Cumulative Effects in Swedish Impact Assessment Practice

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Abstract

The overall objective of this thesis is to investigate how cumulative effects (CE) are considered in the Swedish context of impact assessment. CE can be explained to be the changes to the environment that are caused by an action in combination with other past, present and reasonable foreseeable future actions. Specific questions to examine are:

- What is the EU and Swedish legislative basis for including CE?
- How do the impact assessment actors implementing the Swedish legislation perceive their work with CE. Questions addressed in relation to this are the actors:
  - knowledge base of the term and concept of CE, and also their perception of the requirements to consider these types of effects;
  - knowledge base of how to work with CE in practice;
    attitudes towards and expressed ability to include CE in the environmental impact assessment (EIA) and strategic environmental assessment (SEA) process;
  - experienced difficulties and obstacles to include CE in the EIA/SEA process.

The methods used are mainly qualitative and include literature studies, document analysis and semistructured interviews. The results show that there is a lack of both legislative as professionally based incitements for including CE. An extensive amount of difficulties and obstacles as perceived by the EIA/SEA actors and in relation to the inclusion of CE in EIA and SEA is outlined. All the EIA/SEA actors showed to have some idea about the phenomenon. Even though the actor's *will to act* i.e. to include these effects, is in place, their ability to act is hampered by factors connected to *knowing that* (knowledge on requirements to include CE in the EIA/SEA process) and *knowing how* (knowledge in relation to how to approach cumulative issues e.g. methods for evaluation of CE).

The almost non existent practice in relation to assessment of cumulative impacts in Sweden is hardly surprising considering the existing and thus far rather vague demands in respect of the inclusion and assessment of CE in Swedish EIA and SEA legislation, regulations, guidelines and handbooks. The existing drafts of forthcoming general guidelines and the handbook for SEA do however include the term CE. To what extent these new wordings will lead to the more routine inclusion and assessment of CE will however remain dependent on the various conditions and obstacles identified in this study, namely, professional knowledge and skill relating to the use of methods to assess CE, support and demands from colleagues, reviewers and proponents to include and assess CE, the existence of relevant databases suitable for assessing CE, sufficient time and financial resources, scoping in time and space that enables CE to be included in the EIA work and the emergence of an impact assessment attitude and practice that includes CE.

Keywords: EIA, SEA, cumulative effects, EIA and SEA directives, Swedish environmental legislation, EIA practice

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List of included papers[1]

This thesis is based on the work contained in the following papers, referred to by Roman numerals in the text:

I Oscarsson, A. (2006). "Lack of Incitement in the Swedish EIA/SEA Process to Include Cumulative Effects" in Emmelin, L (ed), 2006, Effective environmental assessment tools - critical reflections on concepts and practice. Karlskrona.

II Wärnbäck, A., and T. Hilding-Rydevik (2007). *Cumulative effects in Swedish impact assessment practice – difficulties and obstacles*. Submitted to "Environmental Impact Assessment Review"

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[1] The author of this thesis changed surname from *Oscarsson* to *Wärnbäck* in July, 2006

Abbreviations

CBD	the Convention on Biological Diversity
CE	Cumulative Effects
CEA	Cumulative Effects Assessments
CEARC	the Canadian Environmental Assessment Research Council
DDP	Detailed Development Plan
EA	Environmental Assessment
EC	European Community
EIA	Environmental Impact Assessment
EPA	The Swedish Environmental Protection Agency
EU	European Union
GIS	Geographic information system
MiSt	an interdisciplinary research programme – Tools for environmental assessment in strategic decision making
NEPA	National Environmental Policy Act
SEA	Strategic Environmental Assessment
Sida	the Swedish International Development Cooperation Agency

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This research project is part of the interdisciplinary research programme MiSt – Tools for environmental assessment in strategic decision making (www.sea-mist.se). The focus of the MiSt-programme is the empirical study of effectiveness of tools of environmental assessment as aid to strategic decision making. The programme is funded by the Swedish Environmental Protection Agency. The thesis work has been conducted at the Department of Urban and Rural Development at the Swedish University of Agricultural Sciences, Uppsala.

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Antoienette Wärnbäck
Uppsala May 2007

Contents

1 Introduction

Both the natural and manmade environments and we as individual human beings are effected by the total picture of impacts derived from e.g. air emissions, toxic wastes, the fragmentation of the landscape, noise, changing scenery and from activities such as road building, traffic, housing, industry, power transmission lines, agriculture and transportation. One example of the effects that can occur as a result of the confluence of many separate, different and sometimes small impacts interacting is that of the emission of nutrients from the agricultural sector to a watercourse combined with the emission of hot water from an industrial plant into the same watercourse. These two emissions taken separately might be harmless to the environment, but together they might lead to toxic algae bloom which negatively affects the fish population which in turn perhaps also has a negative effect on the standard of human recreation and 'outdoor life' in the area concerned. The effects arising from these interactions are in an EIA (environmental impact assessment) and SEA (strategic environmental assessment) context called cumulative effects (CE). Several different definitions of CE currently exist but are often expressed in a similar fashion to the following: *cumulative effects are changes to the environment that are caused by an action in combination with other past, present and reasonably foreseeable future actions* (Council on Environmental Quality 1997, p. 1; Commission of the European Communities 1999, p. 7; Hegmann et al. 1999, p. 3). The importance of taking CE into account is e.g. manifested in Peterson et al. (1987), Council on Environmental Quality (1997), and Wegner, Moore and Bailey (2005).

In relation to the more than 30 year history of EIA and SEA development, the concept of CE were already recognized, in the USA, as far back as the beginning of the 1970's, where these effects were included in the EIS process by the courts when assessing whether a federal activity should include to carry out an EIS (environmental impact statement) or not in accordance with NEPA (National Environmental Policy Act) (Westerlund 1999). Cumulative

effects are currently required to be assessed by four European Community (EC) Directives (Council Directive 85/337/EEC 1985; Council Directive 92/43/EEC 1992; Council Directive 97/11/EC 1997; Council Directive 2001/42/EC 2001). In the Swedish context the term CE is just now being introduced into Swedish EIA legislation through the general guidelines that are currently being drafted. The phenomenon of CE can however be said to be recognized through the Swedish Environmental Code even though this is not undertaken very clearly.

In spite of the seemingly early recognition of CE and the introduction of CE in different international EIA and SEA legislations a number of shortcomings have been recognized internationally. The lack of a common definition in particular is highlighted as a shortcoming while it is also further acknowledged that there seems to be a clear lack of even a general understanding of the concept of *cumulative effects* among those involved in the EIA process (Cooper & Sheate 2004). Baxter, Ross and Spaling (2000) also point to a weakness in respect of the term as the concept of cumulative effects assessment remains basically unknown and thus members of the affected communities may be unable to communicate concerns in respect of these problems. Furthermore, several authors have also pointed out that there remains a lack of appropriate consideration given to cumulative effects in environmental assessments. This has also been noted in countries such as the USA, Canada (Baxter et al. 2001), and the United Kingdom (Cooper & Sheate 2002) which in the circle of EIA actors are often considered as being among the countries in the vanguard in terms of environmental assessment work. Different hindrances and barriers to the sub-optimal inclusion or consideration of cumulative effects have been suggested (Clark 1994; McCold & Holman 1995; Canter & Kamath 1995a; Canter 2000; MacDonald 2000; Piper 2001; Senner et al. 2002; Duinker & Greig 2006).

With respect to the current situation in Sweden two studies which included reviews of Swedish EIA documents show that less than 1% of these documents include a description of cumulative effects (de Jong et al. 2004; Olausson et al. 2004). These two reviews were together based on an extensive data material collection containing nearly 400 EIAs. The documents are mainly of the project-EIA type but there are also many EIAs on Detailed Development Plans (DDP) of which some would have been required to be carried out as SEAs with today's demand for the environmental assessment of plans. One of the review studies focused on the issue of the implementation of the Convention on Biological Diversity (CBD), article 14 regarding EIA, and investigated how impacts on biodiversity are analysed in Swedish EIA documents. The analysed material was taken from different sectors (industry, roads, railways etc.). The study showed that there is a distinct lack of

discussion in respect of cumulative effects and the natural environment. The landscape is not described in ecological terms and both historical perspectives and prognoses of the future are absent from the EIA documents. The poor standard of analysis of environmental effects, including cumulative effects, is thought to be caused by a lack of contact between research and practice, a lack of knowledge within nature conservation biology, a lack of competence among consultants and reviewers, and also due to the fact that the authorities are not clear enough regarding what kind of basic data should be included in the EIA (de Jong et al. 2004). The conclusion that Swedish EIA documents lack both a description and a discussion of the cumulative effects issue is also shown in the other study which was based on EIAs of DDP. That study showed that a description about indirect effects, long-term impacts, regional or global impacts and also cumulative effects was generally lacking for the EIAs consulted (Olausson et al. 2004). As regards the strategic level, a study based on a review of Swedish Comprehensive Plans carried out between 1996 and 2002, showed that, "*[t]he majority of the plans studied have presented some kind of consequences. But aspects that seem to be forgotten are the assessments of indirect and cumulative consequences, except very occasionally*" (Åkerskog 2006, p. 130).

No previous studies have focused on the issue of cumulative effects and the Swedish EIA/SEA process. As such, little knowledge exists in respect of the consideration of cumulative effects in the process behind the documents. What do, for example, consultants, proponents and reviewers know about the phenomenon of cumulative effects and the requirements to include these effects? And what do such experienced obstacles look like? This question, and the curiosity behind it, gave rise to the idea of attempting to understand why cumulative effects are *not* described in EIA/SEA documents in Sweden. One way to further explore cumulative effects as an issue in the process is by collecting empirical information on actors' statements on how they work with cumulative effects, their knowledge regarding the phenomenon and their stated idea of the possibilities, obstacles and difficulties in investigating these effects. In order then to attain an overview of the competence levels needed and of the perceptions of the need to assess cumulative effects and experiences in respect of the difficulties and obstacles relating to the inclusion of these effects among the actors involved in the EIA/SEA process an interview study was performed.

1.1 Objectives

The overall objective of this thesis is to explore how cumulative effects are considered in the EIA/SEA process. Specific objectives of the study are to explore:

- the knowledge base on the term and concept of cumulative effects, and also regarding requirements to consider these types of effects;
- the knowledge base on how to practically work with cumulative effect issues;
- attitudes and expressed ability to include cumulative effects in the EIA/SEA process; and
- the experienced obstacles and difficulties of including cumulative effects in the EIA/SEA process.

This thesis is a part of the interdisciplinary research programme MiSt – Tools for environmental assessment in strategic decision making. The programme's focus is to empirically study the effectiveness of environmental assessment tools as aid to strategic decision making. The object of the research is to study the function of tools that aid in environmental assessment as a key component in strategic decision making. The aim is:

- a critical examination of the function of tools,
- a theory based understanding of their effectiveness, and
- ultimately a development of prescriptions for effective tool use including the effective combination of tools.

On the grounds that previous studies show that cumulative effects are seldom included in the effect description of Swedish EIA/SEA documents this thesis deals indirectly with the effectiveness of EIA and SEA in embracing new impacts, e.g. CE. By effectiveness here is meant to what extent EIA and SEA practice delivers the expected legislative outputs.

