KTH Land and Water Resources Engineering

BEYOND IMPACTS: CONTEXTUALIZING STRATEGIC ENVIRONMENTAL ASSESSMENT TO FOSTER THE INCLUSION OF MULTIPLE VALUES IN STRATEGIC PLANNING

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SUMMARY IN SWEDISH

Miljöbedömning för planer och program har potential att förbättra den strategiska planeringen genom att användas som ett proaktivt verktyg i planeringen och därmed vara ett viktigt redskap i arbetet för hållbar utveckling. Det är dock en utmaning då den praktiska tillämpningen av miljöbedömning på strategisk nivå fortfarande till stor del begränsas till att endast bedöma effekterna av strategiska planeringsinitiativ och inte som ett hjälpmedel i tidiga strategisk planeringsskeden. En viktig förutsättning för att miljöbedömning för planer och program ska vara ett framgångsrikt verktyg i strategisk planering är att tillämpningen av miljöbedömningen utgår från den strategiska planeringskontexten. Det finns dock olika syn på hur miljöbedömning bör tillämpas i strategisk planering vilket har sin grund i att kontexten kan vara komplex och innefatta osäkerheter. Mot den bakgrunden är det övergripande syftet med den här avhandlingen att medverka till utvecklingen av miljöbedömning för planer och program genom att bidra med kunskap om hur miljöbedömning kan kontextualiseras till olika strategiska planeringssituationer för att därigenom verka som ett proaktivt och effektivt verktyg i strategisk planering.

I avhandlingen presenteras tre fallstudier som behandlar olika värden och som utgår från olika strategiska planeringssammanhang. Den första fallstudien behandlar den regionala utvecklingen av Sonso Lagoon i Colombia och utvecklingen av en miljöbedömningsprocess kopplat till den kontexten, den andra studien behandlar gränsöverskridande påverkan i Arktis med särskilt fokus på monitoring och förslag på en miljöbedömningsprocess med betoning på uppföljning. Den sista fallstudien är kopplad till Stockholmsregionen med utgångspunkt i hur gröna kvaliteter och ekosystemtjänster kan integreras i den strategiska planeringen. Kopplat till det presenteras ett förslag på en miljöbedömningsprocess för gröna kvaliteter i den urbana planeringen på regional nivå.

Resultaten från studierna visar att miljöbedömning som tar sin utgångspunkt i kontexten ger möjlighet att möta den strategiska planeringens intensioner, identifiera och engagera aktörer, härleda och prioritera nyckelvärden, samarbeta för att skapa kunskap om viktiga frågor, och att använda denna kunskap för att forma den strategiska planeringen. Fortsatta studier bör bl.a. undersöka hur deltagandebaserade miljöbedömningsprocesser kan bidrar till att främja miljöbedömningens roll i strategisk planering och därmed medverka till hållbar samhällsbyggnad.

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1. Azcárate, J. & Balfors, B. (2013). Network strategic assessment approach for dialogue and capacity development in NGOs. International NGO Journal, 8(3), 68-79.

ABSTRACT

Strategic environmental assessment (SEA) has the potential to improve strategic planning. However, meeting this expectation is a major challenge since SEA practice still constraints itself to assess the impacts of strategic planning initiatives. To advance the role of SEA beyond impact assessment, it has been argued that SEA needs to adapt to strategic planning contexts. Yet, there is a lack of consensus on how SEA should adapt to strategic planning contexts as these are complex, vary considerably and carry high levels of uncertainty. Against this background, the aim of this thesis is to contribute to the development of SEA by creating knowledge on ways in which it can be contextualized to different strategic planning situations. Three case studies addressing different values and strategic planning contexts were designed from which experiences on SEA conceptualization were drawn. The results show that developing strategic focused SEA frameworks that enhance dialogue, collaboration and knowledge generation on multiple values can address issues such as: the lack of data and objectives in developing planning contexts; gaps in knowledge and uncertainty associated to environmental monitoring in transboundary contexts; and the recognition of the importance of ecosystem services and their needed green qualities in urbanizing contexts. Based on the gained case study experiences, it is argued that SEA contextualization can mean addressing strategic planning intentions, identifying and engaging actors, deriving and prioritizing key values, collaborating to generate knowledge on key issues, and using this knowledge to shape strategic planning. Due to the complexity of the issues involved, contextualizing SEA is considered to be challenging to achieve and requires time and resources. However, based on the SEA case studies, it can be argued that the value added to strategic planning outweighs these requirements. Continuing to study the practice of context adaptable, strategic focused and participatory based SEA processes may contribute to advance SEA's role beyond impact assessment and enable reaching its expected potentials.

