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Planners' views on cumulative effects. A focus-group study concerning transport infrastructure planning in Sweden

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ABSTRACT

Cumulative effects (CE) still receive little attention in the Swedish processes for road and railway infrastructure planning. This article seeks to analyse how CE are treated by professionals engaged in Environmental Impact Assessment (EIA) and Strategic Environmental Assessment of roads and railways. The aims were (i) to analyse views of CE held by professionals with long planning practice, (ii) to analyse how planners experience the handling of CE in their daily planning practice, and (iii) to identify means to strengthen the assessment of CE in the Swedish road and railway planning process. The study was performed as an international literature review and two focus groups among planners. Discussions revealed little knowledge and use of the term CE, partly due to lack of incentives and guidance. Little mention was made of research. Participants said EIA work was much directed towards the environmental compartments/aspects listed in the Environmental Code. Environmental impacts designated as significant demanded much work. The discussions revealed a need of more collaboration between various actors in EIA and of novel methods of public participation. Spatial and temporal scales were chosen with little concern of CE. The European Landscape Convention was hoped to enhance CE treatment in EIA. Improvement suggestions include (i) use of the term CE in regulatory instruments, (ii) development of the interplay between CEA practice and CE science, (iii) co-ordination of management of baseline, monitoring and follow-up data, (iv) assessment of CE in relation to project-specific environmental objectives, developed in a bottom-up process, (v) inclusion of CE, within and across environmental aspects, in determining the significance of environmental impacts, (vi) advice on CE treatment in EIA guidelines, (vii) requirement of CE assessment in EIA procurement, (viii) strengthened generalist competence in environmental assessment, and (ix) enhancing skills in stepwise analyses and indirect environmental effects. Research needs include adaptation of the Swedish EIA procedure to international state of the art, knowledge support of quantification in CE assessment, and development of innovative means of public consultation in transport infrastructure planning.

Introduction

Cumulative effects (CE) attract increasing interest in infrastructure and land-use planning worldwide. Assessment of CE is potentially an efficient means to grasp the multitude of environmental effects when an activity in a landscape is being planned. According to Glasson et al. (2008), however, there is no consensus on what constitutes CE (or Cumulative Impacts, CI, as an alternative term). They, for instance, refer to the five categories of CE, namely time-crowded perturbations, space-crowded perturbations, synergisms, indirect effects and nibbling, presented by Peterson et al. (1987). The "tyranny of small decisions" (Odum, 1982) is another concept that, in our view, pinpoints the very core of CE—small projects individually may not pose a great problem to the environment but when enough of them has been built, the collective impact on the environment may be huge. A much used definition of CE is "changes to the environment caused by an action in combination with other past, present and reasonably foreseeable future actions" (Council on Environmental Quality, 1997). This is the definition we will be using in the present article.

Assessment of CE has long been practiced in Canada and USA where procedures are legally formalized under the term Cumulative Effects Assessment (CEA) and incorporated in the procedures of Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) (Canter and Ross, 2010). In spite of assessment of CE being demanded by the European so-called EIA Directive (Council of the European Communities, 1985; Council of the European Union, 1997) and the SEA Directive (Council of the

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European Parliament, 2001), little attention has hitherto been paid to CE in the Swedish road and railway infrastructure planning practice. Rather, CE assessment is largely lacking in Swedish EIA and SEA documents, and a range of obstacles for inclusion of CE issues have been identified (de Jong et al., 2004; Wärnbäck, 2007). Likewise, a lack of knowledge on CE and of incentives to include CE in EIA and SEA work has been documented for Swedish infrastructure and land-use planning (Oscarsson, 2006; Wärnbäck and Hilding-Rydevik, 2009). Besides, the Swedish research in the CE field has so far mainly had a "from outside" perspective focusing "if and how" CE works. Contrary to Sweden, recent Canadian studies, such as Gunn and Noble (2011) and Noble et al. (2011), have investigated professional planners' and practitioners' perspectives of CE work and its relationship with SEA. Seeking the professional planner's views on actions and measures to make CE assessment more effective is therefore the focus of the present article. Such a focus on the professionals' views that stem from their daily planning practice makes this issue interesting in a broader context of planning research also outside Sweden.

The present article explores possibilities to improve the handling of CE in the EIA and SEA work connected to the Swedish road and railway planning processes. The study has been guided by the hypothesis that improvement suggestions can be retrieved from the professional experience of planners active in different roles in the planning process. The article presents results from a qualitative focus-group study involving professionals with experience from the Swedish EIA and SEA processes for road and rail infrastructure planning and, to a smaller degree, spatial planning. The aims of the study were:

(1) to analyse views of cumulative effects held by professionals with long planning practice;
(2) to analyse how these planners experience the handling of CE in their daily planning practice;
(3) to identify means to strengthen the assessment of CE in the Swedish road and railway infrastructure planning process.

We start out with making a brief review of the concept of CE based on the literature. After presenting the results of the focus-group study we discuss the results in the light of previous research on treatment of CE. Finally, we suggest some improvements to strengthen CE assessment in the Swedish EIA/SEA processes and identify some needs for further research.

Literature review

In the vast international literature on CE, frequent themes include science as a basis for CEA work, level of ambition, methodology (inclusive of scales), process (inclusive of follow-up), Valued Ecosystem Components, information sharing, public and stakeholder participation, and competence and education.

CEA practice has been criticized for not being sufficiently based in CEA science. As an example, spatial planning in western Canada is considered to be little influenced by science (Schindler and Donahue, 2006). Greig and Duinker (2011) point to the interdependence between science inside EIA and science outside EIA—the EIA process needs knowledge from science outside EIA, and science inside EIA can provide the science outside EIA with testable effects hypotheses and monitoring data. Seitz et al. (2011) are of the opinion that CEA practitioners often use an insufficient experimental design when assessing CE but the authors also find that CEA scientists often ignore the need of development of knowledge and tools required to underpin CE prediction. They also emphasize that the decision-making process needs to have a precise description of the type of scientific information required in CEA. Dubé (2003) argues that environmental data for CEA science must be collected and managed in a format suiting the needs of CEA practice. The need, and often lack, of scientifically well-grounded thresholds for CE is discussed by Noble et al. (2011) and Seitz et al. (2011).