1.2 Structure of thesis

The first section of this thesis includes details of the theoretical approach and methods used in this study. This section also presents the design of the interview study, the use of the analysis tool ATLAS.ti and the analysis of the interview material. The second section includes a rather extensive literature review. The review contains a presentation of the current situation as regards the assessment of cumulative effects in a Swedish EIA/SEA context. In

addition, it maps out definitions and explanations in respect of the concept of cumulative effects and how they are considered in legislation, guidelines, handbooks etc. The literature review also provides an overview of arguments made on the inclusion of cumulative effects in EIA/SEA and of methods to identify, describe and evaluate cumulative effects. Furthermore, the results are illuminated by the interview study (summary of Paper I and Paper II). Finally the thesis concludes with a discussion and conclusion section which highlights some further needs for research within the area of cumulative effects in EIA/SEA.

The licentiate thesis including the planning, the gathering of empirical data, the analysis and writing of the papers and covering essay has been conducted by Antoienette Wärnbäck. Guidance and advice has been the input from the supervisors and others as indicated in the acknowledgements. Paper II was also written mainly by Antoienette Wärnbäck. The co-author Tuija Hilding-Rydevik contributed however with the idea to the framework used in the analysis, guidance in relation to the contents and structure, input to the discussion and in developing certain parts of the text.

2 Theoretical approach and methods

2.1 Theory and research approach

Theory can best be viewed as a way of observing and thinking about the world rather than merely as an abstract representation of it. Theory should thus be considered as a lens for observation rather than as a mirror of nature *per se*. The lens metaphor can be of use when choosing a theory and in determining what the researcher will direct his/her attention towards as well as in determining what the consequences of this choice will be (Alvesson & Deetz 2000). The research approach chosen in a research project is a strategy that helps find answers to posed research questions. This study is exploratory in terms of aiming to map out how different EIA/SEA actors work with cumulative effects, but also explanatory in nature in terms of mapping out the possible obstacles and difficulties to including cumulative effects in the EIA/SEA process.

The lenses used in this study were chosen with reference to the quest to explore the issue of cumulative effects and its position in the EIA/SEA process. The approach chosen was not to directly observe how cumulative effects are treated in the process, but to investigate how certain types of actors directly or indirectly experience the issue of these effects in the process. During the research process, different approaches were needed and used along the way. The process also took a turn which ultimately changed the original plan of the project. The change of path was determined in response to the results obtained from the original approach chosen earlier in the process. In the initial phase of the research project, the author planned to work more with methods of identifying, describing and evaluating cumulative effects, preferably on biodiversity. The plan included an exploration and investigation of some of the problems with cumulative effects in terms of the methods used

to track them while also suggesting possible improvements in respect of their better adaptation to Swedish conditions. The original plan was to investigate these questions by means of a case study. The plan was to base the case study on the results of an interview study, where the results gathered would guide the author in respect of the advantages and disadvantages of today's cumulative effect methods according to the actors working in the Swedish context. Since however the interview study showed that the level of awareness in respect of how to approach cumulative effects among actors in the EIA/SEA process was lower than originally expected (or hoped for), the interview results could not act as a guide to the author in the planned case study. The interview study did however lead the author to go in another direction, where approaches other than that of the case study methodology were needed. The authors' understanding of the knowledge-base and use of cumulative effects methods were thus developed early in the research process while the research approach had to be adapted to the interview results.

In aiming to illustrate the research approach, the chosen methods, as well as some key findings explaining the choice of theories are first described. A literature study was undertaken as an initial part of the research project. The aim of the literature review was to gain an overview of: the term and phenomenon of cumulative effects, national and international research on cumulative effects in an EIA context, the legislative requirements to include cumulative effects, and how cumulative effects are described and dealt with in guidelines, handbooks and textbooks in respect of EIA. In striving to gain this overview, papers, textbooks, guidelines, handbooks, national legislation, preparatory works, statutes, governmental bills, Swedish Government Official Reports etc., were all studied.

With this thesis' overall aim in mind, which is to explore how cumulative effects are considered in the EIA/SEA process by certain types of actors, the main methodological approach chosen for this study was a semi structured research interview which is a qualitative research method. This approach seems suitable based on Kvale (1997), who states that the qualitative research interview approach is designed to understand the world from the interviewees' point of view, develop the meaning of peoples' experiences and to uncover the world they are living in. The qualitative research interview is technically speaking half structured, which means that it is neither an open conversation nor a strictly formulated questionnaire (ibid). Qualitative interviews are instead relatively loosely structured and open for what the interviewee thinks is relevant and important to talk about, within the topic of the research project (Alvesson & Deetz 2000). For the purposes of this study the interviews were exploratory in nature. One of the main aims of an exploratory study is to discover new dimensions within the issue that is the

object of the investigation (Kvale 1997). This type of interview is described by Kvale (ibid) as open and not very structured where the researcher (interviewer) introduces a question or an issue that shall be mapped out or a complex problem that should be laid bare.

It is important to remember that the use of qualitative methods such as interviews relies heavily on interpretation. The science of interpretation is called hermeneutics which is based on an interest in increasing understanding between people (Ödman 1988). The interpretation does not start with the analysis of the transcribed interview material but rather with the planning phase of interview questions, continuing on with the transcription phase and with the analysis of the transcribed material up to and including the actual writing of the paper. The researcher's interpretation repertoire has much to do with his or her own life-story (Alvesson & Deetz 2000). This pre-understanding in relation to the research issue of interest in this thesis, cumulative effects in EIA/SEA, is thus important when orientating one research in the chaos of signs that any empirical material set can contain. The researcher's job is thus to decide which signs are central and which are not and to do this she must have at least some basic knowledge of the studied phenomena (Ödman 1988). The importance of pre-understanding is also mentioned by Kvale (1997) who states that to ask important questions requires knowledge of the phenomenon in question. Another important aspect connected to the notion of pre-understanding relative to the chosen methods and their limits in the context of the current study comes from the discipline of social psychology and in particular, the theory of social constructionism. According to Burr (1995) there can be no such thing as an objective fact within social constructionism. Our knowledge is not a direct perception of reality. All knowledge is instead derived from looking at the world from one perspective or another, and is in the service of some interests rather than others.

It is also important to bear in mind when using the interview technique as a method that it is context dependent. Aspects such as the fact that the interview is made in a specific social situation and the manner in which the speech situation is conducted are important and cannot be disregarded (Alvesson & Deetz 2000). In this study the interviewees were asked to be part of the study on the basis of their professions as reviewers, proponents or consultants while the results have been treated as such.

Kvale (1997) has described the analysis of a qualitative research interview to consist of six steps:

1. the interviewee describes her life's world, telling spontaneously of what she experiences, feels and does in relation to an issue,

2. the interviewee herself discovers new conditions during the interview, sees new meanings in what she experiences and does
3. the interviewer concentrates and interprets the interviewee during the interview,
4. the interviewer interprets the transcribed interview,
5. in some cases a new interview has to be undertaken,
6. a possible sixth step could be to expand the description and interpretation to also include *the act*, where the interviewee starts to act from the new understanding she has gained during the original interview process.

The analysis undertaken in this study includes steps 1-4. Step five was never undertaken because there was simply no need for it, while step six was not undertaken because it was not in the interests of this study to explore whether the interviewees view on the issue of cumulative effects had changed after the interview situation.

The most common way of analysing interview material (step 4) according to Kvale (1997) is to code or categorize the interview statements. For this study the material has both been coded and categorized. The coding was done with the help of an analysis programme called ATLAS.ti. This programme for example allows the researcher to write down notes and reflections for later analysis, coding, and searching for key words within the transcribed material.

An alternative method to interviews could have been a partial ethnography. A partial ethnography might be used on a situation like the consultation phase in the EIA/SEA process where the actors to some extent settle the scoping for the EIA/SEA study (Alvesson & Deetz 2000). Such a study could provide empirical material and insight into a specific situation, and knowledge could be gained concerning how different EIA/SEA actors put different issues on the EIA/SEA agenda and thereby include or exclude issues related to cumulative aspects. This kind of research approach might probably add interesting material in further research within this area of interest. In this study however this method was excluded in favour of the interview approach since the latter was thought likely to provide a richer seam of material to work with in a first step to explore the issue of cumulative effects in EIA/SEA.

As mentioned previously after the initial interview study the research project took a significant and unexpected turn. Some of the key findings from the interview study which strongly affected the following research approach were based on two results:

1. The interviewees' awareness was lower concerning the cumulative effects approach in the EIA/SEA process than was originally expected.

It was therefore not possible to gain further information and explore how biodiversity issues can be considered in the EIA/SEA process from a cumulative effect view. It was also not possible to go on with a 'method course' in the context of the research even at a more general level. That said and based on the results of the interviews, which show that the actors have no experience of how to approach cumulative issues in the EIA/SEA process, neither more nor less know of any methods at all to use in relation to cumulative effects.

2. The interview results pointed to the existence of a clear discrepancy between the actors' attitudes as to whether cumulative effects is an important issue to consider versus how they act in the EIA/SEA process when it comes to cumulative issues. In brief, the results show that all actors consider cumulative effects to be a very important issue to consider in the EIA/SEA process but at the same time no actor actually includes cumulative effects in the process.

When exploring what these actors state in respect of how they behave over the issue of cumulative effects, it also became interesting to look more closely into *why* they behaved as they did. Several different aspects can presumably be identified as factors affecting these actors' behaviour where norms, legislative requirements, attitudes, routines, intentionality, and knowledge regarding the issue in question, can be mentioned.

As a first step, the reasons for this behaviour, or more exactly, the reasons why cumulative effects are treated the way they are, were studied through the incitement structure surrounding the actors in relation to their knowledge and inclusion of cumulative effects in their EIA/SEA work. A second step in exploring behaviour in respect of cumulative issues was to map out the obstacles to and difficulties of inclusion in respect of these effects in the process. The aim of this thesis (and these two analysis steps) was to explore the knowledge base on the term and concept of cumulative effects, and also in respect of the requirements to consider these types of effects, the knowledge base on how to practically work with cumulative effect issues, attitudes and expressed ability to include cumulative effects in the EIA/SEA process, as well as experienced difficulties and obstacles to including cumulative effects in the EIA/SEA process. The approach chosen to explore these questions was, as noted previously, a qualitative interview study.

In relation to the actors' behaviour it is of interest to set this against whether they are acting intentionally or not. According to Molander (1996) all acts are, at base, intentional. To do something intentional does not on the other hand mean that there is a determined intention in what a person is doing. Molander provides three main types of reasons for this: The acting person 1. announces their *intention* (to achieve something in the future), 2.

says that she *likes* to do like this or that (or: just for the fun of it), or 3. says that it is the *right thing* to do it like this or that (or: this is how things are done at our place).

Attitude, behaviour and knowledge became as implied above important aspects for review within the context of this explorative study. Theories on attitudes lead the author into social psychology. Sears, Freedman and Peplau (1985) was the main input regarding social psychology in this study, though Lippa (1990) and Burr (1995) also inspired the work and together this literature on social psychology and social constructionism has been the main lens through which to explore actors' behaviour. According to Sears et al. (1985) the most common definition of attitudes combines elements from the two traditions of cognitive and learning approaches. They explain the relationship between attitude, behaviour and knowledge as "*An attitude towards any given object, idea, or person is an enduring orientation with cognitive, affective, and behavioral components. The* cognitive *component consists of all the cognitions the person has about that particular attitude object—the facts, knowledge, and beliefs concerning the object. The* affective *component consists of all the person's affects or emotions toward the object, especially evaluations. The* behavioural *component consists of the person's readiness to respond or tendency to act regarding the object*" (Sears et al. 1985, p. 133). There are different theories on the question of attitudes, some of which are mentioned very briefly here. The three main theoretical orientations within the context of attitude are 1. *the learning approach*, which sees attitudes as habits like anything else that is learned, 2. *incentive theory*, which holds that a person takes on the attitude that maximizes her benefit, and 3. *cognitive approach* which asserts that people seek harmony and consistency in their attitudes, and between attitudes and behaviour (Sears et al. 1985). The cognitive approach has been used within the research approach for this study and is further explored below.

