EIA Practice

Examples of Cumulative Effects and Final Disposal of Spent Nuclear Fuel

Antoienette Wärnbäck
Faculty of Natural Resources and Agricultural Sciences
Department of Urban and Rural Development
Uppsala

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Abstract

This thesis is about Environmental Impact Assessment (EIA) practice in Sweden. Impact Assessment (IA) is expected to play a crucial role in enabling democratic and enlightened decision making. EIA practice seems however not to be in accordance with best IA practice norms and legislation in many countries. We therefore need a more thorough understanding of IA practice and its outcomes and about what is gained through EIA and thus also be able to suggest, on a more profound basis, how the practice can be improved.

This thesis presents an analysis of the two cases EIA practice on cumulative effects and the final disposal for spent nuclear fuel. The methods and approaches used are qualitatively and include literature review, document analysis, individual interviews and focus group interviews. The results were analysed using social psychology theory and community of practice theory.

The case of cumulative effects clearly demonstrated that a positive attitude towards including cumulative effects was in place, but the conditions to change the knowledge base were not. In the investigated case for a final disposal for spent nuclear fuel it was revealed that a shared practice and social learning over time might result in difficulties for the authority in mapping out a clear role and identity for itself in relation to the proponent. It also showed that the shared practice that has developed between the industry, and the competent authorities, has over time resulted in the adoption of a shared understanding and similar perspectives, concerning at least two points. The first concerns downgrading the need to more thoroughly investigate alternate technical methods to the main alternative, while the second concerns the need to avoid delays in the planning process. Communication and the shared practice that has developed over a long period of time, can have a significant and not necessarily positive impact on power relations and thus hamper knowledge production, diffusion of roles and identities.

Keywords: EIA practice, communities of practice, social learning, social psychology, interviews, document analysis, cumulative effects, final disposal of spent nuclear fuel.

Author's address: Antoienette Wärnbäck, SLU, Department of Urban and Rural Development, P.O. Box 7012, 750 07 Uppsala, Sweden
E-mail: Antoienette.Warnback@slu.se

Dedication

Till Hedda och Isabell för att ni är både solskenet och stormen i mitt liv

> “No human being can step outside of their humanity and view the world from no position at all, […] and this is just as true of scientists as of everyone else.” (Burr, 2003, p. 152)

Contents

List of Publications

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

I Wärnbäck, A. (2006) Lack of incitement in the Swedish EIA/SEA process to include cumulative effects. In Emmelin, L (ed): *Effective Environmental Assessment Tools - Critical Reflections on Concepts and Practice*. Karlskrona. Also included in licentiate thesis. Swedish University of Agricultural Sciences. Uppsala.

II Wärnbäck, A. and Hilding-Rydevik, T. (2009). Cumulative effects in Swedish EIA practice — difficulties and obstacles. *Environmental Impact Assessment Review 29*(2), 107-115.

III Hilding-Rydevik, H. and Wärnbäck, A. (2012). Learning through social participation in long planning and Environmental Impact Assessment processes - the case of final disposal of spent nuclear fuel in Sweden. Submitted to *Environmental Impact Assessment Review* in May, 2012.

IV Wärnbäck, A., Hilding-Rydevik, H. and Soneryd, L. (2012). Shared practice and clear roles in nuclear waste management? Long-term relations between industry and government authorities: The case of Sweden. Re-submitted to *Environmental and Planning A* in May, 2012.

The contribution of Antoienette Wärnbäck to the papers included in this thesis was as follows:

I Conducted all interviews including transcriptions and analysis and wrote the book chapter.

II Performed and analysed interviews and wrote most of the text.

III Collected and analysed all the document material, carried out the interviews together with Hilding-Rydevik and analysed them alone. Wrote the paper in cooperation with Hilding-Rydevik.

IV Collected and analysed all the document material, carried out the interviews together with Hilding-Rydevik and analysed the material alone. The writing of the paper and a refinement of the analysis is the collective work of Wärnbäck, Soneryd and Hilding-Rydevik.

Abbreviations

CE	Cumulative effects
CoP	Communities of Practice
DDP	Detailed Development Plans
EC	Environmental Code
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
KBS-3	Industry´s main method for final disposal for spent nuclear fuel
NAA	Nuclear Activities Act (1984:3)
RD&D	Research, Development and Demonstration programme
SEA	Strategic Environmental Assessment
SKB	Swedish Nuclear Fuel and Waste Management Co
SKI	the Swedish Nuclear Power Inspectorate
SKN	the Swedish National Board for Spent Nuclear Fuel
SSI	the Swedish Radiation Protection Institute
SSM	the Swedish Radiation Safety Authority

1 Introduction

1.1 Learning EIA practice

This thesis is about Environmental Impact Assessment (EIA) practice in Sweden. There has been a general lack of evaluations and scientific studies of the practice in the Swedish impact assessment (IA) context (Emmelin, 1998; Hilding-Rydevik and Fundingsland, 2005). However, there have been recent achievements in Sweden in connection with implementation of environmental assessment (Åkerskog, 2009), land use planning (Bjarnadóttir, 2008), alternatives (Hilding-Rydevik and Emmelin, 2011), and a survey of amount of performed EIAs (Lindblom and Rodéhn, 2008). From an international IA research community point of view, there is a need for profound and theoretically inspired empirical studies of IA practice (Lawrence, 1997; Cashmore, 2004). The need for these kinds of studies is crucial for several reasons. In many countries IA is the main mechanism intended to promote important environmental issues in different planning processes. It is often also the main mechanism for public participation. IA is thus expected to play a crucial role in enabling democratic and enlightened decision making (Kørnøv and Thissen, 2000). EIA practice seems however not to be in accordance with best IA practice norms and legislation in many countries (Steineman, 2000; O'Faircheallaigh, 2010; Gunn and Noble, 2011). From a best IA norm point of view, the practice is thus criticised, leading to a situation where there is widespread political acceptance for a policy tool of questionable and poorly investigated effectiveness. We therefore need a more thorough understanding of IA practice and its outcomes. We need to better understand what is gained through EIA and thus also be able to suggest, on a more profound basis, how the practice can be improved. The general contributions this thesis makes is thus to help fill the empirical gap outlined above and to provide theoretically

inspired empirical studies that improve our understanding of IA practice and its outcome.

The overall topic examined in this thesis is EIA and, more specifically, EIA practice. Two different cases are analysed in detail in order to explore and widen the understanding of what constitutes EIA practice. One case is represented by a complex environmental issue (cumulative effects) and the other by a unique EIA process (final disposal of spent nuclear fuel). The legislative demands are used as a point of departure and a frame of reference when studying EIA practice. Sweden has a tradition of framework laws, which means that legislation does not specify regulations in detail. Instead, the Swedish Environmental Code, together with statutes, regulations, general guidelines and legal practice, set the requirements for what should be included in EIA documents and how EIA processes should be performed.[1] The effectiveness of the laws is thus to a large extent determined by the interpretation in guidelines and subsequent implementation in professional practice (Hilding-Rydevik and Fundingsland, 2005). However, the Swedish Environmental Code, and the EIA demands it specifies, are quite unclear regarding for example the types of effects and alternatives to include. Consequently, these vaguely formulated demands are largely left to EIA practitioners to interpret and act upon.

The initial study in this thesis work is an analysis of *individual EIA practitioners'* practice in relation to cumulative effects. This practice is analysed from the theoretical perspective of *social psychology*. The outcome of the analysis is also presented in a licentiate thesis (Wärnbäck, 2007). The approach to look into individual practitioners' practice was motivated by the potential to gather empirical material representing several practitioners' individual experiences. Together this made the illustration of the EIA practice clearer and widened understanding of the practice. Understanding of the practice was also furthered by the choice to look at the practice from the perspectives of different types of professional EIA practitioners (*e.g.* proponent, consultant, competent authority). The cumulative effects case is an appealing subject to study, since cumulative effects are both new and a complicated issue within EIA and the demands for these effects are not explicitly asked for in Swedish legislation, *i.e.* the Environmental Code. However, cumulative effects are demanded by the European Union (EU) directives (the EIA Directive, SEA Directive and the Habitat Directive) (Wärnbäck, 2007). There are also other reasons to look at the Swedish EIA

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

practice on cumulative effects. For example, there is a lack of Swedish studies on EIA practice as such. Another reason is to determine why the Swedish EIA documents to such a great extent lack the inclusion of cumulative effects (de Jong, Oscarsson et al., 2004; Olausson, Oscarsson et al., 2004)[2]. Furthermore, there is no overview or understanding of the practitioners' knowledge base, for example on why and how to include cumulative effects in EIA. Several international studies have explored the inclusion of cumulative effects, but there is no other study which confirms or rejects that these findings are applicable to the Swedish context.

This first case raised a number of new questions and it became obvious that the interplay between actors was important, since the practice develops in interactions between people (the practitioners). During subsequent studies in this thesis the focus is hence on *EIA practitioners as a collective* of practitioners. The case chosen was the practice for the final disposal of spent nuclear fuel. A social theory of learning called *Communities of Practice* (CoP) was used for this part of the study. The approach of studying the practitioners as a collective in this particular choice of case proved valuable in furthering understanding: on development of a practice over time, interactions between practitioners, and the (development of) practice in a social context.

The final disposal case also contributed to the examination of EIA practice and practitioners' actions in connection with vague legislative demands. The primary focus was on the practice in relation to the development of alternate technical methods. The wording in the Environmental Code is not alternative *method,* however, but alternative *design*. There is thus plenty of room for the EIA practitioners to broadly interpret the intentions and implications of the legislation. The planning process for Swedish final disposal of spent nuclear fuel has been underway for some 40 years. The same type of actors and to a large extent also the same individuals, have been interacting and working together during this planning process. The practice is therefore an extraordinary case in terms of its long duration for the actors representing industry and competent authority (or several authorities in this case). The practice has developed in many different ways. Two ways studied in more detail in this thesis are the production of the industry's research programmes and the authorities' official statements of opinions on these programmes on the one hand, and the possibilities for these two actors to interact and be engaged in the planning process on the other. The final disposal case is a unique project of its kind for Sweden, but also internationally, where Sweden and Finland are in the forefront of providing a final solution for disposal of their spent nuclear

[2] I changed my surname from Oscarsson to Wärnbäck in July 2006.

fuel. Studying the uniqueness and long duration of the process, including the development of a certain practice between industry and authorities, in this case is therefore a substantial contribution to understanding Swedish EIA practice. There is an abundance of research dealing with the interaction between proponent and the public in the EIA process (Sinclair and Diduck, 2001; Diduck, Sinclair et al., 2007; Mackerron and Berkhout, 2009; Soneryd, 2010). The results presented in this thesis regarding interactions between the above-mentioned types of practitioners are rare within EIA research and fill at least some part of the knowledge gap.

The thesis focuses on how EIA practitioners construct their practice. EIA practice is explored from the perspective of the practitioners as individuals and as a collective. In two separate studies, *social psychology* theories and the social theory of learning called *Community of Practice* (CoP) are drawn upon. The perspective influenced by social psychology mainly contributes to furthering understanding regarding the discrepancy in EIA practitioners' attitudes and behaviour. Using the CoP theory broadened the knowledge base on EIA practice and the incidence of mutual engagement, joint enterprise and mutual accountability among the practitioners involved. To my knowledge, no study has previously used the CoP approach when examining EIA practice. However, CoP theory is more commonly used within studies of organisational performance (Lesser and Storck, 2001) and workplace practices (Seely Brown and Duguid, 1991). In addition, learning as a concept is used in research on EIA practice presented by *e.g.* Glasson, Therivel et al. (1997), Bull, Petts et al. (2008) and Enrique Sanchez and Morrison-Saunders (2011).

The aim and research questions that guided the work are presented in the following section, followed by an overview of the thesis structure.