The international CE literature reveals a widely varying level of ambition in CEA work. Too high ambitions seem to pose a risk of over-loading the EIA work. Baxter et al. (2001) put emphasis on scoping in CE assessment; without careful scoping much effort may be wasted on unnecessary inventory and analysis of marginal issues, thus diverging the focus from the crucial issues. On the other extreme, the prescribed scoping must not be stepped over in order to avoid engaging in a formal EIA process (Weston, 2011). In CE assessment, views, scope and scale must be wide enough to really do justice to the impacts considered significant in each case. Therivel and Ross (2007) note that even a superficial CEA can reveal the appropriate management measures. Baxter et al. (2001) identify the terms of reference as a means to reduce the gap between theory and practice in CEA work. They also recognise a need of guidance as to what should be included in these terms of reference.

Ross (1998) discusses the difficulty facing CEA practitioners who have to select proper assessment methods from a range of methods that are not very helpful in practice. He concludes that the only selection criterion should be: "*The method must be able to incorporate the effects [of] all the relevant human activities that might contribute to the impact being studied*." Geographical Information Systems (GIS) are widely recognized as an efficient tool for environmental assessment inclusive of CEA (cf. Sfakianaki and Stovin, 2002; Blaser et al., 2004; Grimes et al., 2004; Gontier, 2007). Besides, the CE literature contains a multitude of descriptions of methods to be used in CEA (e.g. Council on Environmental Quality, 1997; Rumrill and Canter, 2000; Canter and Atkinson, 2008; Seitz et al., 2011).

Noble (2008) emphasizes the importance of analysing different aspects on proper spatial scales. As pointed out by Baxter et al. (2001) and Franks et al. (2010), CE often extend beyond the area directly affected by a project. Franks et al. (2010) also identify the discrepancy between what a regional environmental study may point out as desirable action towards a preferred scenario, and the scope and authority of the institution in charge of the assessment process. The problem of mismatch between the geographical area possibly affected by CE of a proposal and the jurisdiction responsible for control efforts was pointed out already by Contant and Wiggins (1991).

Likewise, temporal scale is a crucial issue in CEA. One difficulty is how to distinguish contributions to CE from past activities, present activities, the proposed action and reasonably foreseeable future actions, as discussed by Ross (1998). Related to this is another challenge, responsibility departmentalization, e.g. between state departments, as described by Piper (2001), Therivel and Ross (2007), Noble (2008) and Franks et al. (2010). Franks et al. (2010) suggest multi-stakeholder co-operation as a solution.

Baxter et al. (2001) recommend the regulatory authority to enter early in the CEA work and to take an active role in providing proponents and consultants with help to conduct good CEA work. Also, the regulatory authority could help improving CEA practice by complimenting good work and sending negative signals on poor work. Noble (2008) recommends a formal tiering (linking successive assessments) process in order for the CE issues to be kept living throughout the planning process.

The importance of environmental follow-up and feedback is widely recognized (MacDonald, 2000; Baxter et al., 2001; Dubé, 2003; Greig and Duinker, 2011; Seitz et al., 2011). However, lack of monitoring data on previous or existing projects is often a problem in CEA, as discussed by Contant and Wiggins (1991).

"Valued Ecosystem Component" or "Valued Ecological Component" (both abbreviated VEC) is a fundamental point of departure

in CE assessment in countries with a long tradition of environmental assessment, e.g. USA and Canada (Tsunokawa and Hoban, 1997; Ross, 1998; Baxter et al., 2001; Therivel and Ross, 2007; Canter and Atkinson, 2008; Canter and Ross, 2010). Just as for CE, also VEC has numerous definitions, one much used being "*Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern*." (Hegman et al., 1999). EEA (2011) gives a more restricted definition: "*an appraised, evaluated or estimated element or ingredient of a biological community and its non-living environmental surroundings*".

The role of information sharing and activity co-ordination for meaningful CEA has been emphasized by Morrison-Saunders and Arts (2003). However, proponents' inability to retrieve information on other proponents' development plans has been reported as a problem (Duinker and Greig, 2006). Brismar (2004) suggests broad representation of expertise in EIA consultant teams. Achieving effective collaboration among developers, etc., is mentioned by Canter and Ross (2010) among challenges in Cumulative Effects Assessment and Management (CEAM). The crucial role of collaboration, openness, creativity and information sharing between actors involved in CEA is emphasized by Plano et al. (2001).

The value of local participation is often pointed out (e.g. Rajaram and Das, 2006). Given the limited role of public participation in the Directive 97/11/EC (Council of the European Union, 1997), however, Benson (2003) finds that much development is required to make public participation a strong instrument for sustainability development in, e.g., spatial planning. For First Nations' participation in environmental assessment processes, there seems to be much need for improvement (Booth and Skelton, 2011). Generally, public consultation is pointed out as a key factor in CEA as well as throughout the SEA/EIA process (Morrison-Saunders and Arts, 2003), not the least when it comes to the identification of VECs and the determination of impact significance (Baxter et al., 2001).

Stakeholder participation has been identified as one of the most important factors contributing to SEA impact on decision-making (Piper, 2001; Runhaar and Driessen, 2007). Early involvement of multi-stakeholder interests in the CE assessment process is also considered important by Noble (2008) and by Cooper (2010). Stakeholder participation is a need not only identified by researchers but also required by legislation on both SEA and EIA, e.g. in Sweden (SFS, 1998a). Also, the European Landscape Convention (ELC) (Council of Europe, 2000) and the Aarhus convention (UNECE, 1998) demand procedures for the participation of the general public in the implementation of landscape policies and in decisions concerning the environment, respectively. Thereby, these two supranational conventions may also help putting more focus on CE in impact assessments.

Canter and Ross (2010) have drawn attention to the limited CEAM competence at government agencies. In a study on health impact analyses, Birley (2007) has found much room for improvement and pointed to the lack of incentives for raising contractor competence as long as adequate competence is not required in the procurement. Baxter et al. (2001) have identified the need of education and training to "*foster specialists capable of integrating EIA and CEA and ensuring a consistently high standard of CEA practice*". Such training should include, among other items, CEA theory. Also Canter and Ross (2010) point to the need of more explicit terms of reference in CEAM procurement. Baxter et al. (2001) note that the quality of CEA directly responds to what is required in the terms of reference.