Originally within social psychology it was simply assumed that people's attitudes determined their behaviour which is one type of cognitive approach. The connection between attitude and behaviour is however more complex than that. Some conditions affecting consistency between attitude and behaviour include for example the strength of the attitude, the stability of the attitude, the relevance of attitudes to behaviour, the salience of attitudes, and situational pressures. According to Sears et al. (1985), these findings suggest that the theory that attitudes determine behaviour is too simple. Ajzen and Fishbein have however made an attempt to specify what factors determine attitude-behaviour consistency in their reasoned action model. Their attempt might be the most influential effort to specify which factors determine attitude-behaviour consistency (Sears et al. 1985). Fishbein and Ajzen state that attitudes and subjective norms combine to influence our behavioural

intentions and ultimately our behaviour. Subjective norms can be explained as a concept referring to beliefs about how significant others think we should behave (Lippa 1990). The theory of reasoned action has been described by Lippa (1990, p. 255) as "*Fishbein and Ajzen's theory that a weighted combination of attitudes and subjective norms predict behavioural intentions, which in turn predict voluntary behavior*".

According to cognitive dissonance theory, which is another type of cognitive approach, it is instead behaviour that determines attitudes (Sears et al. 1985). This approach is based on the idea that people's attitudes may be rationalized from the things they have already done. This theory also assumes that there is pressure toward consistency between attitudes and behaviour. If behaviour cannot be annulled or changed in some way, the main way of reducing dissonance is instead to change one's attitude. This is a process in which a person's behaviour is followed by a change in attitude.

All this together makes up the research strategy for this thesis. The methods and approach used in the study are described in more detail below.

2.2 Interview study

The design of the research interview contains several different phases and aspects all of which need to be taken into consideration. Before preparing the interview questions the type of interviewees had to be chosen. The motivation here was to explore how cumulative effects are considered in the EIA/SEA process. Previous Swedish studies have focused on how cumulative effects are described in the assessment documents and for this study it was thus of interest to explore how different EIA/SEA actors who work closely with the compilation of the documents experience these effects. The interviewees were therefore chosen to represent reviewers, consultants and proponents. In total ten interviewees were chosen for this study. Six of the interviewees were women, of between 30 and 55 years of age, and with between 4 and 18 years of EIA/SEA experience. The interviewees are described in more detail in the box below.

Short description of type of interviewees

The county administrative board is responsible for the review and the approval of EIAs on road and railway activities and two interviewees working at two different county administrative boards represented the level of review. One had also been involved in work to carry out a countywide transportation plan and its (early form of) SEA.

The municipality is the level responsible for DDP:s and Comprehensive Plans. This authority is from case to case obliged to do an EIA or SEA on DDP:s if they are assumed to lead to significant environmental impacts, and for Comprehensive Plans, the municipality should always carry out an environmental assessment (SEA). At the municipality level, two interviewees were chosen.

The project leader/proponent at the authority level was represented by two interviewees, one from the Swedish Road Administration and one from the Swedish National Rail Administration. Planning for both road and railway activities is, on a case by case basis, obliged to be followed by an EIA.

At the consultant level, four interviewees were chosen of which two had experience only in the field of project EIA, whereas the other two had experience of both EIA and SEA.

During the continuous design of the interview study, questions were prepared for the study based on the explorative research used for this thesis. In the compilation and structuring of the interview questions, an interview guide was used based on an idea by Kvale (1997). The interviews were planned to be open and depending on what kind of statements the interviewees gave, improvised follow-up questions could be used. The interview guide is presented in Table 3. The interviewees did not receive notice of any questions beforehand. During the booking of interviews, the interviewer (the current author) briefly explained what the interview should explore and that it would be a part of a licentiate thesis. The way in which the questions were asked was adapted to the type of actor. Since previous studies show that the term cumulative effects was seldom used in EIA/SEA documents, the interviews were prepared to indirectly address the issue of cumulative effects in the beginning of the interview without using the term as such. This was done because the author wished to gain information both on how they work in a practical sense with cumulative issues, and about their normative views of the term and phenomenon of cumulative effects. During the exploration of the practically work, the author wanted to minimise the risk that the informants developed a guilty conscience for not including cumulative effects in their EIA/SEA work. The interviewees were therefore asked to describe how they do the scoping in time and space (without the author mentioning the term cumulative effects), in this way information was

indirectly gathered on their approach to make clear whether they include cumulative issues in the scoping in terms of their own projects effects together with effects from other past, present and future activities. In that way the author hoped to decrease the risk that the interviewees exaggerated their statements in respect of the inclusion of cumulative effects in their practical work. Subsequently, interview questions were asked using the term cumulative effects in order to explore knowledge on definitions and understanding of the term and concept.

The interviews took place at the interviewees respectively offices, lasted between 45 minutes and 2 hours, were tape recorded and later on also transcribed to more or less literally represent the spoken word of the interviewees. All interviews and transcriptions were undertaken by the same person (the current author).

Table 1. Research questions and interview questions

Explorative research questions:	**Interview questions:**
'Encircling of the subject' - What? - Scoping? - Application/Approach?	What is important to consider when assessing effects? Is it difficult to consider the 'overall' effects? Which delimitation is done when assessing effects? (Scoping in time/physical/aspects) How are these delimitations done? Do you think this delimitation/scoping is difficult to do? Which types of effects are demanded to be considered? Do you think you do what is required to handle these effects in EIA? Do you want better possibilities to consider these effects in more detail/in a better way? Or do you think they are considered acceptable today? Do you think the work with cumulative effects is different from the work with direct effects? Are there any differences in approach? How do you think cumulative effects are handled by other EIA actors?
Why should cumulative effects be handled in the EIA process? - Why?	Do you think that cumulative effects are important to consider? Why/Why not?
Which are the obstacles and opportunities to considering cumulative effects in EIA? - Possibilities? - Obstacles?	Which opportunities do you see today regarding the work with cumulative effects? Is it possible for you to work with cumulative effects as you want to? Which opportunities do you have to influence how cumulative effects are considered? Do you think there is a better way to consider cumulative effects? Do you think that it is motivated to improve the consideration of cumulative effects? Is there anything that makes it difficult to consider the cumulative effects?
How (methods to study, estimate, describe etc.) could cumulative effects be handled in the EIA process? - How?	How do you do to consider cumulative effects? Do you know of any methods or approaches regarding how to consider cumulative effects?
Is there a difference between different actors' definition and interpretation of the term cumulative effects? - Definition and understanding	What do you think the term cumulative effect stands for? How do you define the term? Do you think that other EIA actors define the term in the same way? Are there any differences in how to scope an EIA for cumulative effects compare to direct effects?
Has the phenomenon of cumulative effects been considered in the EIA/SEA process?	Do you have any examples of cases where cumulative effects have been considered in a good way or when these effects obviously should have been considered in a more detailed way?

2.3 Analysis-tool ATLAS.ti

The total amount of transcribed interview material ended up at approximately 100 pages of text. Thanks to the openness that had characterized the interview situations the transcribed material was rich in information on the subject of exploring the issue of cumulative effects. On the other hand the transcriptions were rather difficult to survey. In order to get past this difficulty in finding patterns and interesting issues in such a rich seam of material, an analysis tool called ATLAS.ti was used. This tool can best be described as a workbench for the qualitative analysis of large bodies of textual, graphical, audio, and video data (Scientific Software Development GmbH 2004). It offers a range of tools for accomplishing the tasks associated with any systematic approach to unstructured data, e.g., data that cannot be meaningfully analyzed by formal, statistical approaches. It offers tools to manage, extract, compare, explore, and reassemble meaningful pieces from large amounts of data in creative, flexible, yet systematic ways. The tool was used in a basic way for this study. Citations were coded with labels with a point of departure in the content, e.g. expressed difficulties and obstacles to including cumulative effects in the EIA/SEA process, definition and understanding of the term and concept of cumulative effects, scoping in time and space. The compilation of citations on obstacles to and difficulties in the inclusion of cumulative effects in the EIA/SEA process, which is an issue of special interest to this study, ended up with more than 200 citations. This was still a rather difficult amount of material to survey. To make the group of citations more workable, these citations were coded into 28 more specific groups/sub codes, e.g. obstacles in terms of: financial resources, knowledge base, or lack of available methods. The analysis tool was a significant help in gathering citations within the same or several citation groups in order to find patterns and results of interest.

2.4 Analysis of interview material

For this thesis, two analyses have been undertaken on the basis of the interview material. The first and briefest analysis focused on the lack of incitements to include cumulative effects in EIA/SEA (Paper I), whereas the second and rather deeper paper focused on the obstacles and difficulties to including cumulative effects in the EIA/SEA process (Paper II).

For the first analysis certain types of citations were closely looked at with the aim of exploring incitements to include cumulative effects in the EIA/SEA process. Some citations for example deal with the scoping approach, review approach and requirements, the responsibility to include

cumulative effects, and the requirements in respect of legislation and handbooks. The results were described under the headings: are cumulative effects assessed today, attempts to consider cumulative effects, the overall assessments, the role of the reviewers, requirements concerning the investigation of effects, boundaries in space and time, responsibility issues, and possibilities to influence scoping.

With the purpose of producing a framework for the second analysis, three different frames of reference for obstacle categorisations were tested on the citation compilation undertaken in this study. The tested frameworks were all presented in a paper by Piper (2001). The first, prepared by Trudgill (1990), was made to categorize barriers to a better environment. The second was prepared in order to divide potentials barriers to implementation of environmental protection policy measures (Gunningham & Sinclair 1997). From these, Piper produced a third framework to analyse potential barriers to the implementation of cumulative effects assessment. When testing the frameworks it was found that they were not suitable for this study since several obstacle citation categories fell outside the frameworks. Categories that did not fit were, for example, scoping in time and space, the inclusion of other activities, attitude to cumulative effects, lack of support to include cumulative effects and cumulative effects being a new issue.

After an overview of the obstacle citations certain groups were considered as particularly interesting in the way that discrepancies seem to emerge between them. These groups regarded statements on the importance of including cumulative effects, their basic knowledge on cumulative effects and their knowledge on how to work with cumulative effects including statements on how they worked practically with scoping in time and space. A framework was therefore set up to analyse the results against, and based on, the discrepancy findings and the lack of fit with previous frameworks, a new framework was then developed inspired by the previous three, and by literature on 'know that, know how' (Ryle 1949), and attitudes, knowledge and behaviour (Sears et al. 1985; Lippa 1990). The developed framework consists of the three groups *knowing that*, *knowing how* and *will to act*.

Table 2. The table describes the connection between transcription code, sub codes and categories in this study.