1.2 Aim and questions

The overall aim of this thesis work was to investigate empirically and analyse EIA as a practice. The following research questions guided the work:

- How do EIA practitioners interpret and act regarding new and complex environmental issues when the legislative demands are vaguely expressed?

- How does the practice develop when EIA practitioners are involved in the same planning process over a very long time period?

1.3 Structure of thesis

The thesis is divided into six chapters, this introduction chapter included. Chapter 2 describes the theoretical approach chosen in the research as a strategy to analyse and further the understanding of the two main research questions. Chapter 3 describes the approaches used when applying the theory perspectives to look at EIA practice. Chapter 4 comprises a review of the EIA practice literature representing the main fields of interest for this thesis: EIA practice and cumulative effects, EIA practice and learning, and EIA practice and final disposal for spent nuclear fuel. Chapter 5 summarises Papers I-IV, while the discussion and conclusions are presented in Chapter 6.

An overall view of the thesis structure is given in Figure 1.

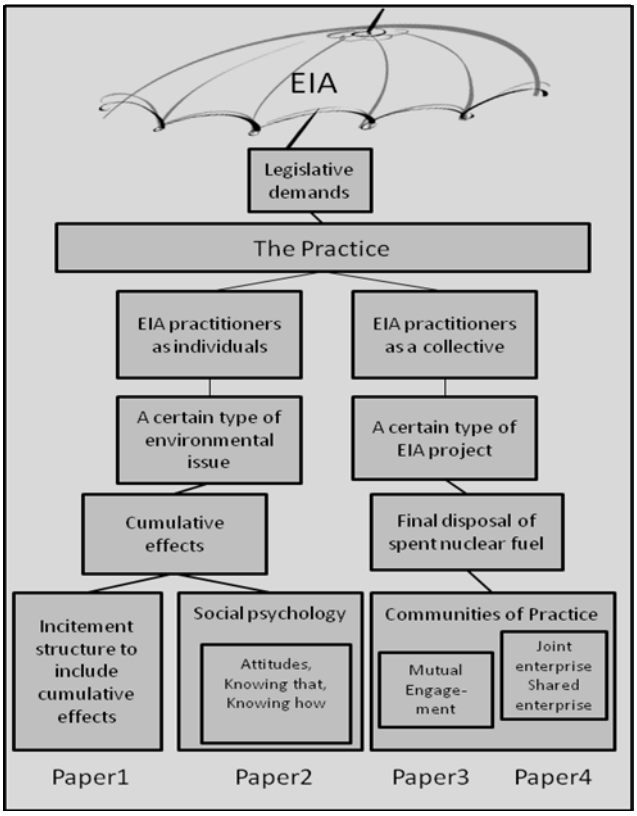

Figure 1. Illustration of the core issues in this thesis.

2 Theoretical framework

> "It is true, of course, that theories do not solve problems in the world; people do. Nevertheless, good theory is what we need when we get stuck. Theories can help alert us to problems, point us toward strategies of response, remind us of what we care about, or prompt our practical insights into the particular cases we confront." (Forester, 1989, p. 12)

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 in choosing a theory and in determining what the researcher will focus upon, as well as in determining what the consequences of this choice will be. The theoretical approach chosen in a research project is a strategy that helps analyse, understand, highlight certain issues, ask new questions or place issues of interest in a certain light (Alvesson and Deetz, 2000). The theoretical approach chosen in the present research was thus a strategy to help further understanding of the research questions posed.

The theoretical framework first studied the individual practitioner and then went on to look at the practitioners in interaction. The research strategy is discussed in detail in Chapter 3.

2.1 Attitudes and behaviour by individual EIA practitioners

In the first part of the work, the focus was on the individual practitioners' experience of the legislative demand to include cumulative effects issues in EIA practice. This was examined from the starting question *how do EIA practitioners interpret and act regarding new and complex environmental issues when the legislative demands are vaguely expressed*. The themes explored included practitioners' knowledge of the requirements to include

cumulative effects, their knowledge base on how to actually include cumulative effects in EIA practice in terms of evaluating and describing these effects, and how they talked about these effects in the EIA process with their colleagues and handled them in the process. Another vital issue explored was how the practitioners experienced and perceived their possibilities, obstacles and difficulties to the inclusion.

Attitude, behaviour and knowledge were therefore important aspects within this study on the practice of cumulative effect. Theories on attitudes and behaviour lead into social psychology. Sears, Freedman and Peplau (1985) provide the main input regarding social psychology in this study, though Lippa (1990) also inspired the work. Together, this literature on social psychology was the main lens used to examine practitioners' behaviour regarding cumulative effects. According to Sears et al. (1985), the most common definition of attitudes combines elements from the two traditions of cognitive and learning approaches[3]. 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, Freedman et al., 1985, p. 133).

Here, I looked at the dissonance issue in the empirical material. There was dissonance regarding attitude and behaviour towards cumulative effects. According to Sears et al. (1985), a cognitive approach asserts that people seek harmony and consistency in their attitudes, and between attitudes and behaviour, and it is usually assumed that people's attitudes determine their behaviour. However, the connection between attitude and behaviour proved to be more complex than that. Some conditions affecting the consistency between attitude and behaviour included 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 the reasoning presented by Sears et al. (1985), these findings suggest that the theory that attitudes determine behaviour is too simple. Ajzen and Fishbein (in Lippa, 1990) made an attempt to specify what factors determine attitude-behaviour consistency in

[3] *Sears* view is that a learning approach sees attitudes as habits like anything else that is learnt.

their reasoned action model. They concluded that attitudes and subjective norms combine to influence people's behavioural intentions and ultimately their 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 (ibid. 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, it is behaviour that determines attitudes (Sears, Freedman et al., 1985). This approach is based on the idea that people's attitudes may be rationalised 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.

Another inspiration for the analysis of cumulative effect practice was the concept of "*know that, know how*" by Ryle (1949), which offers what he described as a theory of the mind. *Knowing that*, according to Ryle (ibid), is related to having abstract information. This has to do with what we know about different things and also to know how things remain. *Knowing how* is based on statements in relation to the interviewees' knowledge of how to work with cumulative effects and the ability and potential to act. These concepts can be viewed as hierarchical. The *knowing that* concept is a sort of first-level knowledge base. The *knowing how* concept is knowledge at a higher level, and relates to what a person knows about how to actually work with this issue in reality. According to Ryle (ibid), *knowing how* consists of proficiencies and the ability to perform certain actions. Knowledge about how something should be done has to do with practice. To do something involves both being able to perform something and being able to subsequently relate to others how to do it. *Knowing that* has limited usefulness without the necessary 'know-how'. Possessed with only 'know-that', one could provide the recipe for a delicious cake, but never be able to bake it. To bake the cake, one needs 'know-how'. According to Ryle (ibid), we learn 'know-how' through engaging in the relevant practice.

As mentioned above, the study of EIA cumulative effect practice in this thesis was inspired by social psychology theory. The focus was on the EIA practitioners as individuals, but that raised questions regarding how the practitioners shape the EIA practice between them, since no practitioner works

in a vacuum. The next part of the thesis work thus looked at EIA practice and how it evolves in interaction between practitioners. The case chosen for study was the very long-running planning process for final disposal of spent nuclear fuel. The theories used to look the development of practice between practitioners are presented in more detail below.

2.2 Interactions, roles and commitments in the EIA practice

> "The understanding of learning as participation in communities of practice took learning out of the clutches of individualism." The Lave and Wenger contribution to the field of learning theories, as described by Elkjaer (2009, p. 87)

Before presenting the main theory used for the next part of the thesis work, the overall perspective used for the work is introduced. This overall or meta perspective influencing the approach was greatly inspired by ideas within the theory of social constructionism. This perspective can briefly be explained by the assertion that people together create the world through giving it meaning and purpose, and thereby construct the world between them. Meaning evolves and changes as people construct new meaning during their interactions (Burr, 2003). The social construction idea is here viewed as to limits the individual to understanding the world within what can be explained within its own language and referring to the surrounding (and socially constructed) world. This limitation is illustrated by the following citation:

> "If I ask about the world, you can offer to tell me how it is under one or more frames of references; but if I insist that you tell me how it is apart from all frames, what can you say?" (Goodman, N. in Gergen, 2001, p. 11)

In the ensuing work, the focus was moved from individual EIA practitioners and their practice to EIA practitioners and their practice as a collective. The work continued to explore the question *how do EIA practitioners interpret and act regarding new and complex environmental issues when the legislative demands are vaguely expressed*, but also looked into the second research question: *how does the practice develop when EIA practitioners are involved in the same planning process over a very long time period*. The practice chosen for study was the planning process for final disposal of spent nuclear fuel. As touched upon before, the theory and idea of *Communities of Practice* as expressed by Etienne Wenger (1998) was a great inspiration for this part of the research. Below the learning field is discussed as a broader picture and CoP is

placed within this picture. Thereafter, CoP theory is described in more detail and as regards its use in this study.

I must first define what *social learning* implies as used in this thesis. Social learning can be defined as the learning which comes about through social interactions, distinguishing it from individual learning (Ison, High et al., 2000). When *social learning* is mentioned in this thesis, it refers to learning through social interactions, whether this is intentional or not.

According to Phillips and Soltis (2009, p. 62), Vygotsky (1895-1934) together with John Dewey (1859-1952) and his friend and assistant George Herbert Mead (1863-1931) inspired:

> "a number of contemporary scholars to develop further the idea that human thinking, learning, and problem solving cannot usefully be regarded as processes that only involve the inside of the human cranium!".

Dewey was an American philosopher who held the view that the key to genuine learning was purposeful activities in social settings (Phillips and Soltis, 2009, p. 56). The meaning of *genuine* learning, according to Dewey, can be explained by what it is not: an endless mass of facts soon to be forgotten. One of Dewey's followers was Michael Cole and his colleagues. Their studies of how young learners draw upon the resources of their environments when fruitfully solving problems or carrying out assignments led to the development of the idea of *situated cognition* or *situated learning*. (ibid, p. 62) Situated learning can be explained as learning that takes place in the same context in which it is applied (Lave and Wenger, 1991), while situated cognition "*poses that knowing is inseparable from doing by arguing that all knowledge is situated in activity bound to social, cultural and physical contexts*" (ibid). Jean Lave and Etienne Wenger developed the ideas of situated cognition and situated learning even further through studies where they showed that unskilled and unknowledgeable people, through their involvement in apprenticeship, can learn quite complex bodies of knowledge and skills. The examples presented demonstrate that by gradually becoming more steeped in a community of practice (such as becoming a tailor or a midwife), these apprentices learned (Phillips and Soltis, 2009).

Other related theories, according to Wenger (1998), are the *social learning, cognitive* theory and *constructivist* theory. These three learning theories have traditionally been the province of psychological theories. Säljö (2000) describes *cognitivism* as a tradition which is a typical representative for a rationalistic perspective. The interest within cognitivism is directed at describing and understanding what is described as human beings' cognitive supply and mental processes. According to Säljö, the element within

cognitivism that has been the most influential regarding the view on learning is *constructivism*. Constructivism claims that the individual does not passively receive information, but through his or her own activity constructs an understanding of the surrounding world (Säljö, 2000) (this approach is also used by *e.g*. Piaget) The *social learning* theories, as explained by Burr (2003, p. 31), are about situation specificity of behaviour and these theorists suggest that:

> "our behaviour is dependent not upon personality characteristics but upon the nature of the situation in which we find ourselves".

This is in line with Wenger and CoP theory. The CoP does not primarily focus on learning as social participation (see description below on Wenger's components regarding CoP and learning and knowing) (Wenger, 1998). To start with, CoP is a social theory of learning, which is based on the assumption that:

> "engagement in social practice is the fundamental process by which we learn and so become who we are" (ibid, p. 0).