Key words: Strategic environmental assessment; Context; Values; Strategic planning; Participation; Ecosystem services; Monitoring

1. INTRODUCTION

Strategic environmental assessment (SEA) was conceptualized to complement environmental assessments at the project level by up-streaming these assessments to strategic initiatives such as policies, plans and programs (Lee and Walsh, 1992), which lacked assessment despite their potential to cause far more researching environmental effects than single development projects (Buckley, 1998). Due to its complementary and up-streaming role, SEA has been considered an important tool for integrating environmental issues in decision making (Goodland, 1998), and it has formally been defined as a systematic process to evaluate the environmental effects of strategic initiatives and their alternatives (Thérivel and Partidário, 1996).

Moreover, SEA's role has significantly influenced the establishment of SEA legal frameworks and SEA process design and application. In Europe, the European Union (EU) SEA Directive (OJEC 2001) aims to harmonize SEA application in member countries based on up-streaming project level environmental assessments to plan and program levels (Kläne and Albrecht, 2005). Additionally, the Protocol on SEA to the United Nations Economic Commission for Europe's Convention on Environmental

Impact Assessment in a Transboundary Context (UNECE, 2003), which is closely linked in focus and content to the EU SEA directive (Albrecht, 2005), explicitly promotes the application of project level assessment based SEA.

After the enactment of the SEA Directive and SEA Protocol, many developed countries embraced provisions for this type of SEA process in their legal systems (Fischer, 2007), and international organizations such as the World Bank and Regional Development Banks also introduced and promoted this type of SEA through their activities in developing countries (Dalal-Clayton and Sadler, 2005).

To meet the established legal requirements and international demands on SEA, a generic SEA process, similar in many respects to environmental impact assessment (EIA) processes used to assess individual projects, has been designed (Sadler, 2011). However, the application of this generic SEA process has perpetuated evaluation patterns that are not appropriate for evaluating strategic decisions that usually present undefined, unclear and complex planning and decision making contexts (Bina, 2007; Jiliberto H., 2007).

Based on this limitation of SEA practice, focus has been placed on modifying SEA's role by shifting perspectives from a do less harm to a do most good approach (Sadler, 2011). For instance, it has been argued that SEA should not only assess the impacts of strategic initiatives but that it should also improve them (Thérivel, 2004; João, 2005). In addition, SEA is increasingly being seen as a transformative process that should enhance policy and planning processes (Bina et al., 2011). To achieve this, however, it has been claimed that SEA needs to become more dynamic to adapt to the decision making context and to address the strategic dimensions of planning (Nilsson and Dalkmann, 2001; Vicente and Partidário, 2006; Jiliberto H., 2007; Bond and Pope, 2012). As well, it is claimed that it is important for SEA to interact with strategic decision making at appropriate points or decision windows (Dalkmann et al., 2004), and for SEA to become a strategic focused instrument that assesses the strategic components, objectives and principles that are put forth in planning and decision making (Partidário, 2007, 2009, 2012). However, there is a lack of SEA examples taking a strategic approach (Vicente and Partidário, 2006; Tetlow and Hanusch, 2012), which is a drawback to SEA's development as SEA conceptualization should evolve together with SEA practice (Cherp et al., 2007).