Transcription Code	Sub codes within the obstacle/difficulties code	Categories in analysis frame
Obstacles/Difficulties	Requirements Knowledge base	Knowing that
	Method Guidelines, handbooks Difficult issue to handle Financial (labour force) Financial (time)	Knowing how
	Attitude Responsibility issues	Will to act

2.5 Validation, reliability and generalization

The aim of this study is to 1. explore how cumulative effects are considered in the EIA/SEA process, while the more specific objectives of the study are to explore 2. the knowledge base on the term and concept of cumulative effects, and also regarding 3. the requirements to consider these types of effects, 4. the knowledge base on how to work with cumulative effect issues in practice, 5. attitudes and expressed ability to include cumulative effects in the EIA/SEA process, and 6. the obstacles and difficulties experienced in including cumulative effects in the EIA/SEA process. The chosen research approach was chosen by the author to provide input to all these aims to various extents. The primary question, did perhaps not provide direct input in respect of *how* the actors work with cumulative effects, but instead resulted in a picture where these effects are *not* considered in the process. Question number six regarding the obstacles to and difficulties of inclusion therefore received a significant amount of attention while the interviewees input into this question became a central part of the study. The interview turned out to be a good method to explore the knowledge base in respect of the term and concept (question two), this is also true for question number three. The knowledge base on how to work practically with these effects (question number four) was found to be deficient. This is a result in itself, but the author had perhaps hoped for more information to be forthcoming on how actors can work in the EIA/SEA process to include cumulative effects (for instance on how they use different methods). The strengths and weaknesses of different cumulative methods could not therefore be explored through this study or by the chosen

research approach. The interview functioned as a tool for gathering information on a superficial level regarding the interviewees' attitude in respect of cumulative effects (question number five). To be more precise, superficially in terms of functioning to explore these actors statement on how they experience cumulative effects and whether they think these effects are important or not to consider. The study did not however produce information on a deeper level, that is, it was not possible to conclude anything in respect of these actors' values in relation to cumulative effects.

Regarding reliability and whether another study, perhaps with other methods and another research approach, would end up with the same results is an interesting question and closely connected to what has been said about the lens metaphor. It is also connected to the researchers pre-understanding of the issue and his or her background. For example, if another researcher had chosen to interview actors at another level, perhaps legislators, the obstacles and difficulties picture would probably have been much different as compared to the results presented here. The lens would however have been pointed in another direction than that chosen in the context of this study. Even if the lens and the direction of attention were the same, the reality that the researchers' pre-understanding of the studied issue is important would probably at least to some extent influence the outcome of the study. The 'basic results' e.g., that cumulative effects are seldom considered in the EIA/SEA process or that the level of knowledge on the methods of measuring cumulative effects is low, would very likely be the same. The discussion about the results and connections to wider social science issues in respect of attitude, knowledge and behaviour is perhaps not however a natural theoretical connection and would thus not have been made by another researcher.

The outcome of this study can to some extent be said to be generalizable in (at least) two ways. Firstly, when comparing the results of this study to previous review studies made on Swedish EIA/SEA documents they all point towards a clear failing in term of the consideration of cumulative effects. The identified obstacles and difficulties have also to a great extent been noticed in (more or less) comparable international studies. The results of this study could thus also be presumed to be generalizable to more than these ten actors interviewed in this study. Secondly the issue of interest in this study, namely, cumulative effects could perhaps be exchanged for another issue in the EIA/SEA process which is difficult or unclear in respect of how to approach. This could for example be the phase of follow-up which has for a long time in Sweden been an issue omitted in EIA or the issue of the introduction of a new requirement demanded in the national EIA legislation which is rather fuzzy. When exploring another poorly treated issue in the context of

EIA/SEA other than cumulative effects, similarities may emerge in respect of the obstacle picture presented here, and also to the lack of incitement identified. Regarding this second example, the possibility to generalize is not stated by the author but is rather more a result of a personal brain-storming session. The question of generalization is a tricky one and it is, among other things, a matter of the type of situation and case and as Kennedy (1979) puts it: "*We have seen that the range of generalization is necessarily a matter of judgement. For studies of single cases, however, that judgement should* not *be made by the evaluator. Instead, it should be made by those individuals who wish to apply the evaluation findings to their own situations. That is, the evaluator should produce and share the information, but the receiver of the information must determine whether it applies to their own situation*".

3 Literature review

The main purpose of the literature review was to understand the concept of cumulative effects in an EIA/SEA context. An additional purpose was to clarify the legislative requirements and to determine how the term and phenomenon are described in Swedish EIA literature. It was also of interest to study which methods are described in international handbooks and guidelines. A second additional purpose was to explore the existing knowledge base in respect of the inclusion of cumulative effects in the EIA/SEA process and in documents as such. This was done both from a Swedish and an international perspective. Lastly, the literature review was also undertaken with the aim of exploring the arguments as to why cumulative effects should be considered.

3.1 Overview of definition and explanation of the term and concept of cumulative effects in an EIA context

Many terms are used in the literature to categorize or explain different types of cumulative effects. This could be helpful in some cases but in reality it might lead to confusion as many of these terms actually refer to the same thing. In addition, many of the definitions and explanations of the concept cumulative effects often appear complicated and thus not easily understandable to the layperson.

The choice of definition used for cumulative effects in assessments contexts is however known to be important. Some studies point out that there is a relationship between used definition in EAs (environmental assessments) and other activities included when assessing the cumulative effect. An assessment using a narrow definition like *combined effects of different components of a project/development* was typically found to focus on the impacts of a certain type of activity, whereas the use of a broader definition tended to include a wider

range of different and unrelated activities in the consideration of potential cumulative effects (Cooper & Sheate 2002; van der Walt et al. 2004).

One such example regarding the diversity of definitions is shown by a UK study (Cooper & Sheate 2002). In that study, 50 environmental impact statements (EISs) were reviewed and these documents gave, in total, as many as eight different definitional examples.

Definitions of cumulative effects used in different guidelines

In the literature, three main guideline documents could be found regarding cumulative effects: *Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions*, EU (Commission of the European Communities 1999), *Considering Cumulative Effects, Under the National Environmental policy Act*, United States (Council on Environmental Quality 1997) and *Effects Assessment, Practitioners Guide, Canada* (Hegmann et al. 1999).

In the guidelines from the USA the definition of cumulative effects is stated as, "*the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non Federal) or person undertakes such other actions*" (Council on Environmental Quality 1997, p. 1).

The definition of cumulative effects in the European guidelines is as follows:
"*Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project*" (Commission of the European Communities 1999, p. 7). The more recently published European guidelines have however, given the similarity of the language, probably been inspired by the NEPA guidelines.

In the Canadian practitioners guide the following definition is used: "*Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions*" (Hegmann et al. 1999, p. 3).

The following could be found in sections of the Swedish literature concerning cumulative effects (translation from Swedish to English is made by the author):

- Cumulative effects are the total effects etc., (Westerlund 1999).
- Cumulative effects are environmental effects that arise because of the interaction between different types of environmental impacts (Folkeson & Statens väg- och transportforskningsinstitut 1999).
- Cumulative effects are the sum of successive changes (The National Board of Housing Building and Planning & the Swedish Environmental Protection Agency 2000).
- An EIA should describe at least three types of cumulative impacts:
  1. the **sum** of effects caused by several projects;
  2. the **aggregated** effects of several projects over time and
  3. **all effects** of a project **taken together** (Roberts 1990).

Irving (see Irving et al. in Canter & Kamath 1995c, pp. 313-314) argues that cumulative impacts can be classified as homotypic or heterotypic. Homotypic cumulative impacts are described as "*the impacts are* [caused] *by multiple developments of the same type*" while heterotypic cumulative effects are impacts that are "*caused by a combination of two or more different developments or land uses*". Furthermore, in the paper the concepts supra-additive and infra-additive impacts are also used. Supra-additive is also termed synergistic while infra-additive is sometimes termed antagonistic. Leibowitz et al. (2000), mention the terms additive as being linear and synergistic as nonlinear. Cumulative impacts may also be classified as direct, indirect or multivariate, where direct responses are explained as a simple stimulus and response relationship, indirect responses are explained as secondary or higher order relationships that act through intermediate sets of stimuli and responses, and multivariate responses are explained as multiple stimuli with interrelationships that act in concert to produce a response (see Bain et al. in Canter & Kamath 1995b, p. 314).

According to Piper (2001, p. 465) cumulative effects "may result from plans for the construction of clusters of large projects, or from gradual, piecemeal environmental change caused by numbers of individually small projects".

A commonly used book in EIA teaching, at least in Sweden, is Introduction to Environmental Impact Assessment by Glasson et al. (2005). Based on a categorization that is commonly quoted, made by the Canadian Environmental Assessment Research Council (CEARC), the book describes cumulative effects as five different types of perturbations and effects.

1. Time crowded perturbation: which occur because perturbations are so close in time that the effects of one are not dissipated before the next one occurs.
2. Space-crowded perturbations: when perturbations are so close in space that their effects overlap.
3. Synergism: where different types of perturbations occurring in the same area may interact to produce qualitatively different responses by the receiving ecological communities.
4. Indirect effect: are those produced at some time or distance from the initial perturbation, or by a complex pathway.
5. Nibbling: which can include the incremental erosion of a resource until there is a significant change or it is all used up.

In a paper on impact pathways in EISs for dams, some central properties have been compiled concerning cumulative impacts (Brismar 2004). According to the paper, cumulative impacts may arise on any type of

environmental impact receptor at any scale, are trigged by multiple causes or impact factors and are generated by multiple impact pathways, generally involving multiple root causes and lower and higher order effects, interlinked by a cause – effect relationship.

3.2 EIA legislation and cumulative effects

3.2.1 Swedish environmental assessment legislation history

In 1981, requirements were placed on the description of environmental effects in an application for permission to conduct ecologically harmful activities. The requirements were implemented in the environmental protection law of that time. It was however not until 1987 that environmental impact assessment was implemented into Swedish legislation, to be more precise into Swedish *road* legislation. A broad requirement on EIA was implemented 1991 in the Swedish Act on the Management of Natural Resources etc. but the regulations should mainly be applied through other legislation, e.g. the Nature Conservation Act, the Swedish Minerals Act, and the Environmental Protection Act. Sweden was not a member of the European Union (EU) in 1991, and the EIA directive was not used in the construction and design of Swedish EIA regulations. Formally, the directive was put in place a year before Sweden entered the EU as the country signed a free trade agreement with the EU 1994. This agreement led to EIA regulations for certain DDP:s in the Planning and Building Act. The environmental regulations became coordinated through the introduction of the Environmental Code in 1999 which replaced 15 different environmental legislations, and not until then were the procedure regulations in the directive implemented into the Swedish legislation (Hedlund & Kjellander 1997).

In respect of strategic environmental assessment regulations has existed in Sweden since 1991 when a requirement on environmental assessment was introduced to the municipalities' energy plans. During 1996, a requirement was introduced into the Planning and Building Act stating that Comprehensive Plans should describe the impacts on the environment. During the 1990's environmental assessments were also undertaken in connection with Regional Transportation Plans, the Swedish Road Administrations' national road management plan and the Swedish national rail administrations' rail management plan. The European SEA Directive (Council Directive 2001/42/EC 2001) was implemented into the Swedish legislation, the Environmental Code and a number of other legislative documents during 2004 (Hedlund & Kjellander 1997).

3.2.2 Cumulative effects and EC Directives

Today cumulative effects are required to be assessed by four European Community (EC) Directives. Two directives refer to the assessment at project level (Council Directive 85/337/EEC 1985; Council Directive 97/11/EC 1997); one refers to the strategic level (Council Directive 2001/42/EC 2001) and the fourth to both the project and strategic levels (Council Directive 92/43/EEC 1992). The first two directives are the so-called 'EIA directives' of which the latter amends the former, the third is often called the 'SEA directive' while the fourth is termed 'the habitat directive'. These directives are implemented in the Swedish Environmental Code (Swedish Code of Statutes 1998). The text box below contains an overview of what is stated in the directives in respect of cumulative effects.

In the **EIA Directive** 97/11/EC which amended the Directive 85/337/EEC, the term cumulative effect is mentioned when declaring what a description of the likely significant effects should cover, Article 5.1:
"*…Member States shall adopt the necessary measures to ensure that the developer supplies in an appropriate form the information specified in Annex IV…*"

Annex IV (Information referred to in article 5.1):
"*A description (1) of the likely significant effects of the proposed project on the environment resulting from:*
- the existence of the project,
- the use of natural resources,
- the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the developer of the forecasting methods used to assess the effects on the environment."