CoP theory was first launched in 1991 in the book *Situated Learning: Legitimate Peripheral Participation* (Lave and Wenger, 1991) and Wenger developed it further in his book *Communities of Practice: Learning, Meaning, and Identity* (1998). The kind of social theory Wenger proposes is not a replacement for other theories of learning

> "[b]ut it does have its own set of assumptions and its own focus" (ibid, p. 4).

Wenger points out four components of a social theory of learning that must be integrated in this kind of theory as a way to:

> "*characterize social participation as a process of learning and of knowing*" (ibid, pp. 4-5).

This includes:

> "1) *Meaning*: a way of talking about our (changing) ability – individually and collectively – to experience our life and the world as meaningful.
>
> 2) *Practice*: a way of talking about the shared historical and social resources, frameworks, and perspectives that can sustain mutual engagement in action.
>
> 3) *Community*: a way of talking about the social configurations in which our enterprises are defined as worth pursuing and our participation is recognized as competence.
>
> 4) *Identity*: a way of talking about how learning changes who we are and creates personal histories of becoming in the context of our communities."

Wenger describes a number of CoP to which we all belongs to several. CoP can be said to be everywhere, with the family, work place, school and hobbies being common cases most have experience of.

The existence of a CoP implies that actors interact in many ways, that they have a common endeavour and that they share a repertoire of common resources of language, styles and routines, by means of which they express their identities as members of the group (Barton and Tusting, 2005). The participation in CoP shapes not only what we do, but also who we are and how we interpret what we do.

When using CoP theory, it is important to point out the essential aspects that a community of practice. The dimensions that make practice the coherence of a community are: 1) mutual engagement; 2) a joint enterprise; and 3) a shared repertoire (Wenger, 1998, p. 72-73).

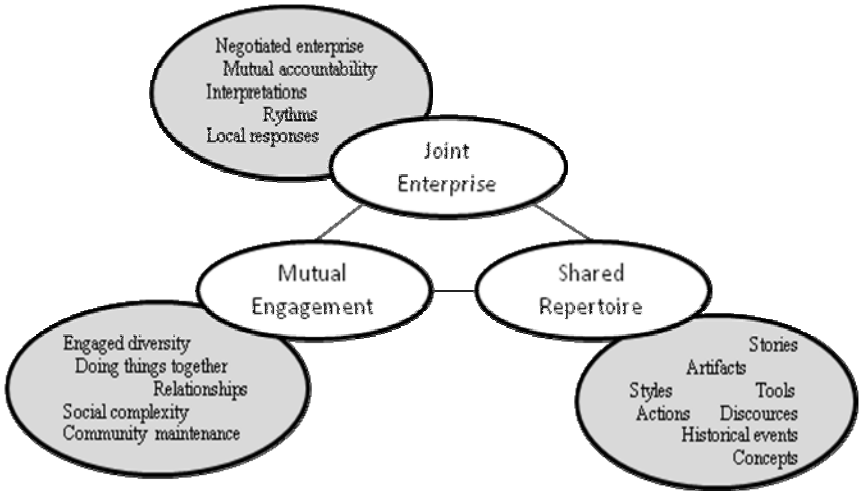

Figure 2. Dimension of practice as the property of a community (Wenger, 1998)

What defines the community is the *mutual engagement* and this does not require homogeneity or agreement, in fact disagreement can be viewed as a productive part of the joint enterprise. Wenger (ibid, p. 76) states that:

> "[m]utual engagement does not entail homogeneity, but it does create relationships among people".

A CoP is made up of people who "*sustain dense relations of mutual engagement organized around what they are there to do*" (ibid, p. 74) and the term is thus not synonymous for group, team or network.

The *joint enterprise* of a CoP is not just a statement of purpose. Negotiations of it give rise to relations of mutual accountability among those involved. These relations of accountability include what matters and what not, what is important and why it is important, what to do and not to do, what to pay attention to and not, what to talk about and what to leave unsaid, what to justify and what to take for granted, what to display and what to withhold, *etc*.

The *shared repertoire* of a CoP includes routines, words, tools, ways of doing things, stories, symbols, actions or concepts that the community has produced or adopted in the course of its existence, and which have become parts of its practice.

Meaning is part of the practice and it is located in the negotiation of meaning. This involves the interaction of two constituent processes called participation and reification. The term negotiation implies continuous interaction, of gradual achievement, and of give and take. Participation can involve all kinds of relations, conflictual as well as harmonious, intimate as well as political, competitive as well as co-operative. Reification refers to how we as humans project our meanings into the world and thus perceive them as existing in the world and having a reality of their own. Reification includes a wide range of processes, *e.g*. naming, encoding, describing, perceiving and interpreting. Identity is viewed as an integral aspect of a social theory of learning and as inseparable from issues of practice, community and meaning. Focusing on identity also brings to the fore the issues of non-participation as well as participation, exclusion as well as inclusion. It is assumed that there is a profound connection between identity and practice.

In the process of sustaining practice, we become invested in what we do as well as in each other and our shared history. It is thus not easy to become a radically new person in the same CoP. Transformation can occur, however, with the support of the community. Communities of practice are also invested in reification – tools, representation artefacts, concepts and terms that all reflect specific perspectives they tend to reproduce. Artefacts tend to perpetuate the repertoires of practices beyond the circumstances that shaped them in the first place. The existence of a CoP does not depend on a fixed membership – people move in and out. Communities of practice exhibit continuities as discontinuities in their development.

The following statement by Wenger about the development of a practice rounds off this introduction to the theory of CoP:

> "[t]he development of practice takes time, but what defines a community of practice in its temporal dimension is not just a matter of sustaining enough mutual engagement in pursuing an enterprise together to share some significant

> learning. From this perspective, *communities of practice can be thought of as shared histories of learning*." (Wenger, 1998, p. 86)

The above description of CoP theory to a great extent influenced the design of the study on the EIA practitioners learning through interactions within EIA practice.

The concept of CoP prompted us to look at EIA practice, and the two EIA practitioners industry and authority in particular, through a new lens and from a different angle than that adopted within EIA research so far.

It should be noted that there have been some criticisms of the CoP concept. The primary criticism and questioning of Wenger's CoP theory refer to the aspects of power, use of terminology, applicability, and what counts as participating in a CoP. Roberts (2006) reviewed several studies within the knowledge management literature that criticise the CoP approach. Fox (2000) and Marshall and Rollinson (2004) are examples of work which challenge Wenger's use of the power aspect. Marshall and Rollinson (2004) point out that

> "[s]truggles over the appropriation and fixing of meaning are seen as important expression of power, but this crucial insight is made almost passing without further elaboration". (ibid, p.74)

When it comes to the use of terminology, the expression *community* is criticised by Lindkvist (2005), Hodkinson and Hodkinson (2004) and Contu and Willmott (2003). Contu and Willmott point out for example that *"[c]ommunity is conceptualized in a way that tends to assume, or imply, coherence and consensus in its practices*" (ibid, p. 287). Handley, Sturdy et al. (2006) also point out that the phrase 'communities of practice' is problematic and somewhat ambiguous and state that some clarification is needed. One issue pointed out is that "[*a]t the heart of this ambiguity is the difficulty of knowing when an individual is or is not 'participating' in a community of practice*" (ibid, p. 649). Roberts (2006) also questions the applicability of CoP theory regarding small groups of people and large multinational organisations. She is critical of the use of the same principles for these two communities and states that there "*there is surely a significant difference between these two types of communities of practice*" (ibid, p. 630).

Some other weaknesses of Wenger's work are listed by Hodkinson and Hodkinson (2004, p. 4). They point out that Wenger "*still fails to deal adequately with workers as individuals, despite the explicit focus on identity*". Another point regards peripheral participation, where "*this new position still*

fails to address significant differences in the learning of newcomers and more experienced workers or full members of the community".

The last criticism included here regards not so much the theory itself but more the user of it. It is made by Amin and Roberts (2008p. 355), who conclude after what seems a thorough literature review that:

> "the use of the term [communities of practice] has become imprecise, having strayed far from the original definition of CoPs as relatively stable communities of face-to-face interaction between members working in close proximity to one another …"

To conclude, several downsides have been pointed out for CoP theory. The way in which this theory is used within this thesis is described in the next chapter. In the discussion, however, the criticisms are considered again in connection with the results of the thesis.

3 Research design and approach

> ”sometimes we simply have to keep our eyes open and look carefully at individual cases – not in the hope of proving anything, but rather in the hope of learning something!” Hans Eysenck (in Flyvbjerg, 2010, p. 73)

This chapter further describes the approaches used when applying the theory perspectives described in Chapter 2 as a lens to look at EIA practice. The theory was used more specifically in order to explore how practitioners in the EIA process interpret and act upon legislative demands on EIA and how the practice develops during a very long planning process. At the end of a relatively long process such as the work in this thesis, the way to the goal might seem rather straight-forward and logical in hindsight. However, in moving along this road, many small and some larger decisions had to be made, which affected the outcome of the thesis. The main decisions and choices made are described below. Before that, however, the overall approach used to investigate the research questions is described.

The research design involved the use of two different cases related to the complex environmental issue of cumulative effects and the multifaceted planning and EIA process for Swedish final disposal of spent nuclear fuel[4]. Both these cases were valuable in exploring the first research question, *how do EIA practitioners interpret and act regarding new and complex environmental issues when the legislative demands are vaguely expressed*.

The approach used to obtain empirical material is presented below and thereafter the design of the studies is described. In short, to analyse the two practices:

[4] The reason for coming into contact with this case at the first place was the main supervisor’s assignment as a commissioner in the Swedish National Council for Nuclear Waste.

- For the case of the practice on cumulative effects, a literature review and an interview survey were included in the approach
- For the case of the practice for the final disposal for spent nuclear fuel, an extensive and thorough review of the industry's research programmes was made, combined with focus group interviews and individual interviews.

Full details of literature review on cumulative effects can be found in my licentiate thesis (Wärnbäck, 2007). Therefore this review is not discussed in here, but some of the content is presented in Chapter 4 in relation to the results obtained in the studies on EIA practice and cumulative effects.

3.1 Empirical collection

3.1.1 Document study

In exploring the Swedish planning process for final disposal of spent nuclear fuel, pre-understanding of the issue was acquired through reading basic material on disposal of spent nuclear fuel, such as information and material from the Swedish Radiation Safety Authority, Swedish National Council for Nuclear Waste and the Swedish Nuclear Fuel and Management Co, and also through reading material on some NGO websites. Furthermore, a deeper understanding was acquired by attendance at workshops, seminars and conferences during the second half of the research project. These were arranged by different actors, for example those previously mentioned but also by the Forum for Stakeholder Confidence (FSC) and Uppsala Regional Council.

The main approach chosen to study the practice of final disposal of spent nuclear fuel was a thorough analysis of documents produced over a long time span. The motives for this choice were: 1) when examining a 30-40 year long planning process, it is not likely that the practitioners will remember all the changes over time; 2) much written material about the spent nuclear fuel issue and the process in Sweden has been produced along the way; 3) it was hoped that some of the material would reflect the very long-running planning process of disposal of spent nuclear fuel; and finally 4) this material might shed light on changes in practitioners' arguments over time for and against different methods and other issues studied.

One type of document appeared to be very well suited for analyses, namely the Research, Development and Demonstration (RD&D) programmes produced by the nuclear waste industry (SKB). Swedish legislation (the

Nuclear Activities Act) demands that these programmes be conducted by the SKB every third year from 1986 onwards.

Here, a thorough review was made of all the RD&D documents produced between 1986 and 2010 and of review statements by the competent authorities (which over the years have been: SKN, SSI SKI, and SSM) on these programmes, as well as Government decisions. All the supplementary RD&Ds and associated statements and decisions were also analysed. A compilation of reviewed documents is presented in Table 1. In all, these documents amounted to about 5000 pages (which were reviewed and read selectively with the main focus on texts regarding project goals, alternative methods, main methods and time plans). Newer programmes and statements (from approx. RD&D 1998 onwards) were available as electronic text files, whereas older ones were only available as electronic images or paper versions. The older ones therefore had to be re-formatted into text files in order to be workable material during the analysis.

