not to the same extent compared to the local energy planning process.

LINKS BETWEEN THE DECISION-MAKING PROCESSES

One approach to the research issue concerning how the system boundaries can be widened has been to analyse whether connecting the two studied decision-making processes would improve the potential for the processes to meet the new emerging perspectives on environmental issues. This is analysed through (i) a study of to what extent the studied assessment reports and plans make references to other related local plans and projects and (ii) how officials at the County Administrative Boards take different plans into account when deciding on development permission. This chapter presents and discusses the results of these studies. For a further elaboration of these results, see V.

REFERENCES TO PLANS AND PROJECTS IN THE STUDIED ASSESSMENT REPORTS AND PLANS

The results of the review show that the studied assessment reports for the biofuelled energy plants include references to spatial plans and the local waste management plan. One environmental assessment report also includes a reference to another proposed energy plant project. As regards the environmental assessment reports concerning waste incinerator plants, spatial plans, waste management plans, the local comprehensive plan and the local energy plan are considered.

The studied local energy plans include references to earlier energy plans, spatial plans, waste management plans, local Agenda 21, transport planning, environmental planning and the local comprehensive plan. In one case, one of the studied energy plans refers to different projects resulting from a local investment programme. As regards the local waste management plans, these include references to waste management plans, comprehensive plans and the local energy plan. Furthermore, the local Agenda 21 and environmental planning is referred to as well. Different projects that are discussed concern transports, energy plant projects and waste management.

To sum up, as regards the energy sector, the project development permission process for the energy sector includes references to the local planning processes but not the local energy planning process. The studied energy plans do also include references to different local planning processes. However, no reference is made to subsequent projects resulting from the plan. As regards the waste sector, the project development permission processes seemingly refer to different plans, thereby the local energy and waste management plans. The studied waste management plans include both references to different local plans related to the waste management plan as well as references to subsequent projects resulting from the plan, for example an energy plant. Based on these results and with regard to the energy sector, the two processes do not seem to be connected at all. As regards the waste sector however, the processes are connected, which would improve the potential for a sound decision-making as suggested by Thérivel et al. (1992), Partidário (1999), and Fischer (2002).

REFERENCES MADE TO PLANS BY PROJECT DECISION-MAKING AUTHORITIES

In the interviews performed with the officials at County Administrative Boards, the officials stated that regarding local plans, such were considered only if there were obvious conflicts or specific future projects that may be held back by the biofuel or waste incinerator plant. Four officials consulted comprehensive and spatial plans to make sure the proposed project would not be in conflict with these plans. As regards local energy plans, two officials mentioned this kind of plan. One official did not consider the energy plan as

“it has lost its significance due to the deregulation of the energy market”.

The other official thought that the project had to relate to the local energy plan in some way. The local waste management plan was mentioned by three of the interviewed officials. Two thought that the waste management plan had to be considered, either when decisions on development permission for waste incinerator plants were made by the County Administrative Board or related to in the environmental assessment report by the project developers themselves. One official thought that these kinds of local plans were usually too old to be considered.

To conclude on these results, the officials seem to relate mainly to spatial plans, as they are legally obliged to do so (SFS 1998:808). However, references to other local plans such as the energy and waste management plans are rare. One reason for this seems to be the fact that these kinds of plans are rarely updated and used as a steering document. Nevertheless, since the local energy and waste management plans in theory would address environmental issues from wider perspectives compared to the environmental assessments for individual projects, the lack of references to these plans may reduce the potential for the development permission process to include environmental issues from wider perspectives.

EXPLAINING THE CHOICE OF SYSTEM BOUNDARIES

This chapter seeks to explain the different actors' choice of system boundaries by relating the system boundaries to the formal rules and to the interests and power of the actors within the two studied formal decision-making processes. The discussions in this chapter regard the choice of system boundaries applied by the project developers, decision-making authorities and local planners. Even though it might bring in important perspectives; the system boundaries applied by the public will not be further discussed here since the public often plays a minor role in practice for the scope covered in the development permission process. For a further discussion of the public's view on environmental issues, see VI.