"*(1) This description should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project.*"

The **SEA directive** mentions the concept of cumulative impacts in a similar manner to the EIA directive. SEA directive, Article 5.1:
"*Where an environmental assessment is required under Article 3(1), an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated. The information to be given for this purpose is referred to in Annex I.*"

Annex 1
"*…the likely significant effects (1) on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors;*" … "*(1) These effects should include secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects.*"

The **habitat directive** places demands in respect of cumulative effects, but only indirectly, without using the exact term. This could be seen in Article 6 where it is stated that plans or projects that will have a significant effect in combination with other plans or projects shall be subject to appropriate assessment. Habitat Directive, Article 6.3:
"*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.*"

3.2.3 Cumulative effects and the Environmental Code

The aim of the Environmental Code is to "*promote sustainable development which will assure a healthy and sound environment for present and future generations*" (Swedish Environmental Protection Agency 2000). The EIA and SEA Directives are mainly implemented in the sixth chapter of the Environmental Code whose framing is composed of:

- when is an environmental assessment required,
- environmental impact descriptions and environmental impact assessments of activities and measures,
- environmental impact descriptions and environmental impact assessments of plans and programmes,
- plans and foundations for planning, and
- coordination.

There are also other EIA/SEA regulations in a statute belonging to the Environmental Code (Swedish Code of Statutes 1998).

The term cumulative effect is not to be found in this legislation neither in the sixth chapter which regards EIA and SEA nor in the seventh chapter were the habitat directive is implemented. Even though the term cumulative effect is not used in the legislation, the phenomenon as such or the requirement to assess such effects is indirectly mentioned which is quoted in the box (the translations from Swedish to English are made by the author).

The Swedish Environmental Code

Chapter 6, Section 3: "*The purpose of an environmental impact assessment is to establish and describe the direct and indirect impact of a planned activity or measure…*"

Chapter 6, Section 3: "*Another purpose is to enable an overall assessment to be made of this impact on human health and the environment.*"

Chapter 6, Section 12: "*The Environmental Impact Assessment shall include*" … "*4. a description of relevant existing environmental problems that have a connection with natural areas such as those intended in 7 chap. or another area of special importance for the environment,…*"

Chapter 6, Section 12: "*The Environmental Impact Assessment shall include*"… "*6. a description of the likely significant effect on the environment in respect of biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritages including architectural and archaeological heritage, landscape and the interrelationship between the above factors*".

3.2.4 Examples from other EU members

As noted previously, the Swedish legislation does not mention the term cumulative effect nor does it clearly demand they be considered. An overview of some terms and their occurrence in national legislation is presented in a study produced by Hyder Consulting (1999). The study was undertaken for the 15 countries that were EU Member States in 1999. Table 1 shows the result of the overview and indicates whether the expressions *indirect impact, impact interaction* or *cumulative impacts* were used in national legislations. The result might be different if it were to be repeated today however as several countries have rewritten their EIA/SEA legislation in response to the new directives regarding SEA. Twelve more countries have since joined EU. Sweden updated its EIA legislation in July, 2004. Today the term *indirect impact* can be found in the Swedish EIA legislation (Environmental Code, chapter 6, section 3) but as in 1999, *impact interaction* and *cumulative impact* are still not mentioned in the legislation.

Table 3. Based on result published by Hyder Consulting (1999)

Member State	**Indirect Impacts**	**Impact Interactions**	**Cumulative Impacts**
Austria	X	X	–
Belgium	X	–	X
Denmark	X	X	–
Finland	X	X	–
France	X	–	–
Germany	X	X	X
Greece	X	X	–
Ireland	X	X	X
Italy	–	–	–
Luxembourg	–	–	–
The Netherlands	X	X	X
Portugal	X	X	X
Spain	X	X	X
Sweden	–	–	–
The United Kingdom	X	X	X
Positive	**12**	**10**	**7**
Negative	**3**	**5**	**8**

3.3 Descriptions of cumulative impacts in some Swedish guidelines and handbooks on EIA

3.3.1 The Swedish Road Administration

The Swedish Road Administration has published several handbooks where one handbook, divided into three parts, deals specifically with EIA. Each of the three parts mentions cumulative impacts. In the first part, which concerns rules and regulations, the term cumulative effects is mentioned in relation to that the concept is the same as that of 'connection to other projects' (The Swedish Road Administration 2002a). There is also information from the statute "The Swedish Road Administration's regulations on public consultation and environmental impact assessments etc., in feasibility studies, road investigations and work plans" (The Swedish Road Administration 2001) regarding EIA and connections to other projects: "*12 § In an EIA it shall, beyond what is stated in the Environmental Code chapter 6 7 §, be evident*
1. the road project's aim and connection to other projects and also in agreement with other land use planning and environmental programme or corresponding,…"

In the EIA handbook (part two), which deals with methodology, the concept cumulative consequences is explained as "*A resulting effect of several changes, independent or interacting*" (The Swedish Road Administration 2002b, p. 6). Later on in the handbook it is stated that "*the sum of several projects' effects could be significant*" and that this is what is meant by "*so-called cumulative impacts*" (The Swedish Road Administration 2002b, p. 14). The handbook also mentions the importance of paying attention to whether several road or traffic projects and other exploitation projects will lead to consequences for the same people or environments. Types of cumulative effects other than additive ones are not however mentioned here. (The translations from Swedish to English were made by the author).

The handbook also contains a discussion of the different types of effects. Effects that are mentioned include primary and secondary effects. It is however also noted that secondary and tertiary effects are sometimes assigned to indirect effects and consequences. Synergistic effects and cumulative consequences are also mentioned and shall, according to the handbook, be considered in the EIA. The two concepts as such must not however be used. It is moreover not explained what such synergistic effects imply or whether they relate to some form of cumulative effect or something else entirely. Direct and indirect consequences are also described in the book. Indirect consequences in terms of road projects are clarified as intended consequences that are not a direct cause of the road project's trespass or disturbances. Indirect consequences relate to occasions where the road construction is expected to lead to exploitation (like buildings), changed traffic behaviour or

to the movement or relocation of some activity etc., that in turn could impact people and the quality of the environment.

The EIA handbook (part three) focuses on analysis and estimation (The Swedish Road Administration 2004). In this handbook there is a separate chapter regarding indirect and cumulative effects. It is stated here that effects of secondary exploitation is a type of indirect effect that could lead to several types of environmental consequences. It is noteworthy however that it is further stated that such 'things' (projects and activities?) that will happen whether the road project is implemented or otherwise shall not be described in the EIA of a road project. According to this handbook, activities connected to other sectors are thereby excluded from the cumulative effect analysis. The handbook does however consider 'two or more connected projects' but is then only referring to when different *road* projects should be estimated together. This contradicts somewhat the statement in the same chapter noting that it is important to have a holistic way of thinking as a basis to achieving an optimal solution when choosing localisation. On the other hand, when it comes to railways that are planned in the same area as a road project, it is stated that the planning can have an openness that suggests it concerns the aggregative effects and consequences of two infrastructure constructions. It is however further stated that an EIA of a project should possibly refer to already considered environmental consequences on a strategic level when choosing the type of activity in terms of transport networks to solve a transportation problem for the area in question.

3.3.2 The National Board of Housing, Building and Planning

The National Board of Housing, Building and Planning have published several text books regarding EIA. One of these books states that there are at least three different sorts of cumulative effects (Roberts 1990). Another book published by the National Board of Housing, Building and Planning in cooperation with the Swedish Environmental Protection Agency (EPA) (2000), deals with EIA at a strategic level and refers to cumulative effects when discussing the sum of different changes. It is also stated here that one of SEA's roles is to make prerequisites so that indirect and cumulative effects could be considered. In a suggested SEA methodology cumulative effects are mentioned as effects that *should* be included in the environmental analysis. The analysis should include direct environmental effects, cumulative and indirect effects.

A guidance report published by this authority during 2006 (The National Board of Housing Building and Planning) calls attention to the fact that both the preparatory work to the Environmental Code and the SEA Directive points to the need to clarify cumulative effects in SEA. It is noted in the

guidance that the preparatory work and directives stress that consideration of whether the impacts consist of secondary, cumulative, interacting, permanent and temporary as well as positive and negative effects in short, medium and long term should be included in the scoping. Furthermore, the guidance report quotes the Government bill (2003, p. 65) which states that "*It is important to, as far as possible, describe the connection between the enumerated aspect because that can make evident another and more serious impact than that which will be clear when only studying individual aspects*" (translation from Swedish to English made by the author). Beyond this, there is no further clarification of the term or the phenomenon of cumulative effects in this guidance report.

3.3.3 The Swedish International Development Cooperation Agency

Sida, the Swedish International Development Cooperation Agency, has prepared guidelines for their programme officers (2002). The role of Sida officers in respect of EIA is to review the EIAs produced by project owners.

Cumulative and indirect impacts are mentioned several times in the guidelines. According to Sida's own requirements, an EIA shall consider indirect impacts on human beings, flora, fauna, land, water, air, climate, landscape, material assets, cultural heritage and also the interactions between these factors. In respect of cumulative effects it is for example stated that these impacts should be identified, predicted and analysed in an EIA for sectors and regional programmes. Cumulative consequences are also mentioned in the review checklist for dams and mines as a question of whether this kind of impact has been considered in the EIA.

Cumulative effects are explained as "*effects of the type that accumulate and increase with time*" (Sida 2002, p. 12). In respect of indirect effects it is noted that it is helpful to divide expected impacts into direct and indirect impacts in order to better consider problems like delayed effects and also to refer effects to specific projects.

3.4 International guidelines on cumulative effects in EIA

3.4.1 USA

The Council on Environmental Quality has published a handbook regarding how to consider cumulative impacts (1997). The aim of the handbook is to introduce NEPA practitioner and other interested parties to the issue of cumulative effects, general principles, useful steps, and also to provide information on methods of cumulative effects analysis and data sources.

This handbook is divided into different parts which present cumulative effects issues related to scoping, describing the environment, determining the

environmental consequences, and also methods, techniques and tools for analysis. In total eleven methods and tools are described in this handbook. An overview of methods is provided in chapter 2.7.

3.4.2 Canada

The Canadian Environmental Assessment Agency supported a working group in its attempt to develop a guide on cumulative effect assessment practices (Hegmann et al. 1999). The guide is a supplement to a reference guide (Canadian Environmental Assessment Agency 1994) which formed the basis of the Canadian Environmental Assessment Agency's response to issues in respect of carrying out Cumulative Effects Assessments (CEA). The target group for the Canadian guide is primarily practitioners, including consultants, government agencies and proponents, who are responsible for conducting CEA. The guide is designed to be generic for any legislated assessment process.

The guide contains definitions and basic concepts, a CEA checklist, key criteria for an acceptable CEA, and cumulative effects history in Canada. The guide's main content is the chapter with information on key tasks in completing CEAs. These tasks are divided into five different steps: scoping, analysis of effects, identification of mitigation, evaluation of significance and follow-up. These steps are the same as for basic EIA though the guide aims to identify and discuss tasks that are unique in CEA. For each step the guide provides examples of approaches on how to assess cumulative effects which are illustrated by different case studies.

3.4.3 The European Union

A study of the assessment of indirect and cumulative impacts as well as impact interactions has resulted in an EU guideline with the aim of advising EIA practitioners on how to approach these kinds of impacts (Commission of the European Communities 1999).

