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Cumulative effects in strategic environmental assessment: The influence of plan boundaries

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ABSTRACT

Cumulative effects (CE) assessment is lacking quality in impact assessment (IA) worldwide. It has been argued that the strategic environmental assessment (SEA) provides a suitable IA framework for addressing CE because it is applied to developments with broad boundaries, but few have tested this claim. Through a case study on the Danish mining sector, this article explores how plan boundaries influence the analytical boundaries applied for assessing CE in SEA. The case was studied through document analysis in combination with semi-structured group interviews of the responsible planners, who also serve as SEA practitioners. It was found that CE are to some extent assessed and managed implicitly throughout the planning process. However, this is through a focus on lowering the cumulative stress of mining rather than the cumulative stress on and capacity of the receiving environment. Plan boundaries do influence CE assessment, though all boundaries are not equally influential. The geographical and time boundaries of the Danish mining plans are broad or flexible enough to accommodate a meaningful assessment of CE, but the topical boundary is restrictive. The study indicates that collaboration among planning authorities and legally appointed CE leadership may facilitate better practice on CE assessment in sector-specific SEA contexts. However, most pressing is the need for relating assessment to the receiving environment as opposed to solely the stress of a proposed plan.

1. Introduction

The field of Impact Assessment (IA) covers a broad range of procedural tools, which all aim to facilitate transparent decision-making and sustainable development through the identification and evaluation of the impacts assigned to proposed developments (IAIA 1999; 2009). The International Association for Impact Assessment (1999) stresses that good IA practice includes an assessment of the contribution to cumulative effects (CE), commonly defined as "*changes to the environment that are caused by an action in combination with other past, present and future human actions*" (Hegmann et al., 1999:3). CE assessment focuses on the total stress on Valued Components (VCs), which for societal or scientific reasons are considered important (Canter, 2015; Canter and Ross, 2010; Hegmann et al., 1999; Johnson et al., 2011). This focus on the capacity of and stress on the receiving environmental (communicated as a VC) rather than solely the stress of solely the development under evaluation is a cornerstone in CE assessment (Duinker and Greig, 2006; Gunn and Noble, 2011; Hegmann and Yarranton, 2011; Therivel and Ross, 2007). Despite its importance, CE are assessed poorly in IAs worldwide (Morgan, 2012; Pope et al., 2013; Tetlow and Hanusch, 2012). Aside from explanations such as lacking conceptual understanding (Gunn and Noble, 2011) and legal guidance (Weiland, 2010), recent research has found that the institutional segmentation of IA responsibility can pose barriers for effectively addressing CE (Chilima et al., 2013; Kristensen et al., 2013; Sheelanere et al., 2013).

It has been argued extensively that the strategic environmental assessment (SEA) provides the most appropriate IA platform for CE assessment (Cocklin et al., 1992; Duinker and Greig, 2006; Gunn and Noble, 2011; Johnson et al., 2011; Therivel, 2010) – though some SEAs show poor CE performance also (Bragagnolo et al., 2012; Cooper, 2011; Noble, 2009). The prevalent argument is that SEA "*offers the chance to influence the kinds of projects that are going to happen*" (Therivel, 2010:18) because the developments under evaluation in SEA (programmes, plans and policies) cover multiple actions on a larger scale of space and time than for instance the project-oriented Environmental Impact Assessment — referred to as 'EIA' (Therivel and Ross, 2007). Yet, the developments subject to SEA are ultimately still bounded. This article proceeds under the assumption that there exist two types of boundaries for any CE assessment made in an IA context: an analytical boundary and a development boundary.

The '*analytical boundary*' marks the scale of space and time applied for considering the multiple (and often diverse) actions causing CE on a particular VC — as described in CE guidelines, such as CEAA (2012) and IFC (2013). João (2007:489) finds that the choice of an appropriate

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analytical scale (and thus also boundary) is critical in IA because it "*affects the problem addressed, the options found, and the impacts evaluated*". CE often occur on different scales among and within impact categories, and a multi-scale approach is thus often needed (João, 2002; Karstens et al., 2007; Therivel and Ross, 2007). For instance, a certain action may generate CE in the near proximity during the time of construction (narrow scale), while it simultaneously plays a part in larger, regional CE over the timespan of multiple years (wide scale).

The '*development boundary*' is in this study defined as the coverage of the development under evaluation. By that we mean that all proposed developments by default influence a set of actions, which may span across geography, time and topics, and which may cause CE. A proposed project is often a single action per se, which will be established on a particular location during a short period of time. Reversely, a proposed plan may cover multiple types of actions, which will take place within a larger planning area during a planning period. All developments can thus be characterised as having a set of geographical, time and topical boundaries — some more narrow than others.