Planning processes can follow different approaches depending on planning traditions, regulatory codes and legal frameworks. In studies of planning processes, it is important to understand how the legal framework is implemented in the day-to-day planning (Sannerstedt, 2001). Therefore, "*any attempt to explain implementation must look within agencies at the factors that affect the behaviour of street-level staff*" (Hill and Hupe, 2002, p. 131). The researcher thus has to understand planner roles and the terms for the work of the planners (Hillier, 2010) and also to know from where the planners obtain their knowledge (Schön, 1983; Akrich, 1995).

Transport infrastructure planning and CE legislation in Sweden

According to the Swedish Roads Act (SFS, 1971) and the Railway Construction Act (SFS, 1995), the planning process for the building of roads and railroads comprises four steps: Preliminary Study, Feasibility Study, Detailed Design Plan and Route Construction Plan. Public participation in EIA is regulated by the Environmental Code (SFS, 1998b). Early in the process, the developer conducts an early consultation with the reviewer, i.e. the County Administrative Board (CAB), and people directly affected by the project. An Environmental Impact Statement (EIS) is written in the second and third steps. If an EIS is to be prepared at the Detailed Design Plan stage, the executor must inform other government authorities, the general public and municipalities and organizations possibly affected. These consultations shall cover the location, scope, design and environmental impacts of the activity or intervention as well as the contents and formulation of the EIS. The developer's project leader prepares the procurement documentation for the contents of the EIS which is generally contracted to a consultancy. The developer then plans the activities jointly with the consultant. The reviewer must approve an EIS before it can be publicly used.

The first European EIA directive is the 85/337/EEC from 1985 (Council of the European Communities, 1985) but CE are not mentioned there. The directive was amended in 1997, and CE are treated in its Annex III (Council of the European Union, 1997).

The strategic level in the Swedish planning process stands before the four stages mentioned above and is regulated by an ordinance (SFS, 1998a) to implement the European Parliament's so-called SEA Directive (Council of the European Parliament, 2001) and The United Nations/Economic Commission for Europe Convention on Environmental Impact Assessment in a Transboundary Context of 25 February 1991 (UNECE, 1991). However, CE are not mentioned in this convention either.

In the preparatory work concerning environmental assessment of plans and programmes in the Environmental Code, CE are mentioned among the effects that shall be included in the assessment of plans and programmes for which significant environmental impacts can be foreseen (Proposition, 2004). However, the term CE is not explicitly mentioned in the Environmental Code proper. Instead, vague formulations are used, such as "comprehensive assessment" of the environmental impacts on human health and the environment, in addition to assessments of the effects on fourteen listed environmental aspects. The recently published EIA handbook for Swedish road and rail infrastructure (Trafikverket, 2011) gives general but not detailed instructions for the treatment of CE whereas the earlier EIA handbook for roads (Vägverket, 2004) only faintly mentioned CE.

Method

The study was based on information retrieval using focus groups (Patton, 1990; Wibeck, 2000). Focus-group inquiry is a form of group interview where one of the major advantages is interactive discussion among the participants. According to Morgan (1998) the methodology is suitable in order to understand differences among the participants concerning their views and actions taken in their daily planning practice.

For the focus groups, targeted participants were to be sought among professionals active in different roles in transport infrastructure and spatial planning plus a representative of a non-governmental organization (NGO). Two geographical regions and both sexes were to be represented. The search for persons meeting these criteria went through the Internet (the official websites of authorities, companies and organizations) and personal contacts of the authors.

Two focus groups were formed, one in Stockholm and one in Malmö. The informants were 9 women and 5 men. They represented the following actor groups within road, railway or spatial (regional or municipal) planning: manager of business area, project manager, environmental specialist, environmental co-ordinator, administrator of environmental protection, purchaser, chief architect of a CAB, architect, chair of local environmental organization, investigator. Where the term "planner" is used in the text, it refers to the entire group of informants. The informants were employed by the Swedish Road Administration, the Swedish Rail Administration, the Swedish National Heritage Board, the National Board of Housing, Building and Planning, two CABs, a consulting agency and an NGO. These actors were official in that they were primarily involved in the assessment of CE in the EIA process.

The focus-group discussions focused on the following questions which were orally presented successively during the meetings:

(i) What would be required for cumulative effects to be given a more important role in infrastructure planning? What driving forces are needed?
(ii) Who is responsible for developing the treatment of CE in the planning? What role are you ready to take yourself?
(iii) At which planning stages can CE assessment be most beneficial?
(iv) What to do in a current infrastructure project or planning activity in order to consider CE of future projects?
(v) How to do in order to assess CE if each of the environmental effects is small or insignificant?

Immediately before the onset of the discussion, participants were asked for a written answer to the following question: "What do you think of when you hear the term cumulative effects?" This was done as a means of retrieving respondents' individual and spontaneous conception of the term before having been influenced by the discussions to follow in the group. The written answers (2–62 words long; median 30) were collected prior to the start of the discussions.

The groups were led by two of the authors as moderators. In parallel with the recordings the moderators made notes concerning the conversations and, to some extent, participants' reactions. In case the discussion went silent, the moderator's role was to ask other questions or follow-up questions in order to fuel the discussion. To inspire the discussions, two large landscape photos were placed on the table, one from an urban and one from a rural environment.

The discussions, 60 and 80 min in length, respectively, were audio recorded and professionally transcribed. The transcribed discussions were qualitatively analysed using content analysis (Krippendorff, 1980; Weber, 1990). In short, this method is based on grouping of phenomena or themes identified in texts.

In the analysis, no distinction was made between the Stockholm and the Malmö focus groups. From the complete transcribed text, citations were subjectively identified and sorted out. A citation was taken as a sequence of words expressing one or several distinct phenomena or revealing one or several distinct messages from a single discussant. A citation could be made up of a phrase, a part of a phrase or several consecutive phrases. The citations, 230 in number, were compiled into a table. From this table, themes (phenomena) were manually identified and encoded into "concepts" using open coding (Strauss and Corbin, 1996). A total of 386 concepts were identified. The concepts were then subjectively grouped into concept "categories" based on the information content of the concepts. During the manual grouping, categories were successively added and re-organized, finally ending up in 12 concept categories:

- Aggregation; holistic view; the EIA process.
- Dialogue; communication.
- CE integration into the EIA process; proper planning stage; incentives; significant environmental effects.
- Legal framework; policy instruments.
- Collaboration between transport sectors.
- Collaboration with spatial planning.
- Responsibility allocation.
- Spatial and temporal scales.
- Competence; purchasing; research
- Quality assurance; environmental follow-up; experience feedback.
- Environmental objectives; enhancement of environmental values.
- Tools.