FORMAL RULES

One of the factors suggested by March and Olsen (1989) that influences the outcome of the decision-making process is the formal rules and the limits they impose. As the two processes — the local planning process and the development permission process — are regulated by legislation, these kinds of formal rules would certainly have a strong influence on the system boundaries applied by project developers and local planners as well as by the decision-making authorities. As regards the energy sector, the development permission process for the biofuelled energy plants was regulated through the Environmental Protection Act (SFS 1969:387). The Environmental Protection Act was very local and project-oriented, which might to some extent explain the main focus on technical issues and on the immediate vicinity of the proposed biofuelled energy plants found in the studied assessment reports (see I and IV). Furthermore, and as indicated in IV, only a few of the assessment reports regarding biofuelled energy plants include an assessment of the impacts at a wider spatial scale than the local. This could also be a result of the local focus of the Environmental Protection Act. Nonetheless, it could also be a result of the lack of guidance on environmental assessments during the period when the biofuelled energy plants were proposed. Environmental assessments were regulated through the Environmental Impact Assessment Ordinance (SFS 1991:738), which specified what an assessment report should contain, and through the Act on the Management of Natural Resources (SFS 1987:12), which specified the aim of environmental assessment for projects. Apart from these, there were no further guidelines in the environmental regulations relating to which issues an assessment report should contain. Guidelines issued by the Swedish Environmental Protection Agency (1995) aimed to further explain the content of an assessment report. In the guidelines, an assessment of the direct and indirect impacts of a proposed project is mentioned; however, there are no suggestions on which spatial boundaries to apply. When it comes to local energy plans, the local planners seem to apply somewhat wider system boundaries. One explanation for this could be that guidelines on local energy planning (Swedish National Board for Industrial and Technical Development, 1991) suggest that environmental issues should be discussed from wider than local perspectives, which might have triggered wider perspectives on environmental issues.

The development permission process for the studied waste incinerator plants is regulated in the Environmental Code (SFS 1998:808). In the Code, the aim of

environmental assessment and guidelines for the content of the assessment report have been specified. However, there are still no suggestions on which spatial or temporal perspectives on environmental issues to apply. However, in the Code, the legal requirements of the EC Directive on environmental assessments of projects (97/11/EC) were incorporated into Swedish environmental legislation. In the Directive, it is stated that impacts should be assessed from a short, medium and long-term perspective. Even if this is not shown in all the studied assessment reports regarding waste incinerator plants, the analysis of the scope of the assessment reports reveals that project developers and decision-making authorities seem to apply wider system boundaries in comparison to the case of biofuelled energy plants. As regards the municipal waste management plans, there were no legal calls for environmental assessments of these kinds of plans. However, guidelines on waste management planning included suggestions to discuss environmental as well as other issues. No spatial perspectives were suggested, however, which might be a reason for the local focus of the environmental issues that are nonetheless included and discussed.

INTERESTS AND POWER OF DIFFERENT ACTORS WITHIN THE DECISION-MAKING PROCESSES

In line with Hill (1997), March and Olsen (1989) and Tonn et al. (2000), the power and interests of the actors are also important aspects that influence the system boundaries which different actors apply. According to Petts (1999), project developers tend to see environmental assessments as an administrative barrier to their proposed project. Their interest in going beyond the legal requirements and applying system boundaries that include more than what is legally expected, may hence be very slight. This slight interest may be a partial reason as to why resource issues are rarely included. As in the case of the biofuelled energy plants, the biofuels used in Swedish energy plants are, according to the Swedish National Energy Administration (2000), primarily forest residues and forestry by-products. Some biofuels, such as peat, are also imported. The heat and electricity-producing sector using biofuels comprises private companies and companies owned by the government and municipalities themselves (Swedish National Energy Administration, 1998). Due to the differing activities of the forestry industries and the energy companies, and their different interests and responsibilities, energy plant owners may consider the impacts of proposed projects on the management of natural resources to be the responsibility of the resource extractors. The energy plant owners are not involved in forestry, and may therefore exclude such issues when scoping their environmental assessment. Hence, since the responsibilities and interests of the actors differ, there is no integration of natural resources into the assessment report.

The power of development permission decision-making authorities is also a very important factor influencing which system boundaries are applied for proposed projects. Both the Environmental Protection Act and the Environmental Code regulate only the permission of single biofuelled energy or waste incinerator plants in relation to the impacts that are directly linked to these plants. Only in exceptional cases could impacts of other parts of the energy or waste management system be considered. This individual control means, among other things, that the decision-making authorities could not set conditions for an activity run by a third party, even if there is a clear

relation between the activities (Michanek, 1990). Hence, in the case of the studied proposed projects, the decision-makers could only call for an examination of important issues like resource management or transports while they could not set any legal conditions on such issues.

As regards the local planners, their interests and power also seem to influence which system boundaries are applied. In a review of the energy planning legislation, the Swedish National Audit Office (1990) found the Local Government Energy Planning Act to be rather toothless and without sanctions. They also indicated that the Act had little impact on development in the sector in practice. Furthermore, many of the local authorities have sold the municipal energy supply system to private companies or turned their energy supply functions into companies partly owned by the local authorities. This means that in practice these local authorities do not have much influence over development in the energy sector, which in turn implies that the local authority would have fewer incentives to make proactive plans with broad perspectives relating to municipal functions over which they don't have much influence. In addition, the local authorities seem to only have influence on the development of a sector within the territorial boundaries of the municipality (cf Gustafsson, 1999), which might to some extent be the reason for the local focus in the local waste management plans concerning the environmental issues that are nonetheless included.