Table 1. *List of documents analysed regarding the practice of final disposal of spent nuclear fuel. The material included Research Development & Demonstration Programmes (RD&Ds) produced by the industry (SKB) and related reviews and statements from authorities (SKN, SKI, SSI and SSM), and Government decisions.*

Actor	**Type of document**	**Year** (publ. RD&D)	#
SKB	Research development and demonstration programmes (RD&Ds)	1986, 1989, 1992, 1995, 1998, 2001, 2004, 2007, 2010	9
SKB	Supplementary RD&Ds	1992, 1998, 2007	3
SKN	Review and statement of RD&Ds (competent authority for the assessment of SKB's research programme)	1986, 1989	2
SKI	Statement of opinion on RD&Ds (consultative body to SKN)	1986, 1989	2
SKI	Review and statement on RD&Ds (competent authority for the assessment of SKB's research programme)	1992, 1995, 1998, 2001, 2004, 2007	6
SKI	Review and statement of *supplementary* RD&Ds	1992, 1998	2
SSI	Statement of opinion on RD&Ds (consultative body to SKN/SKI)	1986, 1989, 1992, 1995, 1998, 2001, 2004, 2007	8
SSI	Statement of opinion on *supplementary* RD&Ds	1992, 1998	2
SSM	Review of RD&Ds (competent authority for the assessment of SKB's research programme)	2010	1
SSM	Review of *supplementary* RD&Ds	2007	1
Government	Government decision on RD&Ds	1986, 1989, 1992, 1995, 1998, 2001, 2004, 2007	8
Government	Government decision on *supplementary* RD&Ds	1992, 1998, 2007	3
	Total amount of documents reviewed and analysed		**47**

The questions used when reading the documents were directly inspired by CoP theory (described in Chapter 2) and included the aspects: negotiation of meaning, the shapes and possibilities of participation, shapes of reification, mutual accountability, mutual engagement, the negotiation of a joint enterprise, and a shared repertoire on how to do things. The CoP viewpoint was a help in choosing appropriate material to study. For example, the material preferably had to show: differences in opinion over time among the EIA practitioners studied; examples of what these practitioners consider important or not in the process; whose arguments count; examples of issues discussed at any length; and questions recurring throughout the whole process. The CoP theory perspective also helped to choose the focus on how the issue and EIA legislative demand to treat alternatives had been approached in the planning process. A focus on management of alternatives highlighted essential parts of the CoP; *what is important and what is not important, whose arguments count and whose don´t, what to do and not to do, what do they agree and disagree on, changes of arguments over time, negotiation of meaning and mutual accountability*.

The coding of the document citations (and later on also the interview questions and the coding of the interview citations) was inspired by CoP theory. These questions were an aid in highlighting the interactions between industry and authorities in the practice of final disposal of spent nuclear fuel. The inspiration of CoP theory influenced the questions used and helped *e.g.* point out changes over time in viewpoints among EIA practitioners regarding an alternative method, shared experiences and histories, features of what is important or not and aspects of mutual accountability regarding the time plan.

3.1.2 Interviews

The literature review on cumulative effects and the analysis of documents on the practice of final disposal of spent nuclear fuel provided an important pre-understanding of the planning process, so that important questions could be asked in interviews (Kvale, 1997). The interview approach seemed justifiable for further investigating EIA practice in terms of issues such as knowledge base and 'know-how' of cumulative effects, and changes in relations and roles in the nuclear fuel project. However, when using interviewing as a technique to explore an issue of interest, it is important to understand that the interviewees talk about how they *experience* their practice to be. Thus when the interviewees talk about how they go about their work, *e.g.* what their daily work looks like, this 'story' is thus always told from some specific position/experience. Performing several interviews and comparing the results to the document analyses provided a clearer picture of EIA practice.

The EIA documents and their contents can be viewed as a practice as such and previous studies have noted that cumulative effects are poorly included in Swedish EIA documents (de Jong, Oscarsson et al., 2004; Olausson, Oscarsson et al., 2004). However, there is still no knowledge or understanding about the practice in the EIA process as a whole regarding treatment of cumulative effects. There is also a gap in understanding regarding practitioners' knowledge base on the issue of cumulative effects as a phenomenon and as a concept, experienced obstacles and possibilities to include these effects, or how to work with these effects. Regarding the practice of final disposal of spent nuclear fuel, analysis of the documents, while very exhaustive, could not give in-depth information on for example interactions between the practitioners involved or their perceived roles during this lengthy planning process.

The interviews were conducted in three sets that covered different aspects of the research questions and examined EIA practice in terms of: 1) cumulative effects as individual practitioners experience it; 2) the planning process for final disposal of spent nuclear fuel as practitioners as a collective experience it; and 3) the authority's review process of the licensing application for the final disposal of spent nuclear fuel.

The first set comprised individual interviews and had a semi-structured approach. The interviewees were EIA practitioners with no (obvious) connection to each other. In the compilation and structuring of the interview questions, an interview guide was used based on an idea by Kvale (1997). This interview set was exploratory in its approach but inspired by aspects found within social psychology. The interviews were carried out during 2006.

The second set of interviews was carried out during 2009 and was designed to focus on the practice in the processes of the RD&D programmes and EIA for the final disposal of spent nuclear fuel. When designing these interviews, the focus was on how practitioners involved in the extended planning process perceived the development of the interactions, roles, break points, relations and collaboration involved in the process. These interviews were a mix of small focus groups (four or less practitioners and two researchers) (Wibeck, 2000) and interviews (one practitioner and two researchers).

The third and last set of interviews was carried out at the end of 2011. This interview set was made up of a small focus group interview and a telephone interview. The design of this set was very much based on the results from the document review of the RD&D programmes and the previous interview sets. The questions focused on the authorities' review of the industry's licensing applications for a final repository for spent nuclear fuel (including EIA).

The approach chosen in this study was to interview key actors within the issues of interest. The different types of practitioners interviewed are described

in more detail in Box 1. In total, 24 people were interviewed and interviews amounting to about 27 hours of recorded material were transcribed and analysed.

Box 1. Overview of type of practitioners interviewed in the three sets of interviews

First set: Practice of cumulative effects
The County Administrative Board is responsible for the review and the approval of EIAs on road and railway activities. Two interviewees working at two different County Administrative Boards represented the level of review. One had also been involved in carrying out a countywide transportation plan and its (early form of) SEA.

The *municipality* is the level responsible for DDPs and Comprehensive Plans. This authority is obliged to do an EIA or SEA on DDPs from case to case if they are assumed to lead to significant environmental impacts. 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 must be followed on a case by case basis by an EIA.

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

Second set: Practice of final disposal of spent nuclear fuel (interactions etc.)[5]
SKB (the industry, proponent): The nuclear power companies in Sweden have jointly established the Swedish Nuclear Fuel and Waste Management Company (SKB). SKB's assignment is to manage and dispose of radioactive waste from Swedish nuclear power plants.

SSM (the authority): National responsibility within the areas of nuclear safety, radiation protection and nuclear non-proliferation. (The interviewees represented employees at both the former authorities SSI and SKI)

MKG and *Milkas* (NGOs): The Swedish NGO Office for Nuclear Waste Review (MKG) is an organisation established by the Swedish environmental movement and its goal is to ensure that the method and location for the disposal of Swedish nuclear waste meets the highest long-term standards for health and environment. The Swedish Environmental Movement's Nuclear Waste Secretariat (Milkas) was founded by the national anti-nuclear group The Swedish Anti-nuclear Movement and Friends of the Earth Sweden, the Swedish branch of Friends of the Earth International. Milkas co-operates with the Swedish organisation Green Women. Milkas' purpose is to follow and critically scrutinise all projects dealing with management of highly radioactive waste, and to work for the best long-term and environmentally sound management method.

Third set: Practice of final disposal of spent nuclear fuel (review process)
SSM (the authority): see description above.

[5] The presentation is based on text from respective homepage.

3.2 Analysis of empirical material

There is not a clear division between where the collection of empirical material starts and where the analysis begins in the practice of doing research. The analysis can actually be said to start in the interview situation or during the reading of documents. However, this division was made in order to be as transparent as possible in the description of the design and approach chosen in this thesis.

In order to see patterns and bundle citations and interesting issues in a rich seam of material, a 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 analysed by formal, statistical approaches. It offers tools to manage, extract, compare, analyse and reassemble meaningful pieces from large amounts of data in creative, flexible, yet systematic ways. Atlas.ti was used for all of the three different loads of material in this thesis – the cumulative effect practice interviews, the RD&D document reviews and the interviews on the final disposal of spent nuclear fuel.

For the first cumulative effect analysis, certain types of citations were closely examined with the aim of exploring incentives to include cumulative effects in the EIA/SEA process (Oscarsson, 2006, Paper I and also included in my licentiate thesis). The key citations dealt with the scope setting approach, review approach and requirements, the responsibility to include cumulative effects, and the requirements in respect of legislation and handbooks.

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 categorise barriers to a better environment. The second was prepared in order to divide potential barriers to implementation of environmental protection policy measures (Gunningham and Sinclair, 1997). From these, Piper produced a third framework to analyse potential barriers to the implementation of cumulative effects assessment. When testing these frameworks in this thesis, it was found that they are not suitable since several obstacle citation categories fall outside the frameworks. Categories that do not fit are, for example, scope setting 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.

Here, the research programmes on Swedish disposal of spent nuclear fuel and the statements of opinion in connection to these were regarded as being a practice as such. This practice regarding the research programmes is further included in a bigger picture, namely the planning process for the final disposal of spent nuclear fuel. As mentioned above, this process was examined using CoP theory and included the industry and the competent authorities as being the practitioners doing the practice. The review of the industry's research programmes, the interviews, and later on also the analysis of the material obtained were all very much framed by the three CoP dimensions *mutual engagement, joint enterprise* and *shared repertoire* (Wenger, 1998, p. 73).

4 The field of EIA practice

Environmental Impact Assessment has certainly not been a field without criticisms. For example, it has been criticised for starting too late in the planning process, when many important decisions that have an impact on the environment have already been made (Arts, Tomlinson et al., 2005). It is also claimed that many environmental issues (such as human health, cumulative effects and cultural values) are neglected by EIA practitioners or are included to a very low extent (Wärnbäck, 2007; Harris, Harris et al., 2009). The issue of EIA effectiveness has gained increasing attention along with increasing criticism of the practice (Baker and McLelland, 2003; Sandham and Pretorius, 2008; Kruopienė, Židonienė et al., 2009; Heinma and Põder, 2010). Cashmore, Richardson et al. (2010) investigated the effectiveness of evaluation theory in connection with the neglected issue of the political constitution of IA instruments and argued that:

> "*raising awareness about the political character of impact assessment instruments, in it self, is a vital step in advancing effectiveness evaluation theory*" (ibid, p. 371).

Pölönen, Hokkanen et al. (2011) conclude that the most significant obstacle to the effectiveness of EIA is sufficient post-EIA action-forcing mechanisms. Baker and McLelland (2003) examined the effectiveness of environmental assessment policy for first nation participants in mine development and found that the environmental assessment processes were not effective. They also pointed out that the cases studied failed to meet overall policy effectiveness as a consequence of failing to achieve procedural, substantive and transactive efficiency.

Taking some of these general comments and downsides of EIA practice as a starting point, some more specific parts of the EIA practice fields connected to the specific approach chosen for this thesis are discussed below. The three

main fields of relevance for this thesis within the EIA practice are described, namely cumulative effects, final disposal of spent nuclear fuel, and learning.