A central part in the guidelines produced is the suggested methods and tools for identification and assessing of these types of impacts. Eight different tools and methods are described as well as an assessment of their advantages and disadvantages. For each suggested type of tool and method there is also information on its application and a short example from a case study. Other aspects presented in the guidelines concern for example legislation, scoping, and the information needed to assess the impact and for the assessment.

3.5 Arguments in the literature relating to the consideration of cumulative impacts in EIA

In the European guidelines on cumulative effects, four main reasons are identified as to why indirect and cumulative impacts and impact interactions should be included in EIA:

- it is required by legislation;
- it contributes towards sustainable development;
- it is good practice, and
- it aids the decision making process (Commission of the European Communities 1999).

The legislation argument is also pointed out in several papers as a reason as to why cumulative impacts should be considered in EIAs (Burris & Canter 1997; Canter 2000; MacDonald 2000; van der Walt et al. 2004).

According to the US handbook (Council on Environmental Quality 1997) regarding cumulative effects it is stated that the reason for analysing these effects is to make sure that federal decisions consider the full range of consequences of actions. It is further stated that it is impossible to move towards sustainable development without incorporating cumulative effects into environmental planning and management. The goal of cumulative effects analysis is claimed to a large extent be "*to inject environmental consideration into the planning process as early as needed to improve decisions*" (Council on Environmental Quality 1997, p. 3).

According to the Canadian guide, cumulative environmental assessment "*is done to ensure the incremental effects resulting from the combined influences of various actions are assessed*" (Hegmann et al. 1999, p. 1). Like the EU guidelines, this guidebook also states that the assessment of cumulative effects is seen as best practice in conducting environmental assessments. Another reason to assess this issue is that it is required in Canadian federal legislation when the action complies with federal environmental assessment under the Canadian Environmental Assessment Act.

Another aspect that is pointed out as a reason to consider cumulative effects is that it provides useful information to decision makers. As Ross (1998) puts it, the information will be more useful since it deals with the true consequences of proposed projects. When addressing cumulative effects, it could for example help decision makers to manage the rate or total amount of development in an area so that the impacts remain within thresholds levels (Canter & Kamath 1995a).

A number of other authors also bring up the issue of environmental protection and the promotion of sustainable principles/development as important reasons in the consideration of cumulative effects (Rees 1995;

Commission of the European Communities 1999; Jeffrey & Duinker 2000; MacDonald 2000; Piper 2001; Lindsay et al. 2002; van der Walt et al. 2004). In this sense, no-net loss and avoidance of further environmental degradation is mentioned as an important reason for consideration of cumulative impacts (Rees 1995; Jeffrey & Duinker 2000).

3.6 Overview of methods on cumulative effects

According to Canter and Kamath "*there is no universally adopted method for assessing cumulative impacts*" (1995a, p. 320). This statement is based on lessons learned from reviewing case studies. Methods on cumulative effects are however mentioned and discussed in several papers, books and guidelines. Some of them have categorised methods in different ways (Sonntag et al. 1987; Stakhiv 1988; Smit & Spaling 1995). Smit and Spaling (1995) have also evaluated several methods and as in the European guidelines (Commission of the European Communities 1999) they discuss the positive and negative (strengths and weaknesses) aspects of different methods. The handbook by the Council on Environmental Quality (1997) on cumulative effects contains a chapter and an appendix which consider methods for analysing cumulative effects. Ten different methods are described and examples are given in an appendix. This handbook also provides some examples of the strengths and weaknesses of different methods.

In various papers there are also discussions regarding suggestions for how to improve existing methods (Baxter et al. 2000). Furthermore, examples of new methods or 'old' methods in new contexts or for different approaches are also provided (Leibowitz et al. 2000). Some also suggest alternative approaches for the consideration of cumulative impacts in environmental assessments (Lindsay et al. 2002). Another issue discussed when it comes to methods is which requirements the method should fulfil to be an appropriate method for consideration of cumulative effects in EIA (Canter & Kamath 1995a). Some authors bring up the issue that there is a lack of appropriate methods and that the methods have their limitations (MacDonald 2000). In a report undertaken by Folkeson et al. (1999) for the Swedish National Road and Transport Research Institute it is stated that there remains a significant general need for method development that is adapted to specific Swedish conditions. Ross (1998) highlights some of the difficulties in respect of methods and how to choose the right ones. Baxter et al. (2001), propose a method to distinguish VECs (valued ecosystem component) specific to CEA in a 'secondary' scoping phase. They have termed the method 'context scoping'. A further method mentioned in relation to monitoring tools was the

use of local peoples' noses to detect certain odours (Morrison-Saunder et al. 2001). Adaptive management is another approach mentioned by Jeffrey and Duinker (2000).

A structured questionnaire checklist is proposed by Canter and Kamath (1995a) made for scoping of cumulative impacts etc. These authors have also studied eight cases and describe the advantages and limitations in the studied methods. Five of the case studies used interaction matrices and/or composite indices, two used GIS and one used a simple checklist.

Smit and Spaling (1995) have classified methods that are used for cumulative effects in EIA. They have differentiated the methods into *analytic approaches* and *planning approaches*. Six categories of different analytical methods were evaluated. Methods that are mentioned as part of a planning approach are multi-criteria evaluation, programming models, land suitability evaluation and process guidelines. In this paper they also refer to other authors' previous classifications of methods used for cumulative effects in EIA. Sonntag et al. (1987) categorized the methods from an analytical perspective into matrix methods, causal analyses and meta-modelling. Smit and Spaling also mention Stakhiv (1988; Stakhiv 1991 see Smit & Spaling 1995, p. 84) who has classified methods from the perspective of planning and has divided the methods into five different classes: 1) valuation methods, 2) linked deterministic and simulation models, 3) unified, holistic and theoretical approaches, 4) land use designation approaches and 5) comprehensive planning and evaluation.

Table 4. Compilation of methods useful for a cumulative effect approach and some examples of were it can be found in the literature

Method	**Reference**
Expert opinion	Smit & Spaling 1995; Council on Environmental Quality 1997; Commission of the European Communities 1999; MacDonald 2000
Consultation and Questionnaires	Council on Environmental Quality 1997; Commission of the European Communities 1999
Checklists & Questionnaire checklists	Canter & Kamath 1995a; Canter 2000; Council on Environmental Quality 1997; Commission of the European Communities 1999; MacDonald 2000
Spatial Analysis, overlay mapping and GIS	Smit & Spaling 1995; Spaling 1995; Canter & Kamath 1995a; Council on Environmental Quality 1997; Commission of the European Communities 1999; Canter 2000; MacDonald 2000; Piper 2002; Dubé 2003
Network Analysis (cause-effect diagram) and Systems Analysis	Smit & Spaling 1995; Council on Environmental Quality 1997; Commission of the European Communities 1999; Canter 2000; MacDonald 2000; Brismar 2004
Matrices	Smit & Spaling 1995; Canter & Kamath 1995a; Council on Environmental Quality 1997; Commission of the European Communities 1999; Canter 2000
Carrying Capacity Analysis	Council on Environmental Quality 1997; Commission of the European Communities 1999
Modelling, models	Smit & Spaling 1995; Power 1996; Cooper & Canter 1997; Council on Environmental Quality 1997; Ross 1998; Commission of the European Communities 1999; Glasson et al. 1999; Jeffrey & Duinker 2000; Lee 2000; MacDonald 2000; Piper 2002
Interviews and Panels	Council on Environmental Quality 1997
Trend Analysis	Council on Environmental Quality 1997
Ecosystem Analysis	Council on Environmental Quality 1997
Economic Impact Analysis	Council on Environmental Quality 1997
Social Impact Analysis	Council on Environmental Quality 1997
Context scoping	Baxter et al. 2000; Baxter et al. 2001
Photo montage	Ross 1998
Landscape/Bio-geographic analysis	Smit & Spaling 1995
Loop analysis	Smit & Spaling 1995

4 Summary of papers I-II

The empirical material gathered through the interview study ended up in two papers. The first and briefer paper focused on the lack of incitements to include cumulative effects in EIA/SEA, whereas the second and more profound paper focused on the obstacles to and difficulties of including cumulative effects in the EIA/SEA process.

4.1 Paper I

This paper was published in 2006 in a research report from the MiSt-programme. The aim of the paper was to focus on statements regarding (the lack of) incitements to include cumulative effects in EIA/SEA. The paper is mainly based on statements concerning cumulative effects issues in relation to the scoping approach, responsibility to include cumulative effects, requirements from reviewers, and also other requirements such as those in respect of legislation or wider norms.

The study confirmed the results from previous studies, namely, that the issue of cumulative effects is poorly described in EIA/SEA documents. It was also shown that the term cumulative effect is rarely used in the EIA/SEA process by the actors involved. The phenomenon as such could however be seen to have been dealt with to some extent. The examples given were however not very clear on the notion of cumulative issues and the discussions that had taken place did not lead to a description of cumulative effects in the EIA/SEA document. It is thus not only the lack of description in EIA/SEA documents but also a basic failure to fully consider these effects in the process as such that emerges here.

On the subject of how the scoping in time and space is made, it is clear from the study that whatever the type of actor (reviewer, proponent, or consultant) the requirements put on, or the approach to, scoping are too

narrow in time to also include effects from past or future activities. Other future activities might to some extent be included in a zero alternative (no action alternative) but there were no signs that effects from these activities will be included in the assessment of effects together with the plan or project in question. Several of the interviewees mentioned that they include other activities than their own in the baseline description of what the area looks like today. There was however no indication of that these effects were included in the evaluation of effects together with the effects of their own projects or plans. The result was the same regarding scoping in space, which strongly indicated that effects from present activities will not be included in the effect evaluation together with the planned activity.

Cumulative effects are not experienced as demanded by legislation, handbooks or other internal policies or the like on how to work with effects in EIA/SEA. Furthermore, the reviewers' statements strongly indicate that they do not ask for cumulative effects to be investigated. This was also confirmed by proponents and consultants who stated that reviewers seldom ask for cumulative effects to be investigated and when they do actually asked for this to be done these effects are still not described in the EIA/SEA document.

The issues relating to responsibility are expressed by some consultants as a possible obstacle to the inclusion of cumulative effects in the assessment. Difficult issues to solve could for example be: who is responsible for which effect and who should take measures for what.

A more positive result in respect of the inclusion of cumulative effects in the EIA/SEA process is that no matter the type of actor, the study showed that they expected to have a significant ability to influence the scoping process. However, aspects such as the different viewpoints held by politicians or procurers in respect of what to include, being too understaffed to effectively deal with demands in respect of cumulative effects, the burden of retaining the economic responsibility not to demand investigations that turn out to be unnecessary and the difficulties faced by consultants in arguing against the proponent emerged as indications of the fact that it is still not easy to include cumulative effects in the process.

To sum up, the results show that there really are few incitements for the actors to encourage them to include cumulative effects in their EIA/SEA work.

4.2 Paper II

The aim of Paper II was to explore the current situation experienced by actors implementing the EIA and SEA legislation in Sweden in relation to the demands on including cumulative effects. The focus here is on the obstacles to and difficulties of including cumulative effects in Swedish EIA/SEA as expressed by the interviewed actors.

This study ended up in an extensive compilation of suggested obstacles to and difficulties of including cumulative effect issues. The study shows that EIA/SEA actors are rather uncertain about the meaning of the term cumulative effects. They all have some idea of what the phenomenon is about, but their views are quite narrow as compared to how the concept is actually explained in the EIA/SEA literature which treats the notion of cumulative effect in an extensive manner. None gave a clear definition of the term or a whole or comprehensible explanation of the complexity of how these effects might appear and interact. It also appears from the study that cumulative effects are not experienced as a part of the official EIA and SEA requirement.