Though not stated explicitly, much of the advocacy for CE assessment in SEA revolves around the argument that development boundaries influence the analytical boundaries, i.e. wider development boundaries allow better consideration of the multiple actions causing CE. Karstens et al. (2007:389) find that the decision-makers proposing and evaluating developments "*are often limited in their powers by the scale of the political system*", just as Bidstrup and Hansen (2014:32) find that planners can be limited by their "*institutional reality*". However, the influence of development boundaries on the analytical boundaries applied for evaluating impacts in IA is poorly studied. The research of Bragagnolo et al. (2012) does show that the assessment of CE in SEA can be bounded by the plan under study, but critical questions remain. Can development boundaries in SEA be expected broad enough to encompass the analytical boundaries appropriate for considering the actions contributing to CE, spanning across various topics and applied on various locations at various times? If not, are the development boundaries then restricting CE assessment?

This present study explores sector plans — a bounded development type commonly evaluated by SEA. Through a case study of Danish mining, the study tests the following hypothesis: *Plan boundaries influence the analytical boundaries applied for CE assessment in SEA*. Attention to one sector in one country was chosen as a means of deepening analysis to comprise also implicit CE assessment. The hypothesis was tested by exploring four topics: a) the understanding of CE among the SEA practitioners, b) the current practice on assessing CE, c) the extent to which plan actions are related to environmental stress beyond plan boundaries, and d) the opportunities for overcoming plan boundaries. The article opens with a short description of the case study context. The method is then described, after which results are presented with respect to each of the four topics. The article concludes with a discussion of the adequacy of CE assessment in SEA and the lessons learned.

2. Case study context: mining plans in Denmark

Denmark is a country in Northern Europe and a member of the European Union. The European SEA Directive (European Parliament, 2001) is implemented in Danish legislation through the National SEA Act (DMEF, 2013b), which states that all plans and programmes posing a risk of significant impacts must be evaluated by SEA. The act specifies that CE assessment is a mandatory element.

This study focuses on the plans regulating on-shore mining of mineral and raw material resources for the construction sector — such as sand, stone and chalk. In Denmark, planning is structured around the national planning hierarchy, which comprise a state level, 5 regions and 98 municipalities (DMIH, 2005). The national act on Mineral and Raw Material Resources (DMEF, 2013a) specifies that each region must produce a plan every fourth year – onwards referred to as a 'mining plan' – which accounts for how supply of resources can be ensured for the coming 12 years. Supply is ensured through establishment of mining zones, within which contractors then can apply for mining permits for mining projects. The plan boundaries of the case are thus:

Geographical boundary: regional

Time boundary: 12 years

Topical boundary: mining

The relation between mining plans, zones and projects is presented in Table 1, while a schematic overview of the planning process is presented in Fig. 1. The table and figure are based on the legal framework (see DMEF, 2013a) and interviews with the regional mining planners. The planning process consists of six phases. First, planners form ideas for a supply strategy and potential locations for future mining zones. Planners are during this phase supported by an 8 weeks public hearing, where stakeholders are invited to send in ideas and proposals for future supply. Proposed locations can only be taken into consideration if they hold substantial resources, and phase one is thus supported by geological mapping (phase two). Each proposed mining location is then evaluated in phase three, during which the onsite impacts are weighed in relation to both the size of the resource deposit (estimated in phase two) and the supply strategy (formed in phase one). The results of these multiple evaluations are then used to establish a full plan proposal in phase four. This proposal is subject to further 8 weeks of public hearing, where stakeholders are now invited to object and comment on the prioritisations and decisions of the planners. The hearing often results in an adjustment of mining zones (phase five) before ultimately approving the mining plan (phase six). As illustrated on Fig. 1, the planning process alters between a local zone focus and a regional plan focus.

SEA is drawn upon throughout the planning process. Broad environmental considerations are made when brainstorming ideas for a supply strategy in phase one, while assessment on a local zone level is an integrated part of phase three. The knowledge on local impacts near proposed mining zones is used to concretize plan-wise impacts in phase four, before returning to the local zone level in phase five. The local and regional assessments are separated in published form, though they jointly make up the 'SEA'. Plan-wide impacts are communicated in an 'SEA report' while more detailed accounts of the impacts of each mining zone are attached as multiple independent 'zone reports'. These latter reports are made in the planning process before contractors may propose specific projects, and thus they should not be confused with the environmental impact statements assigned to project EIA — see Table 1. A last thing to clarify is that the SEAs of Danish mining are sector-specific SEAs. Though each covering the geographical area of a Danish Region (a public administrative authority headed by democratically elected politicians), they have little in common with the broad SEA type 'Regional SEA' — as further clarified in Section 5.3.

Table 1
Mining plans consist of mining zones, within which contractors can apply for mining permits for concrete mining projects. Mining plans are evaluated by SEA, while mining projects may be evaluated by EIA. The study focuses on the SEAs. This is documented through an 'SEA report' and multiple 'zone reports'.

	Regulation	Focus	IA	Documentation
Plan	Plan approval	* Plan * Zones	SEA	* SEA report * Zone reports
Project	Mining permit	* Sub-zones	EIA	* Environmental Impact Statement