CONCLUDING REMARKS

In this chapter, the results of the different analyses in the thesis are synthesised and discussed in order to draw conclusions about the potential for the two studied formal decision-making processes to meet the emerging demand for wider perspectives on environmental issues. These concluding remarks are based on the three perspectives on system boundaries stated in the introductory chapter: practice, context and improvement.

In this thesis, the focus has been on the potential for two formal decision-making processes, the development permission process and the local planning process, to meet the emerging demand for wider perspectives on environmental issues.

As regards the development permission process, the results in this thesis show that the system boundaries applied by project developers and decision-making authorities in the environmental assessment reports have been rather narrow in the past. This means that environmentally relevant issues such as global and long-term impacts and resource management issues tend to have been disregarded. However, the studies of the assessment reports of the waste incinerator plants reveal that these issues are beginning to emerge. The assessment reports of the waste incinerator plants include, to a somewhat larger extent, issues relevant from a global and long-term perspective and which concern indirect activities as well. In the discussions of the development permission process, this thesis also brings out some aspects that influence the potential to meet the emerging demand on environmental issues. First, the formal rules, such as legal requirements or various guidelines, shape the actor's perspectives on environmental issues and hence the system boundaries they apply. As project developers tend to merely comply with the legislative rules, the scope of the formal rules are important. If the perspectives on environmental issues prevailing in legislation and guidelines were limited both in regards to time and space, the system boundaries applied by project developers would also be limited. However, if environmental issues were called for from a wide systems perspective, there would at least be a possibility that project developers would take all environmentally relevant issues into account. At present, the perspectives within the legislative rules limit the system boundaries to include only direct activities and exclude important environmental issues like transport and resources. In addition, the formal rules also set conditions for which issues the decision-making authorities may possibly include and regulate. Legislation does not authorise the decision-makers to set legal conditions regarding indirect activities, such as transports and resource management, run by a third party. Hence, even though the decision-makers have the possibility to at least call for an examination of such activities, impacts regarding such issues might be disregarded. This could mean that when deciding on project development permission for an environmentally hazardous energy project, environmental issues important from a systems perspective are overlooked.

Moreover, the potential for the development permission process to meet the demands for wider perspectives on environmental issues might improve if the formal decision-making process and the environmental assessment process were separated in practice as well as in theory. In theory, the environmental assessment process is to be regarded

as a separate process in which different project development alternatives and impacts are assessed, at least partly independent of which project development alternative the project developers apply for. The environmental assessment process therefore has the theoretical potential to include environmental issues scoped from a wide system perspective. However, since the environmental assessment process for environmentally hazardous projects in Sweden is in practice very closely related to the formal decision-making process for development permission, the scope of both processes tends to mirror the scope of the rules that regulate the development permission process. In other words, the scope tends, in many cases, to be rather local and project-oriented. Third, the analysis of the system boundaries applied by the public reveals that in some cases it is the public, which brings wider perspectives into the decision-making process. In relation to the potential to meet the emerging demands for wider perspectives on environmental issues, these results show that it is important to ensure that the public has the opportunity to express its opinion and that public opinions actually are considered in the decision-making process. If they are, public opinion might help to ensure that the decision on development permission is based on a wider systems perspective as well.

As regards the local planning processes, the potential to meet the emerging demands for wider environmental perspectives differs in theory and in practice. Since the studied local planning processes concern the development of a local technical system, there is a theoretical potential to discuss and assess the environmental impacts from a systems perspective. However, in practice this seems not to be the case. As regards the energy planning process, the local planners apply wide system boundaries in some cases but there is still mainly a local perspective on environmental issues. The waste management plans apply largely local boundaries. However, relevant environmental issues seen from a national policy perspective, such as material and resource flows, are discussed. This thesis suggests that one aspect influencing the potential to include environmental issues from a wider perspective is the unofficial low status of local energy and waste management plans. These plans tend to be rather neglected, and their low status provides few incentives to apply wide system boundaries or to even make such plans. Hence, the potential to meet the emerging demand for wider perspectives on environmental issues is in practice rather low. Therefore, to increase this potential it is important to raise the status of local energy and waste management plans so they can have an actual impact on the development of the local sectors.

Finally, in order to increase the potential for both of the two formal decision-making processes studied in this thesis, tiering the two decision-making processes would enable local planners, project developers and decision-making authorities to address impacts from a wider perspective. This presumes of course that the status of the local plans is increased and that the local plans to a larger extent include environmental issues from a wide perspective. But if both these conditions are met, tiering the two processes would leave only local and project-oriented environmental issues to be discussed within the project development permission process, and project decision-making authorities would only need to refer to the local plan in order to examine the environmental impacts of a proposed energy project from a wider perspective. As the practice is today, however, neither of these two processes has the potential to meet the emerging demand for wider perspectives on environmental issues.

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