All but three of the concept categories contained several subcategories. Eighteen per cent of the concepts were grouped into the concept category "Dialogue; communication". Between 12 and 15 per cent of the concepts were grouped into each of the three categories "Aggregation. . .", "Collaboration with spatial planning" and "Tools". The other eight concept categories each comprised 3–9 per cent of the concepts.

Using the transcriptions, we found that many of the twelve concept categories contained multiple themes often recurring in the discussions. Taking these themes into account, we structured the analysis and the presentation of the results in a way that facilitates comparison with themes and aspects often appearing in the current discussion on EIA practice in Sweden and internationally.

Results

Conception of cumulative effects

Already the written replies to the question "*What do you think of when you hear the term cumulative effects?*" revealed vague views of the meaning of the term. All but one of the fourteen respondents more or less explicitly mentioned *aggregated effects*. Half of the respondents mentioned *different types of effects*, and some of them explicitly mentioned *effects of different projects or measures*. Nine respondents thought of *a project giving rise to different effects*. Four people pointed out that effects can arise from *different measures or sources*. *Spatial dimensions* and *temporal aspects* of effects were each put forward by about half the respondents but only four respondents mentioned both these features. *Indirect effects*, usually together with direct effects, were covered in four answers. Two respondents pinpointed the discrepancy between effects and consequences. Three gave evidence either of their own uncertainty of the term CE or of difficulties experienced with the definition of the term.

In the professional environment of many discussants, CE was not considered a substantial or much utilized term. Instead, a range of other terms and expressions were used. One discussant from the Swedish Road Administration (SRA) said: "*Yes, we never use exactly this word, I can say. Cumulative effects, nobody talks about it, the word. I had hardly heard of it before coming here*." Another discussant referred to the existence of the term CE in the EU legislation and in the preparatory work of the Swedish Environmental Code but mentioned that in practical EIA work other terms are commonly used instead of CE. This, he concluded, could result in a false picture in

research indicating CE are not treated in Swedish EIA work; "*I think it [CE] is included even if one sometimes doesn't describe it in that way*."

Regardless of the terms used for CE, impressions of the extent to which CE are assessed in EIA or SEA varied much between discussants. A more imperative use of the term CE in EIA/SEA procedures and documents was suggested as a means of raising actors' awareness of CE and the need of treating them.

Significant environmental impacts

The focus-groups devoted much time to "significant environmental impacts". This is a crucial concept in the Swedish EIA and SEA processes. According to the Swedish Environmental Code, the foreseen presence of significant environmental impacts of a proposed action or plan triggers a mandatory special procedural treatment comprising, i.e., extended consultations (SFS, 1998b). Many statements bore witness to a range of ways to avoid making projects to be designated as having foreseeable significant environmental impacts, e.g. "*one is completely scared stiff by these significant environmental impacts*. . . . . *they raise costs that cannot be covered*". One informant said it is important to take CE into account when determining whether "significant impacts" are to be foreseen. Minor CE were discussed as a difficult issue to handle, however. Uncertainty was expressed as to whether many minor impacts were to be considered "significant" if taken together; "*is it that threshold we search for?*".

On the other hand, the designation of impacts being significant was found to be a door opener to the legal participation of NGOs in the environmental assessment procedure. However, one discussant declared that all projects were subject to the same type of public consultation, documentation, etc., whether significant environmental impacts be at hand or not.

Driving forces

Lack of incentives was agreed to be a major factor hindering CE issues to be included in current infrastructure planning; "cumulative effects—I know the term and know approximately what it means but it is, sort of, not a hot business among us at the [working place] . . .". The need of incentives of different kinds and from different actors was recognized.

Often, an open question was who has the responsibility for the inclusion of CE in the EIA process; ". . . one tends to stand up in defence of one's own project and really distinguish its effects from other projects so as not to, sort of, burden one's own project with other existing or planned project effects." The EIA reviewer at the CAB was found to have a crucial role here. Responsibility departmentalization was sometimes found to hinder CEA inclusion in project appraisal; ". . . everyone has his own thing which runs OK. Everybody gives the go-away that we have done it right. . .".

Many participants claimed that more demanding legislation would be an efficient pusher of CEA implementation and development. The Roads Act was said to give weak support to other issues than the description of alternative road corridors, and the Swedish Planning and Building Act does not cover all types of spatial planning. The municipality Comprehensive Plans are not legally binding and are subject to merely weak demands for assessment of CE. High expectations were expressed concerning the efficiency of the ELC, however. Legal instruments for judging the acceptability of environmental impact were asked for. The lack of legislative demands on idea studies at very early stages was mentioned as a drawback to CE assessment in these sometimes influential studies.

Apart from legislation, economic incentives were pointed out as a potential driver of CEA development but no suggestions were specified. Rather, costs accompanying CE assessment were considered among factors hindering CE to be analysed. "*What we can pay for is to get an EIS approved*. . ."

Covering also CE in the quality assurance of EIS was suggested to enhance CE treatment. Quality assurance is much more than ticking a checklist; ". . . *cumulative effects, they are not revealed by merely ticking off a list but one has to weigh it all up together*. . .".

Due to lack of responsibility, action programmes decided in the EIA process were often not implemented. Environmental follow-up of earlier projects, preferably extended in time, was felt important to enhance the handling of the CE issue. There was a hope for the ELC to become a tangible structure to follow up against. Feed-back of follow-up experience was considered crucial for the enhancement of CE assessment. Feed-back was often hampered by limited availability of old EISs as well as lack of knowledge of their existence.

Developing the role of procurement of EIA was identified as important for the development of CE assessment. Posing clear requirements both on treatment of CE and on EIA consultants' competence and experience could benefit the treatment of CE. On the other hand, posing adequate requirements demands client competence.

Integration of CE assessment into EIA work

Most of the focus-group participants considered efficient integration into the ordinary planning process a key success factor for CE assessment. One discussant suggested a heading "Cumulative effects" would help CE becoming included in the EIA and SEA work.

One discussant was aware of the need of treating different kinds of CE in different ways, and at different stages. Stepwise CE assessment was recommended. The importance of introducing the CE issues early in the planning process was pointed out by several discussants; ". . . *the earlier the better. The further down the process and the more detailed it becomes, the less value is given to the description of many of the cumulative effects*. . .". The CE issues were thus felt to receive successively less weight during later planning stages.