In respect of the methods used to identify, evaluate and describe cumulative effects, the study demonstrates a widespread unawareness of how to approach this issue. The only methods or approaches mentioned were discussion and GIS (Geographic information system). GIS is mentioned as a method that could *probably* be used for cumulative issues but that had not yet been used for this purpose by the interviewee in question. Furthermore, the results demonstrate a distinct lack of information in respect of approaches and methods in Swedish handbooks on how to deal with cumulative effect issues. Another support-issue affecting whether attention in respect of the assessment is given to CE is the availability of basic data and the finding of the right information. It was stated by an officer working at a county administrative board that a significant amount of basic data is available though nothing has been done specifically in respect of EIA. Support from the competent authority appeared to be of the utmost importance for consultants in proposing issues to be included in the EIA work against the views of the proponent. Reviewers seldom however placed demands in respect of the investigation of cumulative effects.

There are no indications that the proponent asks for competence on cumulative effects when procuring consultants or that it is likely to ask/demand the consultant to investigate this type of effects during the process. It seems that the procurers are often simply unaware of cumulative effects and thus unlikely or unable to ask for competence in this issue when choosing consultants.

Financial resources were shown to be an important component affecting whether an issue, like cumulative effects, is likely to receive attention. The reviewers do not have the time to do something outside the ordinary, in this case to place demands on the inclusion of cumulative effects and also have the extra time and competence to counter-review this demand. At the municipal level it seems that insufficient resources are generally available to employ a specialist on, for example, cumulative effects. At the proponent level on the other hand the study showed that financial issues are not necessarily an obstacle to the inclusion of cumulative effects.

Since however there is a complex relationship between what is demanded by the legislation and reviewers and that knowledge and skills on cumulative effects remain low, the proponent generally does not demand that the consultants they procure include these issues in their assessments. It thus remains a financial problem for consultants to include cumulative effects issues. An important finding here is however that the interviews pointed towards the fact that at all actor levels, the (lack of) knowledge about the issue of cumulative effects is experienced as a greater limiting factor in terms of inclusion than the financial questions surrounding the inclusion of CE effects.

The EIA/SEA actors studied here see cumulative effects as a new issue at the same time as most stated that they have not yet discussed this issue with their colleagues. On the other hand, the study showed that all actors claimed that cumulative effects are important to highlight, investigate or take into consideration.

In this study the results in respect of suggested obstacles were divided into *knowing that*, *knowing how*, and *will to act*. The various obstacles and difficulties and their categorization are indicated in the box below.

Compilation of suggested obstacles to and difficulties of including cumulative effects in the EIA/SEA process:

Knowing that
- Little or no awareness of a definition of CE (compared to definition in international CE handbooks)
- Limited and varied understanding of the phenomenon and concept of CE
- No experience of CE being demanded by legislation
- No or little information from Swedish handbooks on CE issues
- No or vague requirements from handbooks, internal manuals, or the like to thoroughly (or at all) include CE issues
- No awareness of international handbooks on CE
- No requirements from reviewers to include CE issues
- CE are not asked for by proponents to be investigated

Knowing how
- No known method or approach/procedure to include CE in EIA/SEA
- No general directions on how to work with CE
- No or little support to include CE from colleagues, proponents, consultation parties, reviewers etc.
- No support from handbooks of how to scope for CE or how to do the estimation etc.
- No support from reviewer of how to include CE
- Inadequate and not adapted basic data to include CE
- CE falls out of the requirement framework when EIA/SEA consultants are procured
- Limited by financial resources, i.e. time and labour force
- Too narrow time horizon in the effect description and evaluation
- Too narrow geographical boundary and no inclusion of other activities in the effect evaluation

Will to act
- CE is a new question
- No or little discussion of CE issues
- No custom in the business to include CE
- Consultants investigate what they are paid for
- Avoidance of difficult issues and questions
- Hard to include late in the process
- No discussion about need to or how to increase knowledge about CE
- Improvement of CE is not a prioritized issue
- Lack of a sense of responsibility to include effects from activities other than those relating to the project in question (who should describe what, who should take measures and who should pay for what)
- Focus on separate issues, type of effects; no comprehensive approach
- Different persons dealing with different parts in the EIA/SEA, no approach for the entity
- Use of checklist/gross list which lack CE issues
- Carry out EIA/SEA according to what is stated in the environmental code
- Long time span hinders cooperation between different processes in EIA/SEA

The manner in which this study was undertaken does not make it possible to rank the obstacle aspects listed in the box. Several interviewees did however state that the knowledge base is the most important obstacle in respect of the inclusion of cumulative effects in the EIA/SEA process.

During the analysis of the material these obstacles were divided into the three categories *knowing that, knowing how* and *will to act*. These categories formed the framework for the analysis aiming to better understand the relationship between the interviewees basic understanding of cumulative effects, their knowledge about how to work with cumulative effects in the EIA/SEA process, and their ability and will to include these effects in the process. The idea for this framework was initiated by the finding that all interviewees stated that cumulative effects is an important issue to include in the assessment at the same time as they also stated that these effects are seldom actually included in the process. It was also shown that several of the interviewees, no matter the type of actor, expressed that they have a significant ability to influence the EIA/SEA scoping. It was thus considered as likely to be both fruitful and interesting to base the analysis on this discrepancy between attitudes and behaviour while looking more closely at the knowledge base of this issue.

To conclude, the connection between these three categories can be seen to be that the basic level of knowledge in respect of cumulative effects both as a specific term and as a more general phenomenon is low while at the same time as the requirement to include these effects remains absent. The knowledge of how to approach cumulative effects has not therefore been developed and the potential for this inclusion has not really been investigated or looked at more closely. Even though the actors' will to include these effects is discernable, their ability to act is hampered by factors connected to the two other categories (knowing that and knowing how) for the reason that: an approach within the Swedish EIA/SEA business to include also cumulative effects and financial resources has not been developed thus limiting their ability to change their approach since this is not considered as a prioritized issue.

5 Discussion and conclusions

The first analysis of the interview material focused on incitements to include cumulative effects in the EIA/SEA process (Paper I). As can be seen in some of the results presented, there are several aspects affecting actors' experienced incitements to include cumulative effects or rather the lack of such incitements when working with environmental effects in the EIA/SEA process.

To conclude, the following findings must be considered as representing a lack of incitements:

- cumulative effects are not requested to be included in the scoping phase by reviewers, proponents etc.
- reviewers do not ask the proponent or consultant to include cumulative effect issues,
- proponents do not ask for skills on cumulative effects when procuring consultants,
- the legislative requirements are not seen as demanding cumulative effects to be included,
- Swedish handbooks and guidelines do not provide support on how to approach cumulative effects,
- no internal policies or standards exist which require the inclusion of cumulative effects in the assessment, and
- there is no custom in the 'EIA/SEA business' of including cumulative effects.

Since the issue of cumulative effects can be seen to be a rather anonymous aspect in the Swedish EIA/SEA process, and that there are few incitements for reviewer, proponent, procurer or consultant to include cumulative effect issues, it seems logical to acknowledge that the knowledge base on cumulative effects has not advanced further over the years in relation to environmental assessment requirements. It could of course be viewed the other way around, namely that the incitement to

include cumulative issues is poor due to the lack of knowledge about what cumulative effects are all about. In this case, it is however most likely the first conclusion that mirrors the experience of the interviewees in the most appropriate way. This conclusion is based on where in the EIA/SEA 'world' they are working and their statement on what affects their work with, for example, the scoping of effects.

These actors are working with set norms and rules on how to act within their EIA/SEA work. Of course this work develops as time goes and as new knowledge is gained or in light of, or in response to, issues raised by stakeholders in the EIA/SEA process. The issue of cumulative effects must therefore actively be added to the incitement picture to change these actors' knowledge-base and ways of working.

The following paragraph relates to issues beyond the original purview of the interview study, but the picture would probably be different if exploring the same issue among legislators, and authorities responsible for setting up regulations, guidelines and handbooks connected to the requirements on environmental assessment in the Swedish environmental code – which in turn is based on the EU's EIA and SEA directives. The difference lies in the fact that these actors, for example the legislators, had actively to take a stand against the directives and how this should be implemented in Swedish legislation. These actors therefore took an active decision (intentionally or unintentionally) not to include the term cumulative effect in the wording of the directives in the wording of the environmental code. These actors' incitement picture was therefore rather different as compared to the actors involved in this study. It is perhaps correct to state that the legislative actors did not have enough knowledge about what cumulative effects are to support an incitement structure (i.e. implement the term cumulative effect into the environmental code) for cumulative effects.

One obvious point raised the literature study is the fact that the term cumulative effect is simply omitted in Swedish EIA/SEA legislation, i.e. the Environmental Code. As was shown in the interview study, the actors do not read what is stated in the directives, but instead read the national legislation when setting the framework for what is required for an environmental impact assessment. As such, no actor sees cumulative effects as being required according to the legislation. Therefore it is central to question whether this is acceptable or not. Should EIA/SEA actors know what is stated in the directives or is it too much to ask from a reviewer, proponent or consultant that they should have read the directives just in case of lack of a clear demand in the national legislation? The EIA and SEA are both minimum directives constituting the EU members' lowest

level of demands in their national legislation in respect of these assessments. The question here is simply *what is the level of responsibility to live up to these directives?* Is the level to be set at a government level, authority level or at the level of the person/company/authority who applies for permission where an EIA or SEA is needed? The answer is that the responsibility at the level of the proponent is very high. Even though the term is not included in the environmental code the owner of the environmental assessment must seek what is required, not only by what is stated in the environmental code, but also through statutes, regulation, general guidelines, and legal practice. The requirements are not limited to what is stated in the environmental code which instead should be seen as a basic framework. [2] Sweden has a tradition of framework laws which means that legislation does not specify regulations in detail. Their effectiveness is instead to a large extent determined by its interpretation in guidelines and its subsequent implementation in professional practice (Hilding-Rydevik & Fundingsland 2005).

It can be concluded from the study that there is really no discrepancy between knowledge (cognitive component) and behaviour in relation to the issue of the inclusion of cumulative effects in EIA/SEA. The study shows that the knowledge base on cumulative effects is low in respect of legislative requirements and the phenomenon of cumulative effects. In respect of knowledge on how to work with cumulative issues the study shows that the interviewees do not know how to approach this issue and they generally do not include this issue in the assessments. This seems logical, because if you do not know very much about an issue it does not affect the way you act since it is not on your mind when you (intentionally or unintentionally) decide how to behave. The results thus point toward a consistency between knowledge and behaviour.

The study does however point to a discrepancy between the component *behaviour* and the actors' *attitude* in respect of cumulative effects. This can be seen when looking into the interviewees statements whether they think cumulative effects is an important issue to include and investigate in environmental assessments. The results show that all interviewees claim that cumulative effects are important to highlight, investigate or take into consideration. This fact put against the result that cumulative effects are seldom considered in EIA/SEA shows a clear discrepancy between behaviour and attitudes.