4.1 EIA practice and cumulative effects

In spite of the seemingly early recognition of cumulative effects (early 1970s in USA) and the introduction of cumulative effects in different international EIA and SEA legislation, a number of shortcomings have been recognised internationally. There is not *one* common definition in the literature for cumulative effects. Among the definitions used, they are often expressed in a similar fashion and are variants of 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, Cocklin et al., 1999, p. 3). The lack of a common definition in particular is highlighted as a shortcoming, while it is also 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 and Sheate, 2004). Baxter, Ross and Spaling (2000) also pointed out a weakness in respect of the term, as the concept of cumulative effects assessment remains basically unknown and thus members of the communities involved 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 of cumulative effects in environmental assessments. This has also been noted in countries such as the USA, Canada (Baxter, Ross et al., 2001), and the United Kingdom (Cooper and Sheate, 2002). These countries are nevertheless often considered by the EIA community as being in the vanguard as regards their environmental assessment work.

Different obstacles and barriers to the inclusion or consideration of cumulative effects have been suggested in several studies (Clark, 1994; Canter and Kamath, 1995; McCold and Holman, 1995; Canter, 2000; MacDonald, 2000; Piper, 2001; Senner, Colonell et al., 2002; Duinker and Greig, 2006). Some of the obstacles and barriers mentioned are: variability and uncertainty in quantifying management effects, inability to predict secondary or indirect effects, difficulty of validation (MacDonald, 2000); weak interpretation of cumulative effects by practitioners and analysts, inappropriate handling of potential future developments (Duinker and Greig, 2006); lack of information

and guidance, resource and skill shortage, and uncertainty about where the responsibilities for such work may lie (Piper, 2001)

The importance of taking cumulative effects into account is *e.g*. manifested in Commission of the European Communities (1999), Canter and Kamath (1995) and Rees (1995). The arguments expressed include: it is required by legislation, it contributes towards sustainable development, it is good practice, it aids the decision making process, it brings up the issue of environmental protection, and it provides more useful information which deals with the true consequences.

Reviews of EIA documents in Sweden have shown that less than 1% of these documents include a description of cumulative effects (de Jong, Oscarsson et al., 2004; Olausson, Oscarsson et al., 2004). These two reviews were based on extensive data representing nearly 400 EIAs from different sectors (industry, roads, railways *etc*.). One study (de Jong, Oscarsson et al., 2004) focused on how impacts on biodiversity are analysed in Swedish EIA documents and found a distinct lack of discussion in respect of cumulative effects and the natural environment. In addition, forecasts for the future are most often absent in EIA documents. The conclusions presented based on the results are that there is 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 a lack of clarity by the authorities regarding the kind of basic data that should be included in EIA (de Jong, Oscarsson et al., 2004). The conclusion that Swedish EIA documents lack both a description and a discussion in the EIA document of the cumulative effects issue was also shown by Olausson, Oscarsson et al. (Olausson, Oscarsson et al., 2004). They identified a general lack of information in EIAs about indirect effects, long-term impacts, regional or global impacts and cumulative effects. A study based on a review of Swedish Comprehensive Plans (strategic level) carried out between 1996 and 2002 found similar results and concluded 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).

To conclude, the evidence strongly indicates that the issue of cumulative effects is insufficiently included in EIA documents in all countries. However there is no information about the Swedish context in particular regarding *why* this is the case. There is no information in the literature on how the Swedish consultants, proponents and reviewers treat cumulative effect issues in the EIA *process*. Furthermore, there is no information on what these practitioners know about the phenomenon of cumulative effects and the legislative requirements to

include these effects. Consequently, little knowledge exists about the process behind the documents regarding the treatment of cumulative effects.

4.2 EIA practice and final disposal of spent nuclear fuel

This section gives a short overview of previous research on the issue of final disposal of spent nuclear fuel in connection with EIA.

The process to find a solution for final disposal of spent nuclear fuel has reached very different phases of planning in the world's 31 nuclear power countries (Rogers, 2009). Finland and Sweden have accomplished most in their respective planning processes, although Finland has come further in the process, using a similar technical concept as in Sweden and with a selected site in 2000. The Finnish nuclear industry representative Posiva plans to submit an application for construction licensing by the end of 2012 (Posiva, 2012). The Swedish planning process is at the stage where the competent authority and the Environmental Court are reviewing the industry's licensing application for a final repository for spent nuclear fuel. There is very little material available concerning final disposal of spent nuclear fuel within an EIA context. Considering that no country has yet produced an operational solution, this is not surprising.

The Slovenian case for radioactive waste disposal, with the focus on EIA and long-term evaluation in the licensing process, is dealt with by Kontic, Kross et al. (1999). They suggest a concept of reasonable assurance together with the evaluation of interests and potentials for future land-use in the particular environment. Elam and Sundqvist (2009) also examine the KBS project but in addition consider the demands in Swedish environmental legislation on EIAs. They conclude that:

> "[a]n EIS, however, cannot be prepared where a ready-made concept has already been substituted for a general objective. Therefore, the overall goal of nuclear fuel safety must be freed, at least temporarily, from the KBS-3 concept if an authentic EIA process is to be carried out in Sweden today. For a variety of reasons, however, SKB currently appear both unwilling and unable to discuss nuclear fuel safety beyond the KBS-3 concept." (ibid, p. 985)

Some highly relevant questions for the EIA investigated in connection with final disposal of spent nuclear fuel are presented in the following paragraphs. However, the connection to EIA is not explicitly pointed out. The process of finding a site for the repository is an example of a relevant EIA issue, where siting approaches, siting assessment and site selection methods for the case of disposal of spent nuclear fuel are researched (Olsson and Gale, 1995;

Lawrence, 1996). Dawson and Darst (2006) compare Sweden and the Czech Republic regarding selection of a publicly acceptable nuclear waste disposal site and conclude that the key factors behind the Swedish success compared with the Czech Republic failure are social trust and the resilience of democratic institutions.

The issue of siting is often discussed in connection with aspects such as people's attitudes (Lidskog, 1997; Greenberg, 2009), risk perception (Slovic, Layman et al., 1991), worry, acceptance (Sjöberg, 2004), ways to win trust in the siting process (Vira, 2006), and the NIMBY (Not-In-My-Back-Yard) phenomenon (Lidskog and Elander, 1992). Greenberg (2009) interviewed more than 2000 residents living near nuclear power plants in US and found that these residents were more concerned about nuclear site-related issues than the comparison group (600 people living elsewhere in the US). One of the conclusions reached by Lidskog (1997, p. 247), after studying public participation as a solution to siting conflicts, is that:

> "[s]ince there does not exist a correct perspective on the siting, it is important that different perspectives are used to illuminate the siting proposal – this is a way of acquiring more knowledge. It is hoped that this communication will have the effect that all actors create better knowledge of a siting proposal."

Lidskog pointed out that this communication is not a means to create consensus and that the dialogue should be both critical and open. Lidskog describes open dialogue as a situation where "*all the participants and their arguments are looked upon as legitimate*" (ibid). Other important EIA process areas dealt with are questions relating to technical method, method alternatives and process approaches, even though no study highlights EIA *per se* (Briggs, Kunsch et al., 1990; Sumerling and Smith, 1998; Ewing, 1999; Dijkgraaf and Vollebergh, 2004).

Additional EIA-related issues dealt with concern decisions, regulations and policies. Some early work was done by Malone (1989), who focused on environmental legislation and decision making and the lack of systematic, interdisciplinary evaluation of impacts based on site-specific data, and by Lemons and Malone (1989), who proposed several alternative frameworks for assessing decisions about nuclear waste disposal. Both these research cases relate to the Yucca Mountain site in Nevada, US. The UK radioactive waste industry's history of policy change and its connection to institutional change is described in Mackerron and Berkhout (2009), who concluded for the UK context that *"[a]fter 50 years of policies, institutional change and debate, very little has been achieved in securing the long-term disposition of waste*" (ibid, p. 1005). Three indicators are also presented which connect institutional change

with the generation of legitimacy. These indicators are called institutional segregation between operators and overseers, the autonomy of regulatory and oversight bodies, and the diversity of oversight bodies.

The Swedish nuclear waste management is analysed *e.g.* by Lidskog and Sundqvist (2004) and Elam and Sundqvist (2011). The industry's main KBS-3 method is questioned and Lidskog and Sundqvist point out that the KBS method has been unchanged since its introduction more than 25 years ago. This (non)development of the main method, they claim, has been done in spite of questioning of the method in different parts. This was previously also touched upon by Elam and Sundqvist, who state that the KBS programme and continuing to hold this solution alive "*has meant keeping it anything but immutable and immobile throughout its 30 years or so history*" (p. 259). Finnish nuclear waste management is explored by Litmanen (2008), who focuses on the social and political usage of social science research and its effectiveness in this context. Another Finnish study examined the role of the regulator in the development of the Finnish nuclear waste disposal programme (Vuorinen, 2008). The three licensing steps for a Finnish nuclear facility are reported to consist of decision-in-principle. This first step includes an application with an EIA programme and repository. The second step is the construction licence, and the third and last is an operating licence. The French political framing of the nuclear waste issue is explored by Barthe (2009), who concludes that:

> "The orientation towards a political treatment of the problem resulted primarily, albeit partially, from the narrowing down of the technical options for addressing it. Without technical alternatives, the political authorities appeared to be the only way of solving conflicts generated by France's nuclear waste policy." (Barthe, 2009, p. 941)

There have also been several other country-specific studies on nuclear waste management, *e.g.* in India (Mohan and Aggarwal, 2009), the USA (Hummel, 2012), Russia and Germany (Hunold, 2001). For the Indian case, it is concluded that:

> "there is an urgent need for a comprehensive nuclear energy policy and a communication plan covering all aspects of development, related use, and a plan for final disposal of spent nuclear fuel" (Mohan and Aggarwal, 2009, p. 964)

The USA case reached a cul-de-sac in 2009, when the Obama Administration decided that plans for the Yucca Mountain site should not be continued (Hummel, 2012). Before this decision, the plan for this site was that the repository would open in 2017 (Solomon, 2009) and it would thus have been

the first high-level radioactive waste disposal site in the world. The German study comprises a profile description of the environmentalists between state and society. Hunold (2001) concluded that the anti-nuclear movement has been adequately diverse in terms of being stable enough in its political contention. According to that author, some party leaders had hoped to establish environmental corporatism, but this did not occur thanks to the stability within the movement. Rogers (2009) focused on national approaches for the disposal of spent nuclear fuel but also discussed the need for a global approach that takes care of the increasing amount of radioactive waste. Rogers points out that there are some countries which have developed centralised interim storage policies (13 out of 31). However, most countries rely on *in situ* or on-site storage.

Vigsø (2009) analysed the argumentation from different stakeholders in the Swedish process for final disposal of nuclear waste and found a dividing line between two parties: on one side was the industry (SKB) and the authorities (SKI/SSI) and possibly also the Swedish National Council for Nuclear Waste, while on the other side was the environmental organisations. Vigsø (ibid) also found that within each of these parties there is a common understanding regarding central questions and values but that despite tensions and opposing views in factual questions, a certain type of community has established among the organisations involved. Vigsø concluded that this is nothing unusual, but points out that it might lead to actors within the community knowing each other so well that much of the base for the value estimations remains implicit.

SKB, the industry itself, initiated support for social science research in 2004 in order to obtain information on the societal aspects connected with its activities (SKB, 2012). Of the 18 research projects supported by SKB, two had a clear connection to EIA. The first one focused on the public, expert knowledge and deliberation. One of the conclusions drawn was that consultations have led to a specific focus on local environmental issues. It is also pointed out that the industry's local information and communication activities lead to good relations but imply weak mechanisms to counteract the proponent's dominating role (Soneryd and Lidskog, 2006). The other research project was performed by Keskilato, Nordlund et al. (2009) and examined the experience of legislation and EIA process for the final disposal for nuclear waste. That study identified the view expressed by interviewees as being that:

> "the process for EIA and consultations has been based on practice established between the parties who have participated in the site selection process since the early 1990s. The forms for the consultation were thus worked out before the beginning of the formal consultation process in 2001." (ibid, p. 7)

4.3 EIA practice and learning

When looking into research on EIA and learning, it quickly becomes clear that most studies focus on the learning that occurs, or should occur, between the *proponent* and the *public* and learning processes involving these actors (Webler, Kastenholz et al., 1995; Palerm, 2000; Wilkins, 2003; Bull, Petts et al., 2008). No work found through this review focused in particular on learning, EIA and the interaction between the proponent and the authority.