One informant stated that effects difficult to assess (such as CE) run the risk of being left out from the EIA.

Collaboration within and between infrastructure projects

Joint assessment of multiple projects was much discussed as being central in CE assessment but difficult to accomplish. Intermodal co-operation is scarce, and alternative modal solutions are rarely discussed. Many participants expressed a strong need of co-operation between road and rail infrastructure planning processes; ". . . *when we work with railway development, and then there may be a road construction project situated close to it. How do we sum these effects up*?" The planning responsibility was not shared between the two sectors.[1] Discussants representing one transportation mode often found difficulties already in incorporating effects of a project concerning another transport mode, and incorporating other types of exploitation was found to be even more complicated.

Discussants pointed out the importance of mutual information exchange between, e.g., developers, EIA professionals and officials at the supervisory authority. The CABs were little discussed in spite of their crucial roles in the planning process. One focus-group participant found the CAB, as the competent authority, to enter the EIA process too late. The value of early consultation with the CAB in infrastructure planning was emphasized. One discussant advocated

[1] After the performance of the study, however, the Swedish Road Administration and the Swedish Railway Administration have merged into the Swedish Transport Administration.

a strengthened role of the CAB in its assessment of infrastructure projects in relation to other societal planning.

The focus groups put forward the importance of more and efficient teamwork between the various professionals working with EIA for a project. Formal or informal EIA networks were suggested. Personal contacts were considered valuable as was insight into the working procedures of other EIA professionals. The wish for broader bases for decision making was also mentioned.

Collaboration between infrastructure planning and spatial planning

Many statements expressed the lack and need of collaboration between spatial and infrastructure planning. Having to communicate with several spatial-planning organizations when planning a single infrastructure project was often seen as an obstacle by developers. Having an infrastructure plan influencing two or more municipalities (or counties) was found to increase communication demands. Insight into other organizations' planning processes would make the planning go smoother. Unforeseen secondary development, typically emerging around highway intersections, was subject to much concern by several discussants; "*. . . intersections then become so-called commercial places or interesting spots where various types of business will be established*." The possibility of such development was often neglected and should, according to participants, be paid attention to and included in CE assessment.

The structuring influence of transportation infrastructure on housing and other spatial development was subject to much discussion. Nature areas designated as "valuable" in the spatial plans were said to be of little significance when it comes to infrastructure planning. The same was true of delimited "quiet areas".

Co-operation between spatial planning at different levels, and in different spatial-planning organizations, would facilitate infrastructure planning, according to many discussants. The strong steering role of the regional development programmes and the Regional Development Plan (for the Stockholm area) was subject to much discussion. The municipal Comprehensive Plans were mentioned to be a means of co-operation in inter-level spatial planning. According to many discussants, higher-level spatial plans were often thrown over by the powerful so-called municipal planning monopoly. Municipalities cutting up a development project in multiple municipal detailed development plans "*so that the totality can't be seen*" was said to occur.

The SEA for the national infrastructure plans should be more integrated with SEA for regional spatial development plans. More of regional system analyses and regional transport infrastructure plans was asked for. Personal contacts, networking and insight in other organizations' planning procedures were found to facilitate taking other development projects into account. Trans-sectorial networks on CEA as well as focus groups made up of different EIA actors were suggested for bridging the departmentalization of responsibilities.

Public participation

Much discussion concerned communication with non-professionals such as land-owners, local NGO representatives and the public affected by an infrastructure project. Broad discussions, early in the planning process, with various stake-holder groups were advocated as means to gain knowledge of local conditions and opinions. "*. . . and not only the knowledge of the experts. Yes, they have expertise in the local environment. But we must listen much more*."

Public consultation according to the Environmental Code was much discussed. This formal communication instrument was considered important but needing development to increase its efficiency. Some discussants pointed out the large knowledge among NGOs and the local public. The educational level of the inhabitants in an area was said to influence the recognition and perception of environmental issues by the local public. The opportunity for developers to gain information from locals during public-consultation meetings was found to be under-exploited. The legally required newspaper announcements of these meetings were felt formal and little tempting. In those meetings, participants from the public were often men of age, which discussants meant was partly explained by landowners often being males.

Exploitation of unconventional means of dialogue was encouraged: village communities, walking tours in towns, articles in newspapers and, especially, the Internet which was put forward as a crucial key to reach new groups, especially young people. The Internet was pointed out as especially suitable for spatial information. *Ad hoc* deliberation in novel forms was advocated as complementary to the regulated consultation which was felt rigid and inefficient, often due to participants being recruited from narrow sections of the potential stakeholder groups.

Competence and learning

Competence of professionals engaged in the environmental assessment process, notably consultants, was seen as crucial for the quality of the assessment. Much discussion spotted the need of specialists versus generalists. Both types were needed. Specialists were found to have an important role and should be more often engaged in special cases. The result of the assessments was said often to mirror the expertise field of the consultant, however, and one-sided specialist dominance was to be avoided. Teamwork between specialists in various expertise fields was sometimes needed. On the other hand, many discussants argued there is a lack of generalists in the EIA work. Also, experience was said to be undervalued. An experienced generalist could often substitute specialists; "*We delegate to specialists issues that we can actually see ourselves*."

Learning from colleagues and organized further education and in-service training were put forward as sources of improved knowledge. Areas where actors' knowledge needed improvement included, e.g., stepwise analyses, holistic analyses and indirect environmental effects. Environmental follow-up was identified as a means of learning.

Environmental objectives

One of the focus groups identified an opportunity for better CE treatment by coupling the EIA work with the environmental objectives. Work with the environmental objectives opens up for inter-sector co-operation since these national objectives shall steer the development of all societal sectors. "*Also in the work with the environmental objectives, one touches the issue of overall or long-term effects, and there we also have a system that we might try to develop. Yes, perhaps the work with the environmental objectives could also help looking beyond those sector boundaries. . .*"

CE assessment was hoped to become a means not only to develop the role of mitigation and compensatory measures but also to enhance the environmental quality in connection with the planning of new infrastructure. Utilizing possibilities to strengthen environmental values should go along with the traditional approach of avoiding valuable areas and minimizing damage.