This discrepancy can be made clearer by turning to social psychology. Three possible explanations for the discrepancy will be given here based

[2] Personnel communication: Peggy Lerman, lawyer and expert on EIA and SEA legislation, LAGTOLKEN PL AB, 2007-04-10

on Sears et al. (1985). One possible explanation might be that these actors have not thought much about cumulative effects before the interview and therefore they had not yet been able to sharpen their arguments as to why the inclusion of cumulative effects is important. This attitude is thus not very strong or clear. They might never have had to think about and express their attitude before and they had hence not rehearsed or practiced their attitude before the interview. This can also be interrelated to a hypothesis within social psychology which states that we will have firmer attitudes about an attitude object (cumulative effect in this case) when we have direct experience with it than when we have only heard or read about it. Another, supplementary, explanation of the aforementioned discrepancies could be that a certain situational pressure exists to behave in a contradictory manner. This situational pressure might for example emerge from how people behave within the business, what is the 'normal' thing to do, or that they are under stress from the imposition of strict financial limits. External or situational pressure could also come from project leaders or proponents or from the fact that the person does not experience this attitude (will to include cumulative effects) as supported by demands in the legislation or requirements in handbooks. A third explanation for the discrepancy could be the phenomenon that prior behaviour influences future behaviour because people are, to some extent, 'creatures of habit'. It is sometimes difficult to give up a certain type of behaviour for a new one. If EIA/SEA actors are not used to including cumulative issues in the assessment, it requires a lot of effort to amend this way of do things into a new behaviour structure which also includes a consideration of cumulative effects.

As can be seen in the overview box in chapter 4.2 there are both obstacles to and difficulties in the inclusion of cumulative effects that could fit into all three of these explanations in respect of the discrepancy between behaviour and attitudes. The explanation of the discrepancy is thus most likely to be found in a combination of all three conditions.

Some conclusions can now be made when comparing the actors' statements in respect of the importance of taking cumulative effects into consideration in relation to the arguments raised in the literature study over why these effects should be considered in EIA/SEA. With the discrepancy between attitude and behaviour in mind and the explanation that this might be because of the attitude not being very strong or clearly defined this can be weighed against arguments already found in the literature. Some of the main arguments in the literature study are: 1. it is required by legislation, 2. it contributes to sustainable development, 3. it is good practice and 4. it aids the decision making process. The first and

third arguments can be seen to be lacking among the actors such that:

- the actors do not see cumulative effects as being required by legislation, and
- they all stated that cumulative effects are more or less always lacking in the EIA/SEA process. Still they had difficulty in coming up with examples where cumulative effects should have been included.

The second and fourth arguments were not directly used by the actors either but could perhaps be speculated about in the sense of being the underlying reason for stating that cumulative effects are important to include. It can thus be concluded that without mentioning the four main arguments as to why cumulative effects should be included, their attitudes remain lacking in both strength and clarity.

Now, let us return to Molander's (1996) argument that all acts are, at root, intentional. Molander elaborates this further however and states that to do something intentional does not mean that there is a determined intention in what a person is doing. Molander gives three main types of reasons for this: The acting person 1. denounce an *intention* (to achieve something in the future), 2. says that she *likes* to do like this or that (or: just for the fun of it), or 3. says that it is the *right thing* to do like this or that (or: this is how things are done at our place). Do these actors actually skip the inclusion of cumulative intentionally? The explanation probably lies in Molander's third description of different levels of intentionality, or to be more precise "*this is how things are done at our place*" (Molander 1996, p. 110). Several of the interviewees directly or indirectly stated that it is difficult doing something out of the ordinary and that they are generally wedded to routines on how things are done within 'the EIA/SEA business'. The discrepancy explanations can also be looked at here, where one has to do with the idea that people act taking what they are used to doing as a starting point; we are creatures of habit. The actors can therefore be stated to actually skip the inclusion of cumulative effects intentionally, because they are used to so doing.

This inconsistency between actual behaviour and attitudes has been shown within social psychology to be a common phenomenon where people seem to live quite comfortably with the inconsistency. According to Sears et al. (1985) it still seems to be correct to say that attitudes always produce pressure to behave consistently even though other pressures (as mentioned above) also affect behaviour. The discrepancy between attitudes and behaviour has also been noted by other researchers. Wood et al. (2007) describe it is surprising that actors think that cumulative effects are important since new research shows that there is a lack of the early identification of potential cumulative effects in EIA. It has also been shown that EIA scoping does not specifically

consider cumulative effects or does so only to a limited extent. The authors conclude that it is positive that the actors now seem to have discovered cumulative effects. The paper is based on empirical investigations and assessment of recent scoping activities in England and Wales.

One of the most important outcomes of this study is the finding that the phenomenon of cumulative effects among the EIA/SEA actors is considered a vital issue to include in the assessment process. The attitude towards these complex effects is shown to go hand in hand with the requirement made by the EU directives which state that the assessments' description of likely significant effects should cover cumulative effects. This is an important finding in terms of the fact that, according to Sears et al. (1985), it is usually much easier to change ones cognition (which consist of all knowledge, facts and beliefs a person has about a particular object) than attitudes. This has to do with the idea that attitude has an evaluative or emotional component that beliefs in facts do not have. Facts and attitudes therefore function differently. Once an attitude is established, it is much more resistant to change than beliefs in 'facts'. This is important to bear in mind when looking at this thesis result showing that the knowledge of cumulative effects is low and that there is a lack of awareness of how to manage cumulative effects in the assessment process. Based on Lippa (1990), who states that an attitude is different from a mood or an emotion, as emotions can come and go in seconds, while attitudes remain more stable, and while emotions may be broad and diffuse attitudes are directed at some target or object. It can thus be stated that attitudes identified in this study can be treated as attitudes are thought of within social science. It is not however certain that the interviewees statements regarding whether the inclusion of cumulative effects is an important issue actually mirrors an attitude and not an emotion or mood prevalent at the moment of the interview situation. The current author did however get a feeling of trustworthiness and sturdiness in respect of the interviewees' statements on the importance of including cumulative effects and therefore does not believe that it was just an expression of an emotion of that particular moment in time.

If the opinion among our politicians is that we should carry out our agreed upon commitments when entering the EU, EIA/SEA work in Sweden should strive to live up to the requirements placed on the environmental assessments in the EU directives. The assessment work should thus include cumulative effects. It is therefore good news that the attitude among the actors working most closely with the assessment work already consider these effects to be important enough to include. If changing and improving the extent of cumulative effect consideration, the energy and effort should therefore not in the first hand focus on these actors will to act, but instead be

focused on obstacles connected to knowing that and knowing how. This for example concerns improvement of the knowledge base regarding the legislation requirements, the concept and phenomenon of cumulative effects, and within the context of the review requirements and also to raise awareness of how to approach and manage cumulative effects at all levels (reviewer, proponent, and consultant) when carrying out the assessment.

A key question here for future perspectives and cumulative effect consideration is whose responsibility it is to ensure that Sweden lives up to its obligations in this area in terms of EU membership. In this case, who or which authority should follow-up the implementation and compliance of the EU directives on the assessment of certain public and private projects, as well as certain plans and programmes? The Swedish EPA has an important role to play in this work. Their main tasks are to act as the standard-setter, guide, coordinator and evaluator (Swedish Environmental Protection Agency 2007). The EPA is tasked with informing and making sure that environmental legislation is followed as well as with the provision of environmental knowledge. They shall also guide other national, regional and local authorities in respect of environmental and supervisory issues. The EPA shall also explain how legislation should be expounded, and develop regulations, general guidelines and handbooks. It is thus the EPA who has the commission to see to it that Sweden follows what is stated in the EU directives in respect of the consideration of cumulative effects in environmental assessments for projects, plans and programmes.

After the implementation of the SEA directive into the Swedish environmental code, the EPA has began to work on the development of two handbooks, one for the environmental assessment of plans and programmes in accordance with the environmental code, and another on the environmental impact assessment of activities and measures (projects). Both of these handbooks are however still at the referral stage. Published versions are expected around the summer of 2007. The draft handbook on plans and programmes mentions cumulative effects and states that two of the important advantages of making environmental assessments on a plan- and programme level, and not just at the project level, are that there is greater possibility to introduce alternative solutions and also to consider cumulative effects. It is further stated that when an authority or municipality carries out or changes certain plans and programmes they should be considered as cause-significant environmental effects if the plan or programme in question might have importance for other plans' or programmes' environmental effects and this should include the consideration whether the plan or programme might cause cumulative effects. When undertaking the significant environmental effect judgement, the plans' or programmes' *total effects* should also be considered.

According to the draft handbook, the assessment of its total effects should also include consideration of whether the effects are secondary, cumulative, interacting, permanent or temporary in the short, medium and long terms. Beyond this, the draft handbook does not mention cumulative effects in any great detail. Definitions and explanations of the term and concept are thus lacking. The draft handbook for activities and measures does not mention cumulative effects as a term but as a phenomenon. The phenomenon is however mentioned rather clearly in connection to an appendix in the statute to the environmental code, which contains criteria for deciding whether certain activities and measures might cause significant environmental effects or not. In connection to scoping, the handbook does not however mentioning the term very clearly except that the EIA should include information of the planned activities or measures and the possible connections to other activities and projects.

General guidelines on environmental impact assessment connected to the environmental code have also been developed by EPA. This document is also at the draft referral stage. This draft mentions cumulative effects in the same way as the handbook on plans and programmes does, namely, in connection to the judgement of significant impacts.

Based on the draft handbooks and general guidelines, the key actor, the EPA, does not seem to actively work for future improvement to any great extent regarding the issue of the fuller consideration of cumulative effects in environmental assessment on projects, plans and programmes.

As was pointed out in the literature study, some studies have shown that there is a relationship between the definition used in respect of cumulative effects in EIA and the inclusion of other activities in the assessment (Cooper & Sheate 2002; van der Walt et al. 2004). The aim of this thesis is not to suggest how to improve the consideration of cumulative effects. It can however be concluded that if the inclusion of cumulative effects should be increased and improved in occurrence and quality, one central change to be made as a first step is the actor's knowledge about what the notion of cumulative effects actually stands for as a term and as a phenomenon. Their awareness should be improved to a level where they have comprehensive knowledge of cumulative effects as a concept and where they use a broad definition to secure the inclusion of potential cumulative effects.

The actors' knowledge of how to approach cumulative effects was also shown to be poor. From an international perspective there are, on the other hand, several methods and approaches used in respect of cumulative effects to identify, describe and evaluate these effects in an environmental assessment. An overview of methods and approaches can be viewed in chapter 3.6. The gap between knowledge of the approach and available methods and

approaches in the international literature can therefore be seen to be rather broad. If compiling improvement suggestions this knowledge deficit should also be high on the list of changes to be made if the inclusion of cumulative effects is to increase.

An issue of central importance to investigate before suggesting solutions to raise the awareness and consideration of cumulative effects is however the question of whether there are also other types of obstacles hindering this inclusion at other levels. One important level is for example that of the legislative actors. This level is essential to include if studying underlying reasons as to why cumulative effects are not mentioned in Swedish legislation. A further level to include could be that of the EPA. This level should be studied with a view to investigating their awareness of the lack of consideration of cumulative effects in EIA/SEA and whether they have a strategy on how to increase this consideration. Further research within the context of how the concept of cumulative effects has been implemented in for example Canada and the USA should also be undertaken, aiming to look more closely at how awareness levels as well as the general approach and culture have been developed within their EIA/SEA processes. This exercise could provide an important input into any future attempt to strengthen the consideration of cumulative effects in Swedish environmental assessment processes.

An additional issue that deserves attention is that of the reviewers' influence in the EIA/SEA process. How can the reviewers' role be strengthened and how could their awareness of cumulative effects be improved? The need for significant improvement in the knowledge base in respect of the term and concept of cumulative effects has been recognised as a general problem among the involved actors in this study. Finally, another issue that has to be studied is that of whether the existing methods mentioned in relation to the cumulative effect literature are applicable to Swedish conditions or whether they need to be adjusted and amended in order to be useful as tools in the Swedish EIA/SEA process.

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