The EIA research on learning raises many different concepts and terms connected to learning. Commonly used concepts and terms include social learning, transformative theory/learning, instrumental learning/competence, single loop learning/know-how and double loop learning/know-why (Webler, Kastenholz et al., 1995; Sinclair and Diduck, 2001; Sinclair, Diduck et al., 2008; Fischer, Kidd et al., 2009; Jha-Thakur, Paola Gazzola et al., 2009).

Among several of the studies on EIA and learning, there seems to be a common view that a solution to achieving sustainable development is to increase the involvement of the public in the EIA process (Sinclair, Diduck et al., 2008). Several of the studies also appear to presume that learning will only bring good and positive aspects to the planning process (Webler, Kastenholz et al., 1995; Fischer, Kidd et al., 2009). An exception to the latter is the study by Sanchez-Triana and Ortolano (2001), where one can conclude that the actors involved had (indirectly) learned *not* to involve the public in reviews of the EIA.

Some of the EIA research states that the aim of social learning is to promote sustainable development (Sinclair, Diduck et al., 2008, p. 424) and a democratic process (ibid, p. 416). One study points out that learning within EIA is a means to reach consensus:

> "The crystallization point of participation is when the group transforms from a collection of individuals pursuing their private interests to a collectivity which defines and is oriented toward shared interests. Achieving this moment should be a major objective of public participation." (Webler, Kastenholz et al., 1995, p. 460)

Within the EIA research there are also studies focusing on obstacles to learning. Bull, Petts et al. (2008) present results regarding barriers to social learning and their connection to personal decisions and will to learn. They claim that if behaviour is to change, people must personally decide to be open to learning. They also conclude that learning is a matter of choice and that attitude (not knowledge) is a barrier to learning. Another study dealing with attitudes is that by Wilkins (2003, p. 401), who claims that:

> "The values of people engaged in an environmental impact assessment (EIA) play a significant role in its result due to the considerable subjective decision making upon which EIA is based. […] The attitudes and values of the actors involved in the process are crucial to determining the results achieved."

Wilkins thus seems to have a similar view on what is actually learned to Bull, Petts et al. (2008).

Other issues regarding EIA and learning used by various authors are knowledge management at government agency level (Enrique Sanchez and Morrison-Saunders, 2011) and learning from experience. Regarding the latter issue, Glasson, Therivel et al. (1997) investigated whether there had been any change in the quality of Environmental Impact Statements (EIS) in the UK since the introduction of mandatory EIA in 1988 and concluded that there has been learning from experience and an improvement in quality. However, they did not analyse what this learning process consists of in detail.

5 Summary of Papers I-IV

The results of this thesis project are presented in chronological order in Papers I-IV as follows:

Paper I Incitements for individual EIA practitioners to include cumulative effects in their EIA practice.

Paper II Difficulties and obstacles for individual EIA practitioners to include cumulative effects in their EIA practice. Analysis of the dissonance between practitioners' attitude and knowing that/knowing how.

Paper III EIA practitioners shape the practice together: focus on the practitioners as a collective. Description of practitioners' arenas for interactions for a very long planning process (the final disposal of spent nuclear fuel). Analysis of impacts of these long-time interactions on knowledge production in the EIA practice.

Paper IV EIA practitioners shape the practice together: focus on the practitioners as a collective. Analysis of how this knowledge producing process for a certain issue has evolved over time, and how these interactions and shaping of the practice over such a long time have affected the authority's EIA review process. The case of final disposal of spent nuclear fuel.

5.1 Lack of incitement in the Swedish EIA/SEA process to include cumulative effects

Paper I is a chapter published in 2006 in a research report from the interdisciplinary research programme MiSt[6] (Oscarsson, 2006). This study was also included in my licentiate thesis (Wärnbäck, 2007). The aim was to investigate obstacles and opportunities for including cumulative effects in environmental assessment of projects and plans in Sweden. The study also aimed to further explore the practice and understanding of cumulative effects amongst different groups of EIA/SEA actors.

The study showed that the issue of cumulative effects is poorly described in EIA/SEA documents, eight years after the implementation of the Environmental Code. However, the study went deeper than just confirming this state and sought to understand the EIA *practice*. It also sought to understand not only the practice as regards the development of the EIA document, but also the whole EIA practice from the start of a project and the associated EIA process to the decision to approve or reject the EIA.

The results showed that the term 'cumulative effect' is rarely used in the EIA/SEA process by the practitioners involved, but the *phenomenon* as such has been dealt with to some extent. However, the examples given by the interviewees were 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. Paper I concluded that there is a lack of descriptions in the EIA/SEA documents and also a basic failure to fully consider these effects in the process as such.

One decisive aspect in the EIA practice on cumulative effects is how the scope in time and space is set. If the scope is too narrow, it will automatically exclude cumulative effects in relation to other past, present and future projects and thus make impossible to assess cumulative effects. Paper I found that the practice approach to how scope is set is in fact too narrow in time to include effects from past or future activities, irrespective of the type of practitioner (reviewer, proponent, or consultant), their stated requirements, or the approach used.

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[6] MiSt (Tools for Environmental Assessment in Strategic Decision Making) is an inter-disciplinary research programme on tools for environmental assessment in strategic decision making funded by the Swedish Environmental Protection Agency. The programme is co-ordinated from the Spatial Planning Programme of Blekinge Institute of Technology.

However, it was found that other future activities might to some extent be included in a so-called "no action alternative", although there were no signs that effects from these activities would be included in the assessment of effects *together* with the plan or project in question. Several of the interviewees mentioned that they include activities other than just their own in the baseline description, *i.e*. what the area looks like today. However, as in the no action alternative, there was no indication 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 scope setting in space, with strong indications that effects from present activities will not be included in the effect evaluation together with the planned activity.

The results in relation to experienced requirements to include cumulative effects in their practice showed a unanimous outcome among the different practitioners. It was concluded that the practitioners do not experience cumulative effects demanded by legislation, handbooks, internal policies etc. on how to work with effects in EIA/SEA. There is thus a basic lack of awareness of their responsibility in relation to the EU legislation.

Statements from practitioners tasked with being reviewers 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 investigation of cumulative effects. When they do so, these effects are usually not described in the EIA/SEA document and the EIAs are still approved by the authority in question.

One complicated feature of the phenomenon of cumulative effects, when caused by two or more different activities, is the question of which actor is actually responsible for each effect. Is it for example the project causing the major effects, or is it the project which is last to be established? The issues relating to responsibility were cited by some consultants as a possible obstacle to the inclusion of cumulative effects in EIA. Difficult issues requiring to be solved included who is responsible for which effect, and who should undertake measures for what.

The results on the subject of the practitioners' ability to affect and reform the scope setting approach (and thereby enable an inclusion of cumulative effects) showed that no matter the type of practitioner, they had a significant ability to influence the scope setting process. In spite of this, a good number of aspects emerged as indications of the fact that it is still not easy to include cumulative effects in the process, including: 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.

To sum up, Paper I concluded that on the one hand, there are few incitements that encourage Swedish practitioners to include cumulative effects in their EIA practice. On the other hand, actors claimed to have good possibilities to include cumulative effects in the EIA/SEA scope setting. In the end, this perceived possibility is not put into action. There appears to be a clear clash between a will to include and strong obstacles in terms of time, financial aspects, responsibility issues and requirement experience.

This discrepancy between statement on possibilities to act and actual practice was investigated in more detail in Paper II.

5.2 Cumulative effects in Swedish EIA practice — difficulties and obstacles

The aim of Paper II was to describe and analyse EIA practice in relation to the legislative demand to include cumulative effects. The study documented the views of the practitioners interviewed on perceived difficulties and obstacles to including cumulative effects in Swedish EIA/SEA.

The obstacles and difficulties identified, categorised into the analytical frame *knowing that, knowing how* and *will to act*, are summarised below. The Swedish EIA and SEA actors interviewed in this study:

- Did not to any significant extent recognise that they are obliged to include and assess cumulative effects in their EIA/SEA work. This applied to all the actors interviewed, irrespective of their role as consultant, reviewer, proponent or government body official. They did not perceive that the Swedish EIA and SEA legislation, regulations and guidelines demand this. They were not aware of the demands in respect of cumulative effects in the EU EIA and SEA directives or of their responsibility to implement these. Their knowledge of the term and the phenomenon was patchy and not all-encompassing.
- Perceived that there are many difficulties and obstacles regarding how to include and assess cumulative effects in their EIA/SEA work, were not aware of existing methods for assessing cumulative effects to any great extent and were not aware of existing international guidebooks related to assessing cumulative effects.
- Expressed a will to act and actually include cumulative effects, but this will has thus far to be put into action.

The results showed that there is a lack of procedures in place and knowledge of methods in relation to how to actually work, in practice, with cumulative effects and how to include cumulative effects in the EIA/SEA process. The *knowing how* basis can thus be concluded to be low. There was also a basic lack of support from reviewers, handbooks, proponents and legislation in respect of the inclusion of cumulative effects in EIA/SEA. This skills and knowledge shortage is suggested to have a significant potential impact on the ability of the different actors to promote the inclusion of cumulative effects, even if they would like to do so.

When it came to the interviewees' statements concerning the *will to act* in the EIA/SEA process, there was a general view that these effects are really important to consider and these effects should be included in the process (attitude). In contrast to this attitude, the statements concerning the practitioners' actual behaviour clearly showed that cumulative effects are not really included in the EIA/SEA process (behaviour).

This discrepancy between attitude and behaviour has long been acknowledged in social psychology: "*Much research in social psychology suggests that actual behaviour is often inconsistent with attitudes, and that people seem to be able to live quite comfortably with the inconsistency*" (Sears, Freedman et al., 1985, p. 136). Inconsistency can come from weak or ambivalent attitudes and thus "*Anything that contributes to a strong attitude should increase attitude–behavior consistency. One factor certainly would be how much we are forced to rehearse and practice our attitude*" (ibid, p. 145). An interesting result within social psychology is that "*when people have to think about and express their attitudes, their behaviour becomes more consistent with the attitude, presumable because this helps to strengthen the attitude*" (Fazio et al., see Sears, Freedman et al., 1985, p. 145). This fact is exemplified in Paper II in statements highlighting the fact that cumulative effects are not a commonly discussed issue. Thus the interviewees' attitude (regarding the fact that cumulative effects are important enough to consider) has not yet been tested in discussions or questioned by others. Therefore the attitudes remain unclear and inconsistency in behaviour emerges. One possible future scenario here is that these attitudes will become stronger and/or clearer with time and consequently will become more consistent with behaviour, *i.e.* cumulative effects will be included in the actors' EIA/SEA work.

Paper II also showed that the practitioners experienced and perceived many difficulties and obstacles affecting their ability to ask for, or actually include, cumulative effects in their work. The obstacles and difficulties listed demonstrate that the practitioners' room for manoeuvre is perceived to be hindered by, for instance: a lack of financial resources; more or less fixed or set

routines and how things are done on a mainstream EIA basis; the general avoidance of difficult issues in favour of including data and facts that are easier to obtain; a planning approach that focuses on separate sector perspectives and direct effects; and a lack of desire, ultimately, to take responsibility. The way the study was designed did not make it possible to rank the obstacles so that the main difficulties and barriers appeared more clearly. However, several practitioners noted that the paucity of the knowledge base is the most important obstacle to including cumulative effects in the EIA/SEA process.