Spatial and temporal scales

Scales in space and time were much discussed. Spatial and temporal delineation more adapted to the type of planning and environmental issues was pointed out as important to environmental assessment inclusive of CE assessment. The focus-group

discussions revealed concern as to the planning process being restricted to the project or the geographical area directly affected by the project or plan in question. Also for local projects, environmental aspects of regional as well as national relevance ought to be assessed. Unfortunately, maps used in municipal and regional planning were often restricted to the geographical area directly concerned.

Discussants viewed CE assessment as necessary but difficult also for small projects—these were usually a one-person responsibility. Discussants often returned to the frequently occurring issue of small projects eating (nibbling) into remnant unexploited areas.

Temporal scales were to be chosen to suit the planning situation. Even a small project could have long-term (as well as large-scale) effects. Every single project would have to consult long-term regional development plans and municipal Comprehensive Plans. The validity of municipal plans often being restricted to the political term of office was considered an obstacle to claiming a sufficiently long time perspective in CE assessment. "*First come, first serve*" was found difficult to handle in CE assessment work; a single additional project proposal may be stopped because of the multitude of already present activities in the geographical area concerned.

Tools

Existing planning tools and facilities to assess CE were considered underutilized. To overcome this, a need of education and training was identified. A lack of tools, or acquaintance with them, was feared to lead to underestimation of CE. Some viewed SEA ("*at least in theory*") and the ELC (to be ratified)[2] as CE assessment tools in themselves. Also checkpoints in the planning process were considered a CE assessment tool. The complicity in assessment methods was mentioned to range from the ease of traffic-noise calculation to the difficulty of assessing landscape appreciation. Photo documentation was put forward as a simple and pedagogic CE assessment tool.

The need of novel tools and working procedures for CE assessment was a recurring theme in the discussions. Desires were often vague: "*. . . a kind of tool or method to do this type of balancing . . .*". Limit values and target values were considered important tools where existing. The strength in legal limit values, such as the environmental quality standards for air pollutants, was felt much more valuable than the looser concept of target values. The lack of limit, threshold and target values for the CE of an environmental impact stemming from several sources was identified. Noise assessment, said above to be easy, was given as an example of a difficult issue: "*. . . how should we assess road and railway noise together? We can make technical calculations but the target values are set for either of them separately*." A need for further environmental aspects to be subject to limit values was identified but difficulties were encountered, as exemplified by landscape perception and amphibian-population dynamics; "*But take biodiversity or landscape perception—have a try to set up a target value for landscape perception if you can!*" Also desired, but considered still more difficult to obtain, were methods for the aggregation of impacts concerning different environmental aspects.

Handbooks and guidelines were said to be generally lacking when it comes to CE, and a strong need was put forward. These tools should be as stringent and practicable as possible. A staff member of a CAB saw no hindrance of the CAB helping develop handbooks. Changes in legislation should be "*accompanied by good guidance and handbooks . . .*" concerning EIA/SEA.

Not to be overlooked, CE should be included in checklists. Checklists were appreciated and much used. The comment "*Checklists—gorgeous but dangerous*" was used to illustrate the tendency of feeling content when the checklist is fully ticked off but without deeper concern, however. Checklists should be complemented by a mechanism catching effects not treated in the EIS; "*. . . a mechanism that captures what was not captured. . .*". GIS were not mentioned during the discussions.

One participant expressed an unspecified wish of more knowledge on CE, and another participant saw a need of ways to make research results more easily applicable in practice. Apart from this, the role of research did not emerge in the discussions.

Discussion

Swedish research has hitherto not put much effort into seeking the professional planner's views on actions to make CE assessment more effective. This is what we do in the present study. Possibly mirroring limited acquaintance with "cumulative effects", the focus-group discussions more concerned EIA/SEA as a whole than CE specifically. However, the discussions revealed many views that effectively contributed to attaining the three aims of our study concerning (i) planners' conception of CE, (ii) their handling of CE issues, and (iii) suggestions to strengthen CE assessment in Swedish transport infrastructure planning.

Conception of cumulative effects

According to Glasson et al. (2008, p. 325) there is no consensus on what constitutes CE. Likewise, Gunn and Noble (2011) and Noble et al. (2011) found a wide variety of interpretations of the concept of CE in a recent international interview study among SEA and CEA academics and practitioners.

Focus-group participants said they did not use the term "cumulative effects". This is in line with earlier findings of the vague role of CE in Swedish EIA/SEA practice (Wärnbäck and Hilding-Rydevik, 2009). Partly, this can be traced to the term neither being used in the national legislation, nor being in common use in the Swedish language. However, the lack of an explicit national CE legislation should not really matter—the EU's amended EIA directive (Council of the European Union, 1997) is also valid in Sweden, which makes the assessment of CE compulsory in EIA work. However, introducing the term CE in legislative texts and in handbooks would probably further the treatment of CE in Swedish EIA/SEA work.

The role of science

The very limited mention of science in the discussions is in parallel with the disconnect between CEA practice and CEA science frequently discussed in the EIA literature. Greig and Duinker (2011) find that the scientific basis to underpin EIA is still little implemented in EIA practice in Canada. They suggest measures to strengthen the contribution of science to EIA and CEA practice. Likewise, Noble et al. (2011) call for innovation in science and CEA methodology to enhance CEAM of watersheds. Schindler and Donahue (2006) report that the successive allowance of a multitude of diverse development projects in western Canada largely takes place without regard to the knowledge of the obvious cumulative effects in this sensitive region. Dubé (2003) encourages the use of science to evaluate cumulative environmental change at key points in decision-making in regional development. The linkage between CEA research, environmental monitoring and front-line environmental assessment practice should be strengthened to advance CEA practice. She also suggests integrating stressor-based methods and effects-based methods to more adequately fit the assessment of CE in a sustainability context. Seitz et al. (2011) point to the

[2] The Swedish government ratified the ELC in 2011 (Council of Europe, 2011).

lack of science and quantitative methods for CEA where projects are complex. They suggest co-operation between scientists, proponents and regulators as a means to integrating science into CEA practice.

Data availability and quality is a frequent theme in the scientific CEA literature. The broad spatial and temporal scales necessary in CEA puts great demands on data concerning extended areas. Such data are often lacking (Noble et al., 2011). Seitz et al. (2011) urge authorities to provide scientists with appropriate spatial data to develop landscape metrics and models to be used in CEA and EIA practice.

VEC and environmental aspects

Interestingly, the concept of VEC was not mentioned at all in the focus groups. Nor does it appear in Wärnbäck and Hilding-Rydevik (2009), in the recently published Swedish EIA handbook for roads and railways (Trafikverket, 2011) or its predecessor for roads (Vägverket, 2004), or, to our knowledge, in Swedish EISs. This probably goes back to the absence of a VEC concept in regulatory instruments on environmental assessment in Sweden. This is in contrast to the current practice in fore-running nations such as Canada, US and Australia where VECs form the basis of CEA (e.g. Canter and Ross, 2010). VECs can be seen as an aid to refocus the assessment work from the development project to the environment concerned, and as a catalyst of communication between various actor groups involved in or influenced by the project (Tsunokawa and Hoban, 1997; Canter, 2008; Swor, 2008). Folkeson (2010) has suggested a procedure to incorporate CE in EIA for road planning in Sweden based on the VEC concept.

The focus-group discussions and other evidence, such as EISs and Wärnbäck and Hilding-Rydevik (2009), indicate that the CE approach is far from implemented in Swedish infrastructure planning. Instead, the assessment is still divided in separate environmental compartments or aspects (such as plants, soil, water and landscape) stated by the Environmental Code (SFS, 1998b) and EU's EIA directive (Council of the European Union, 1997). Even if CE has found its way into the new Swedish EIA handbook for roads and railways (Trafikverket, 2011), the listed environmental aspects continue to be in focus there. For instance, they play an important role as a basis of scoping of the EIA work. Interestingly, the handbook has given the term environmental aspects a widened definition, comprising "environmental interests, environmental impacts and environmental consequences". This can be interpreted as an opening towards treating other environmental issues than those environmental aspects listed in the Environmental Code.

Environmental objectives and significant environmental impacts

The focus-group discussion brought forward the possibility of enhancing the treatment of CE by giving environmental objectives a stronger role in the EIA work.

The new EIA handbook (Trafikverket, 2011) suggests that regional, local and project-specific environmental objectives may be more practicable to use than the national objectives. We suggest project-specific environmental objectives, developed in a bottom-up process involving public participation, to take a role resembling that of VECs in other countries.

The focus groups revealed a strong tendency among proponents to try to avoid so-called significant environmental impacts. This mirrors the crucial procedural role of impacts designated as "significant" in Swedish EIA legislation. The Environmental Code states that the presence of significant environmental impacts forces more actor categories to be included in the mandatory consultation, which brings about time and cost expenditure. Significant environmental impacts have a crucial role also in many other countries (Canter and Ross, 2010), and the importance of selecting criteria for significance determination early in the assessment process has been long recognized (Duinker and Beanlands, 1986). We suggest that CE, within and across environmental aspects, be more consciously incorporated in the significance determination. Introducing the VEC approach and using project (or local) environmental objectives could be suggested as alternative or complementary means to enhance the treatment of CE in Swedish EIA work.

Collaboration, process integration and tools

Focus-groups' suggestions on more collaboration between actors in a project is in line with international practice (Canter and Ross, 2010). Collaboration is to be sought at different planning levels and stages. For instance, early collaboration between the CAB and the project executor is of major interest when writing the procurement documents. If the CAB demands more work on CE (when evaluating the EIS) and CE issues were not included in the procurement, the project will probably be delayed and made more expensive.

The focus-group discussions evidenced that getting the EIS approved with as little effort as possible is often a practical goal in consultancy work. Possibly, this finding may also have a connection to economic issues and latent power relations, as suggested by Antonson (2011). Duinker and Greig (2006) identify a discrepancy between proponents' focus on obtaining project approval and regulators' responsibility for making sure that its impacts are below acceptable levels. Seitz et al. (2011) find CEA, in practice, often to have limited scientific integrity and to have the goal of getting a proposal approved rather than assessing the CE, sometimes with the help of mitigation. Therivel and Ross (2007) consider mandatory CE analysis necessary in order for it to happen. As regulatory authority, the CAB could push CE development efficiently by demanding proponents of infrastructure projects to follow the EIA directive (Council of the European Union, 1997) in their EIA process. The proponents would then require CE assessment in their EIA procurement. This would demand increasing knowledge not only in the consultancy but also in the client organization. Procurement could therefore get a key role in enhancing CE treatment in Swedish EIA work. Procurement has been shown to have a crucial role in promoting environmental consideration in, e.g., large infrastructure projects (Varnäs et al., 2009).

Since 1993, landscape has been an issue to be assessed in Swedish EISs (Antonson, 2008). Sweden ratified the ELC in 2011. From now on, the treatment of landscape in Swedish EIA work should comply with ELC's definition of landscape (Antonson, 2011). This is much broader than the landscape conception conventionally practiced in Swedish EIA work. Also, the new EIA handbook (Trafikverket, 2011) states that the landscape analysis shall cover the aspects expressed in the ELC. The new definition will require much re-thinking among road planners and EIA consultants (Antonson, 2011). As an example, early in the process road planners must consider the landscape, not only road corridors. To include landscape *sensu* ELC in CE assessment will be a demanding challenge to infrastructure planning and EIA consultancy, notably due to inexperience, higher cost and lack of handbooks and tools. Using effective dialogue with the public may be a good way to start (Blicharska et al., 2011; Mikusinski et al., in press).

To understand cumulative effects on a landscape, cumulative change in that landscape must be identified. As proxies for change in the landscape at a broad scale, landscape metrics can be used to indicate cause—effect relationships. A range of such landscape metrics have been suggested by Seitz et al. (2011). They point to the need of a broad regional strategic approach to CEA that will

facilitate the estimation of the contribution of a project to the cumulative effects at a landscape scale.

Discussants differed in their views whether CE assessment should be part of the ordinary EIA/SEA process or performed separately. Some researchers suggest CE not to be a stand-alone item but integrated in the ordinary process (Bérubé, 2007). Challenges and opportunities to integrate CEA and SEA are discussed by Gunn and Noble (2011). Another important question is at what stage the CE assessment is most effective. Focus-group participants pleaded for early introduction. Early introduction is also emphasized by Baxter et al. (2001) and in on-going research projects concerning landscape and cultural heritage in Swedish road planning (Berglund et al., 2011; VINKLA, 2011).