5.3 Learning through social participation in long planning and Environmental Impact Assessment processes - the case of final disposal of spent nuclear fuel in Sweden

Paper III describes and discusses what a social learning perspective helps us to see and understand of the conditions for EIA implementation and the EIA practice that emerges for an exceptional case – the nearly 40 year long planning process for final disposal of spent nuclear fuel in Sweden. The questions that initiated this project especially related to the relations between the proponent and the competent government authority in the process. The focus was on the development of arenas for participation, interaction, communication, *i.e*. the conditions for a CoP to develop.

The planning practice that EIA was introduced into, around 1990, was characterized by a number of features since its start in 1945:

1. Close co-operation between industry and government.
2. An NAA stipulation that the industry need only to present one single and safe alternative.
3. A halt in the process due to public protests (1985–1992).
4. The research, development and demonstration programme as the main arena for development of the technical solution for the repository.
5. An early strategic choice of one single method – the KBS-3.
6. The top-down and non-participatory approach in relation to the municipalities and the general public, with *e.g*. test drillings conducted without local consultations and dialogue (1977-1985).

The planning process after introduction of EIA (1990-2011) had some quite different characteristics:

1. Restart of planning process in 1992 – interaction and communication approach.
2. Voluntary EIA work.
3. EIA legislation comes into force parallel to NAA and the RD&D process – alternatives and public consultations are demanded.
4. Multiple arenas for interaction and communication created.

5. Contents of the EIA under scrutiny – especially the interpretation of alternatives.
6. The main application and EIA is submitted.

An important ingredient in the CoP concept is learning as experience and doing and becoming (Wenger, 1998). The outline provided in Paper III of the very long planning and EIA process for final disposal of spent nuclear fuel in Sweden showed the existence of a complex practice and an ongoing interaction between different actors developing over the years. This practice has given ample possibilities, over a long time period, for different actors to participate, become 'members' of the planning and EIA process, and 'gain' mutual experiences around a common issue through going about their different tasks and roles specified by legislation or undertaken voluntarily. The RD&D process and the EIA consultations can be viewed as processes in which actors negotiate meanings over *e.g*. the conditions that need to be fulfilled by the final repository, over the links to the nuclear power production and how important it is to have a disposal solution application handed in by 2011. The descriptions in the RD&D programmes and in the draft EIA of *e.g*. the technology, the planning process, the environmental impacts contributed to shape the meaning actors gave to the whole project, possible solutions, *etc*. The documents on the RD&D process, EIA consultations, seminars, other meetings, contributed to the reification process.

In spite of the differences among stakeholders regarding the best solution to the disposal issue *etc*., it appears quite clear that there exists a joint enterprise *i.e*. to engage in the issue of disposing of the spent nuclear waste in Sweden. The results in Paper III applied especially to the developer and the government authorities.

The actors have also developed a shared repertoire over the years. There are *e.g*. clear routines in the process, especially in relation to the process of production and decision making in relation to the RD&D programme, in which SKB, the government authorities and the Government have a close collaboration.

As outlined in the history of the planning process before 1992, EIA was introduced to a process that had some clear ingredients, *e.g*. a top-down, non-communicative approach in relation to municipalities, the general public and NGOs, protests and the resulting halt in the process. The restart of the process and introduction of EIA were made by actors that wanted and understood the need for communication and interaction. There was a readiness for continuing with the process in quite a different way than before. The developer, competent authorities, municipalities *etc.* all embraced the need for EIA consultations and dialogue. EIA implementation was thus introduced to a favourable context in

terms of will to communicate and interact and EIA became an important arena for communication. However the extent to which the EIA consultations are taken into account in the planning process has been questioned (Soneryd, 2006/2007).

With the restart of the planning process with a communicative spirit and practice and through the communication arenas that were introduced through EIA and other communicative efforts, the total amount of interaction increased. This was also the case between the developer and the government authorities. EIA interaction arenas thus became part of, and very much contributed to, the development of the CoP.

Part of CoP theory claims that there is a profound connection between identity and practice (Wenger, 1998, p. 149). Focusing on identity brings to the fore the issues of non-participation as well as participation, exclusion as well as inclusion (ibid, p. 159). In relation to the planning and EIA process for final disposal of spent nuclear fuel, the question of who is in and who is out, participation and non-participation, is highly relevant. The difficulty for NGOs to get access to the process and the reasons put forward by SKI in particular show the boundaries for who is in and who is out.

Paper III also draws conclusions in relation to what can be learnt about EIA effectiveness in this case. Choosing a specific learning perspective has important implications for conclusions. Thus Paper III does not claim that EIA would become more effective through learning, because CoP theory states that learning takes place the whole time and in all instances, but perhaps not what was intended *e.g.* from the legislation point of view. So learning in itself is not good or bad but what is learned can be good or bad. Furthermore the planning and EIA process studied in Paper III went on for a long time and included ample opportunities for interaction and communication among roughly the same actors with clear engagement and stakes in the process, *i.e.* it provided good grounds for learning through participation. This can make the EIA process ineffective in relation to the knowledge production expected from the EIA legislation.

The emergence of a CoP in Paper III highlighted the downsides of communicative/collaborative planning and EIA approaches/processes that take place over long time frames and where roughly the same actors participate in the main parts.

5.4 Shared practice and clear roles in nuclear waste management? Long-term relations between industry and government authorities: the case of Sweden.

Paper IV focused on learning outcomes of the practice that developed as part of the CoP described in Paper III. The aim of Paper IV was to examine the shared practice in a very long planning process between the two different EIA practitioners industry (proponent) and competent authority. It analysed the outcomes of long-term interactions between the nuclear waste industry and government authorities, and examined the potential problems this creates, with the government authorities now set to review the final application of the process.

When the permit application was submitted by SKB, the competent authorities that had been an integral part of this planning process in their roles as both interlocutory partners and as the formal reviewers of SKB's research became formal reviewers of the application, including the EIS. The final application submitted by SKB relates to a repository that is to harbour the radioactive spent nuclear fuel from Swedish nuclear power plants for more than 100 000 years – this fact alone places special requirements on the planning process to be functional in relation to finding technical alternatives that fulfil the requirements for safety from a technical, environmental and societal perspective for an incomprehensibly long period of time.

Paper IV analysed whether the long-term shared experience and learning among government bodies and industry had led to a convergence of perspective, narrowing options and potentially reinforcing industry's influence and power over policy. Swedish EIA legislation explicitly demands that alternatives be presented as part of the EIS submitted together with the permit application. The results of the 'knowledge production' experience, in terms of the alternatives produced, were exemplified in Paper IV by deep boreholes as the alternative technical solution for the final disposal of spent nuclear fuel. The study examined whether the industry and the competent authorities agreed or had opposing views on this method and whether and how their standpoints have changed over time.

Paper IV revealed that the shared practice and social learning over time has resulted in difficulties for the authority in mapping out a clear role and identity for itself in relation to industry actors. In relation to the expectations contained in the EIA legislation, the clear roles and expected knowledge production in relation to the existence of possible alternatives have been impeded.

Paper IV also showed that the shared practice that has developed between the industry, SKB and the authority, the former SKI and SSI, has over time resulted in the adoption of a shared understanding and similar perspectives,

concerning at least two points. The first concerns downgrading the need to more thoroughly investigate alternate technical methods to KBS-3, while the second concerns the need to avoid delays in the planning process.

The results showed that on several occasions the public authorities have demanded investigations or clarifications of various issues connected to the alternative method deep boreholes. It is also clear that the demands of the authorities and the Government in respect of a safety analysis for deep boreholes, a research and development programme for deep boreholes, and more internal research on deep boreholes rather than just the compilation of results from international investigations on deep boreholes, have not been met by the industry.

Paper IV shows the difficulties that arise when the views of the competent authority converge over time with those of the industry actors. Thus requests from the competent authorities, such as the Government, do not ultimately have the power to influence the actions of SKB in relation to seriously investigating the deep boreholes alternative.

Regarding the issue of the need to solve the waste problem as soon as possible, Paper IV showed that the public authorities and the industry have, over time, 'negotiated' and thus ended up with a coherent view (that it is urgent to solve as soon as possible).

One dimension important to highlight is the Swedish corporatist tradition of close relationships between industry and government. The early development of nuclear power in Sweden progressed in close co-operation between industry and government (Lidskog, 1998, p. 23-33) and in 1945 the Swedish Government, in cooperation with trade and industry, decided to begin research on what was at the time called "atomic energy". In the planning process for final disposal of nuclear waste it is thus not surprising, in the Swedish context, that there has been close interaction between industry and government.

It is not surprising that a draft solution for the final disposal of nuclear waste was presented very early in the process, as this was stipulated by the Swedish government as essential in order to obtain permits to get the nuclear power plants up and running. Looking at the technical development of nuclear power production and other technological development, however, it is perhaps not relevant to assume that a method for final disposal of nuclear waste that was drafted 34 years ago, and that is still not completely developed, should remain the method of choice for the decision makers.

One explanation for the actions of SKB is of course that they act as a commercial actor and operates in its own interests, as could be expected from them. What is perhaps more troublesome, however, is how the views of the competent authority have over time converged with those of the industry actors

and how requests from the competent authorities, such as the Government, do not, ultimately, have the power to influence the actions of SKB in relation to seriously investigating alternatives to the KBS-3 method.

Communication and the shared practice that has developed over a long period of time, can – as demonstrated in Paper IV – have a significant and not necessarily positive impact on power relations and thus hamper knowledge production, diffusion of roles and identities. In all, this portrays the very complex nature of planning practice (Watson, 2002; Allmendinger, 2009) as a social activity, thus also once again making visible the distance between normative planning and EIA 'ideals' and actual planning practice.

6 Discussion and conclusions

This thesis presents an analysis of two quite different cases and an exploration of two quite different theoretical approaches. The use of the cases helped to highlight certain important issues in relation to EIA practice and research. The issues discussed below are those learned in the two cases, how the different theories contributed to identifying these and how complex it is to change practice in a certain direction.

6.1 Key findings

Learning is treated as a neutral concept in the thesis, but that which is learned can be said to be positive or negative. Quite different kinds of learning outcomes are highlighted in the cases. In a social perspective we cannot avoid learning (Wenger, 1998), but the question is what we learn in different situations. An important issue to bear in mind is thus not *whether* people learn, but *what* they learn from different situations (Säljö, 2000). In connection with this, the case study of cumulative effects can be mentioned as an example of what EIA practitioners have learned in their practice situation (Paper I and II). The results strongly indicate that the practitioners had learned not to include cumulative effects in the environmental assessment. There was plainly no incentive to do this. Learning is viewed here as the constant (re)creation of meaning taking place in practice. The phenomenon that practitioners in different areas learn an 'incorrect' or 'unwanted' behaviour in relation to legislation has been the area of study for political science and other evaluations. In relation to EIA, this 'incorrect learning' relates very strongly to the criticism that there is insufficient examination of issues in relation to how they are dealt with or excluded from the EIA process, *e.g.* in EIA documents (as demonstrated by Kågström (2009) in relation to human health).

Sanchez-Triana and Ortolano (2001) also demonstrated a case where EIA practitioners learned to avoid holding a public review of the EIA. Their results show that the obstacles that exist to development of a practice that includes cumulative effects are related to knowledge base: lack of knowledge about the existence of demands to include cumulative effects, and lack of knowledge about the phenomenon as such and how to work with cumulative effects in general.

An important finding from this thesis is a more thorough understanding of the difficulties in changing a practice. According to social psychology theories, the potential to alter a practice in a certain direction (*e.g.* legislative demands) is higher if the practitioner's attitude towards a certain topic correlates with his or her knowledge base on the topic in question. However, changing a practitioner's attitude towards a certain issue in one way or another is a far more complicated and challenging issue compared with improving the knowledge base of an individual. Practitioners' attitude to an issue is connected not just to their specific EIA practice but also to their individual and previous experiences. However, attitude is not always in accordance with behaviour. Three main reasons for this discrepancy can be pointed out based on social psychology theory: if attitude is not rehearsed and expressed, it may not become sharp and clear; external/situational pressure can make an individual behave in a manner contrary to his or her attitude; and we are all creatures of habit and prior behaviour influences future behaviour (Sears, Freedman et al., 1985).

A vague or unclear legislative demand can potentially become a 'non-existent question' and an issue that is seldom or never discussed by EIA practitioners. Consequently, practitioners' attitude to this vaguely expressed issue may become and stay weak and unclear due to lack of rehearsal.

Sears et al. (1985) point out that it is usually much easier to change cognition (all knowledge, facts and beliefs a person has about a particular object) than attitude. This is because attitude has an evaluative or emotional component that belief in facts does not possess. Cognition and attitude therefore function differently. Once an attitude is established, it is much more resistant to change than beliefs in 'facts'. The case of cumulative effects clearly demonstrated that a positive attitude towards including cumulative effects was in place, but the conditions to change the knowledge base were not (Paper II).

Following from the argument above on attitudes and knowledge base, the case of the cumulative effects identified a number of obstacles in the practice. However some positive results were also identified. If a government authority (Swedish Environmental Protection Agency, Swedish National Board for Housing, Building and Planning) decides to make efforts to increase inclusion

of cumulative effects in EIA in future, one very vital aspect seems to be already in place. In the case of the cumulative effects, attitude, which is very difficult and complex to affect, is already in place: EIA practitioners consider this an important issue (Paper II). The authority in question thus 'only' has to focus on increasing the knowledge base and know-how concerning cumulative effects among EIA practitioners. The challenge for the authority is to disseminate information on the legislative demands and on methods to increase the knowledge base. In this study, cognitive theories were helpful in showing that even though an issue seems to be totally neglected within EIA, some important conditions for change of practice may still be in place. However, the practice is often more complex than this. This thesis identified several obstacles which practitioners have to deal with every day and that cannot all be solved by increasing the knowledge base. In addition, practitioners constantly have to balance priorities, *e.g.* financial resources, time, other development activities, and the public interest.

The use of CoP theory provided different insights to the social psychology perspective and the knowledge-attitude-behaviour concept. Performing a practice also involves giving meaning to the practice in the negotiations taking place between the practitioners. To quote Wenger (1998, p. 54) "*the meaningfulness of our engagement in the world is not a state of affairs, but a continual process of renewed negotiation*". Mutual engagement, joint enterprise and shared repertoire are dimensions of the practice that can be seen as the glue for the community. The negotiation of a joint enterprise means that the practitioners in a community negotiate about what they are there to do. This negotiation is not just a stated ambition, but also creates relations of mutual accountability. Bearing in mind that this mutual accountability concerns *e.g.* what matters and what does not, what is important, what to do and not to do, what to talk about, the cumulative effects practice could also been seen as emanating from much more complex interaction processes (Wenger, 1998).

The planning and EIA process to develop the alternative method of deep boreholes was a very complex case and it is highly challenging to detect the patterns and learning that have occurred (Papers III and IV). It is important to point out that the industry and authorities involved have evolved and changed their opinions over the years, but that this is an expected consequence of the social interactions and learning over time. On the one hand, the industry has firmly concentrated on developing the main method (KBS-3), but it has not investigated alternate methods to any comparable depth. On the other hand, over the years the authorities have gradually lessened their demands on the amount of effort the industry needs to devote to investigating deep boreholes. They have thus gradually come closer to the view of the industry. Thus over

the years, the industry has learned that no matter what the authorities ask to be investigated, they will not enforce these demands. Thus the industry submitted its permit application without having to examine the deep boreholes alternative in the process. For their part, the authorities have learned that no matter what they ask for, the industry can either agree in its written response but refrain from taking measures or simply not respond at all.

In spite of the criticisms of CoP theory, here it allowed thoughtful interpretation of the development of practice, especially in relation to the concepts and perspectives of mutual accountability and joint enterprise.

6.2 Reflections on theory and method

The study of the cumulative effect practice (Paper I and II) did not examine the actual practice in real action. Instead, the analysis was limited to what the interviewees expressed they perceived their practice to be. A limitation of the study is thus clearly a potential gap between what the practitioners choose to mention in interview and what EIA practice as a whole actually includes in terms of inclusion of cumulative effect phenomena. An approach that included some form of participant observation would perhaps have minimised this gap.

The review and analysis of the research programmes on the final disposal for spent nuclear fuel (Paper III and IV) was a very thorough study of a large volume of material. The study was unable to report all there is to say about this very interesting and complicated project, so it is important to reiterate what can actually be stated and claimed based on the analysis. The documents from the industry and the authorities regarding the industry's RD&D programmes contain statements from actors that are related to each other.[7] However, these statements are also related to previous statements by the same actor. One important aspect of the analysis of this exhaustive empirical material is thus not only the statements as such, but how statements on the same issue or topic change *over time*. The different statements and dimension of time are illustrated in Figure 4. Based on CoP theory and the design of the analysis, the analysis presented in this thesis provided information on:

1. The industry's statements and how these have changed over time.
2. The authorities' statements and how these have changed over time.
3. Whether the industry's and authorities' statements are close to each other, and how this has changed over time.

[7] The authorities make a statement of opinions on the basis of the RD&D report from the industry and the industry responds to the authorities' requests for clarifications or measures.

4. Whether the respectively authorities' statements are close to each other, and how this has changed over time
5. When the statements have changed in any directions over time and the party initiating this change.
6. Whether there is a totally new version of a statement.

There are thus several aspects for which the analysis shows *that* something happens, and also *what* happens. The whole starting point for the case on nuclear waste was that learning is an explanation for *why* something happens. The study also showed that there have been various relations and interactions between the authorities and the industry, so a plausible explanation is that learning according to CoP theory has taken place.

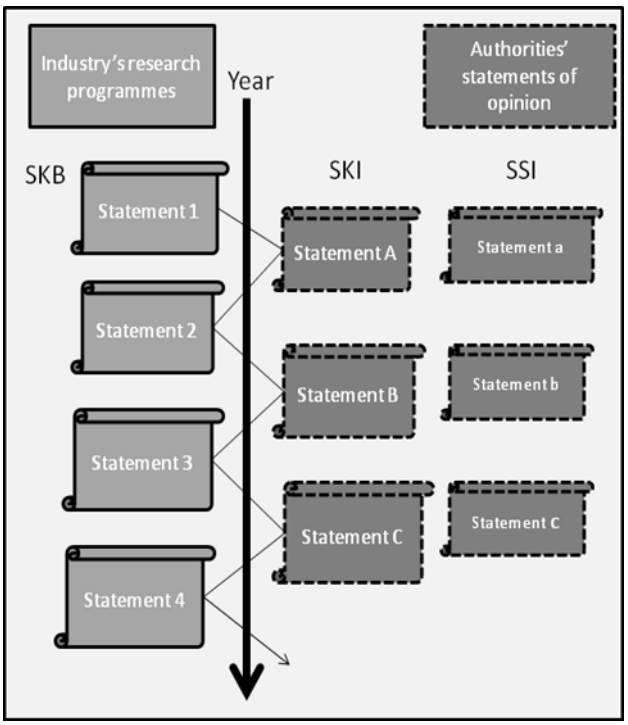

Figure 4. Illustration of the industry's and authorities' practice of the research programmes over time. Changes in statements about an issue of concern (for example deep boreholes) are pictured in relation to the time dimension. A new statement can be totally new, the same as in the previous research programme or a mix of several statements made previously. Statement 2 can thus be the same as Statement 1, or the same as Statement A, or can be a mix of Statements 1, A and a.

In some cases it may be even possible to detect whether a statement about a certain issue is totally new or whether it is a mix of previous statements or perhaps just the same statement that appeared in previous research programmes. This is based on the following assumptions. The preparation and writing of the research programmes and the statement of opinion on these are part of the practice in which the key actors of this study are involved. It is thus important to look out for changes in formulations, which can be subtle changes of wordings or more radical changes of the standpoint expressed on a given issue, when studying this practice. The statements made in the research programme and in the authorities' statements of opinion are often directly related to each other, for example the industry's response to requests by the authority. The practitioners not only relate to what the other party wrote in the previous research programme/statement of opinion, but also to previous statements made by themselves, and what they consider important to communicate in the current phase of the process. The written communication between the industry and the authorities was treated in this thesis as a practice that changes over time. The practice for the research programme process in which the industry and authorities are involved can be viewed as a *learning process*. These changed statements can thus be argued to be made within a practice (process) of learning. The changed statements are also a result of how the practitioners have learned to perform their practice. They can be argued to have their origins in the practitioners' social learning, which is caused by their engagement in the practice. However, it should be pointed out that apart from learning in practice, a change or refinement of a statement can also come about because of other influences, such as occurrence of major accidents (Chernobyl, Fukushima), pressure from public opinion, change of personnel/leader, or a break point (such as implementation of the Environmental Code). However, the way members of a practice react to such pressures or accidents is an effect of the meanings they attribute to them, according to the theory proposed by Wenger (1998).

The interview survey had an advantage over the document review in that it provided some potential to look into the question of why the practice evolves in a certain way. However, it is important to bear in mind that an experience narrated from an interviewee is not *the only* standpoint that exists, but *one possible* view regarding the reason why the practice has evolved as it has. A particular opinion to the why question is obtained by several interviewees giving *their* views and experiences on a certain situation or development of an issue. However, this could have been experienced differently by these different practitioners. Thus it is also important to bear in mind the length of time over which these issues are discussed. With the long time line in the radioactive

waste disposal case, it is not easy for the actors involved to clearly remember the reasons why something happened and moved in a certain direction.

6.3 Conclusions

The study on practice related to cumulative effects dealt with individual officials and their views of their current practice. This is the first thorough study of actual EIA practice on cumulative effects in the Swedish context. The second study examined what appears to be a very complex planning and EIA practice and attempted to capture the interaction between authorities and industry and how the practice evolves over a long period. It thus highlighted the impacts on practice over a long time. The study of research programmes covered nearly 25 years of the planning process for the final disposal of spent nuclear waste. It provided an example of unique and detailed material and analysis in relation to EIA practice. Another unique element in this thesis is the study of the RD&D programmes, which have not previously been investigated from an EIA perspective in this detail, and its focus on the interactions between industry and the relevant authorities.

Both studies show that it is difficult to change practice. They also provide a better understanding of the processes involved in how practice develops, thus giving a more nuanced picture of the situation. This enhanced understanding could help improve EIA practice and regulations in Sweden.

6.4 Further research

Since the investigation of the cumulative effect practice was carried out, some small changes have occurred. One of particular interest occurred in November 2011, when the EU court decided in a case against Spain that even though the word "should" is used in the national legislation as regards inclusion of cumulative effects in EIA, the court judged that cumulative effect *shall* be included in the assessment and that it is thus not only desirable, but mandatory.[8] It would be interesting to look into these new requirements on inclusion and how these potentially affect the practice of Swedish competent authorities and the Environmental Court when deciding to approval or reject applications and associated EIA.

Another very interesting thread to follow is the case of final disposal of spent nuclear fuel and the arrival of a new actor, namely the Environmental Court. Will it be possible to trace any differences in the positions and

[8] EU court decree 24 November, 2011. Case C-404/09, the commission against Spain

standpoints of the Court compared with the competent authorities? Are any of these possible differences related to the issue of the authorities' shared practice with the industry? Studying the effects of a new actor on the practice could provide useful knowledge and possibly open new perspectives on *e.g.* alternative methods or other aspects negotiated long since within the EIA process.

A third interesting issue for further research is the matter of power. Power is an important aspect of EIA practice, but was not examined in this thesis. Future studies could for example analyse who has the power to affect the practice; who is listened to and; which kind of arguments are neglected, and on what grounds.

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