According to the focus-group discussions and the literature review, today's methods for public participation in EIA work seem little purposeful. The high share of concepts grouped in the concept category "Dialogue/communication" points towards informants' view of involvement with actor groups as an important issue. The ELC puts focus on awareness and participation of the general public. Public consultation, currently predominantly in traditional formats, would probably be made much more efficient by using not only project websites (as recommended already by Morrison-Saunders and Arts, 2003) but also various novel dialogue methods such as participatory mapping (Wu and Isaksson, 2008), focus groups, guided promenades (Trafikverket, 2011), scenario techniques (Duinker and Greig, 2007; Noble, 2008) and network analysis (Cooper, 2010). Developing and using effective methods for public participation would not only enhance EIA work at large but perhaps CE assessment in particular. Baxter et al. (2001), for instance, conclude that locals do not experience the impact from single projects in isolation but the sum of impacts from all projects affecting them. Public consultation helps identifying key values and issues in a contextual setting and thus supports the CE scoping process.

Participants' wish for thresholds applicable to CE assessment is in line with the lack of science-based thresholds to indicate ecologically significant change (Dubé, 2003). Handbooks and guidelines, up-dated according to current legislation, were identified by the focus groups as an important aid to promote CE assessment in EIA work. Piper (2001) pointed out the lack of guidelines as one of the barriers to implementation of CE assessment in the UK. Our interpretation of the focus-group discussion is that this is currently also the case in Sweden.

Scales

The focus groups expressed much concern as to the geographical area of EIA work often being restricted to the area directly affected by the development project. The selection of spatial scales in EIA/SEA is crucial for CE assessment (Gontier, 2007). As Noble et al. (2011) report, the limited spatial scale, commonly set by the regulator, in project-based environmental assessment often hampers incentives to assess CE. Compared to project-based assessments, the assessment of CE needs to use much wider temporal and spatial scales (Dubé, 2003; Seitz et al., 2011). Broadening the spatial scale must not lead to the neglect of local issues, however (Therivel and Ross, 2007; Noble, 2008). Also, the risk of aggregation of impacts poses a risk of individual stressors being obscured or masked. Multi-scaled approaches are therefore recommended (Gunn and Noble, 2011).

Implementation of the ELC, with its landscape definition, will encourage planners to switch from treating isolated environmental issues to widening the survey area of assessment. Also, focusing on VEC as an assessment basis would in some cases, depending on the VEC chosen, demand a broader spatial scale (Hegman et al., 1999). Widening spatial scales to landscape could also help viewing the nibbling issue from a broader perspective. Interestingly, the new Swedish EIA handbook (Trafikverket, 2011) recommends considering CE when delineating the influence area to be subject to the EIA.

Conclusions

The lack of common understanding of the term CE poses a problem not only in potentially causing confusion among actors. Also, the direction and focus of the CE assessment process run the risk of being arbitrarily steered by conceptions held by the individual actor. There is much room for improvement to the guidance on CE assessment in Swedish EIA and SEA handbooks. Another pathway would be to modernize the Swedish EIA and SEA legislation based on state-of-the-art knowledge and state of the practice of CEAM in more advanced countries.

Interestingly, the literature reveals evident drawbacks concerning CEAM practice also in N America even if CEAM legislation and handbooks exist since long there. Obviously, problems are not only related to legislation and guidance but appear to be more deeply rooted. Some of the roots are probably to be found in the limited interplay between CEA practice and CE science (and other relevant fields of science). Practitioners appear little updated with scientific advancement or lacking incentives to use such knowledge. Also, there are signs of limited understanding of the nature of scientific research. On the other hand, scientists often fail to capture practitioners' needs. Practitioners frequently ask for methods useful in CEA. Typically, there is a demand for thresholds applicable to various aspects of CE assessment. Also, methods concerning monitoring are asked for, as are existing monitoring data. Co-ordination of retrieval and management of baseline, monitoring and follow-up data would enhance availability and reduce data gathering costs. Overall, there seems to be a great demand for knowledge support of quantification in CE assessment.

To bridge the gap between science and practice, several measures can be taken. More research must be devoted to CE per se, which calls for more support from funders of basic and applied research. Researchers need to present their research results in formats apprehensible for practitioners and applicable to practice. The scientific community also needs to be receptive to development needs of practitioners. Raising the scientific competence of proponents' project leaders and EIA consultants can be achieved by putting higher demands on scientific knowledge, preferably in multiple fields of science, when personnel is being hired. Further education of proponents, consultants, regulators, competent authorities, etc., may serve the same purpose. Also, internships and study visits to scientific institutions, planning bodies, infrastructure administrations, consultancies, etc., could add to the mutual understanding of roles, views, expectations, demands and knowledge.

These suggestions can be viewed as contributions to a range of incentives needed to raise the status of CEAM in Sweden and elsewhere. Other suggestions include regulatory authorities demanding high-quality CE assessment to approve proposals on projects and other development. Such demands will rapidly propagate through proponents to EIA and SEA consultants. Recent development in Sweden and elsewhere has shown the effectiveness of procurement as an instrument to enhance environmental concern in planning.

Our limited focus-group study evidenced a range of challenges which Swedish CE assessment and environmental assessment share with other countries. The problems facing CEAM therefore seem to be of a more universal character. They therefore deserve increased development efforts involving not only collaboration between science and practice but also experience exchange between countries.

With reference to the hypothesis in Section 1, our study has brought forward a range of improvement suggestions. Some of them emerged directly from statements made in the focus groups but many additional ones could be derived from statements describing short-comings and difficulties experienced in participants' professional day-to-day work. Administrative and procedural improvement suggestions comprise:

- use of the term CE in regulatory instruments concerning EIA/SEA;
- development of the interplay between CEA practice and CE science;
- co-ordination of retrieval and management of baseline, monitoring and follow-up data;
- giving local or project-specific environmental objectives, developed in a bottom-up process, a role resembling that of VECs;
- assessment of CE in relation to these environmental objectives;
- inclusion of CE, within and across environmental aspects, in determining the significance of environmental impacts;
- more practicable advice on CE treatment in EIA/SEA handbooks and guidelines;
- introduction of requirements on CE assessment in EIA/SEA procurement;
- strengthened generalist competence to enhance a holistic approach to environmental assessment;
- enhancing skills in stepwise analyses and indirect environmental effects.

In addition, the results indicate a need of research and development directed towards:

- adaptation of the Swedish EIA and SEA procedures to international state of the art and state of the practice;
- knowledge support of quantification in CE assessment;
- development of innovative means of public consultation in transport infrastructure planning.

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