Another limitation to the conceptual evolution and the application of SEA has been a lack of clarity in respect to SEA's purpose, definition and scope (Wallington et al., 2007; Bina et al., 2011; Jiliberto, 2011). In recent decades, different types of SEA approaches have been developed that vary in focus, in the level of public participation, and in length (Verheem and Tonk, 2000; Therivel, 2004; Dalal-Clayton and Sadler, 2005). Moreover, SEA can exclusively focus on the environment (Fischer, 2003) or include social and economic issues when necessary (Verheem and Tonk 2000). SEA can also run in parallel to, be integrated with or replace planning and decision making processes (CEA, 2006; Sheate, 2010), and it can link to a variety of assessment techniques and tools, such as scenarios based on geographical information system (GIS), life cycle assessment and environmental management systems, adding considerable flexibility to SEA application (Thérivel, 2004; Balfors, et al. 2005; Sheate, 2010) but also confusion as to what SEA is to achieve and how it should perform (Verheem and Tonk, 2000; Vicente and Partidário, 2006; Tetlow and Hanusch, 2012).

In addition, SEA should be more adaptable to context and more participative. It is argued that the role of SEA in strategic planning needs to be developed so that SEA better adapts to different contextual situations and conditions (Hildén, 1999; Kornov and Thissen, 2000; Nitz and Brown, 2001; Hilding-Rydevik and Bjarnadóttir, 2007; Bina, 2008). However, it is challenging to establish what context in SEA is, as there

are many elements to context and no consensus on what it should constitute (Runhaar and Driessen, 2007; Runhaar, 2009). In trying to understand context and shaping SEA development accordingly, it is suggested that SEA should work explicitly with issues of power, value conflicts and knowledge generation (Richardson, 2005). In turn, meaningful participation in SEA is increasingly considered as a way to facilitate addressing these issues.

In participatory SEAs, competing values can be made explicit, adding value to SEA (Wilkins, 2003; Runhaar, 2009; Morgan, 2012). Moreover, cooperation between institutions and stakeholder involvement in planning and decision-making can be enhanced (Illsley el al., 2014), facilitating the inclusion of the different perspectives of multi-actors in complex decision making situations (Hedo and Bina, 1999; Sheate et al., 2001; Bina, 2007). As well, participatory SEA points out a new path where SEA cross fertilizes with other fields (Bina, 2007), plans for suitable participatory and communicative practices (Doelle and Sinclair, 2006; Vicente and Partidário, 2006), and applies strategies to collaboratively produce, exchange and transfer knowledge (Sheate and Partidário, 2010; Kornov 2011; Partidário and Sheate, 2013). However, carrying out meaningful public participation in SEA has been challenging. This has been so partly because of the forward looking and strategic nature of SEA (Sinclair et al., 2009; Sheate and Partidário, 2010; Elling, 2011), and due to a lack of participatory approaches, methods and techniques for an early and comprehensive involvement of the public in SEA (Sinclair et al., 2009; Partidário and Sheate, 2013).

In addition, by serving to integrate environmental issues in decision making, SEA's role has increasingly evolved towards enhancing sustainable development. For instance, SEA is viewed as aiming to contribute to sustainable development (Bina, 2007; Sadler, 2011; Tetlow and Hanusch, 2012), having the potential to integrate sustainability issues in strategic initiatives (Walker et al., 2014), promoting sustainable decision making (Fischer, 2003), and facilitating the creation of a development context towards sustainability (Partidário, 2012). Yet, it is argued that there remains ambiguity with respect to SEAs efficiency in achieving its sustainability mandate (van Doren et al. 2013). The main challenges that have been mentioned with this respect are: the existence of variable interpretations of sustainability in the context of SEA, a limited use of assessment criteria linked to sustainability objectives, and a lack of guidance on how to make SEA operable to facilitate sustainability integration in decision making (Noble et al., 2012; White and Noble, 2013).

Even though SEA has evolved from a generic one-size-fit-all impact assessment tool to a multi-purpose tool focusing on improving strategic decision making, SEA is still considered to be in a maturing phase (Richardson, 2005; Partidário 2011; Sadler, 2011; Tetlow and Hanusch 2012). Despite this, high expectations have been placed on SEA to contribute to a sustainable development. To meet these expectations, SEA needs to continue to mature through both theoretical and practical advances (Cherp et al., 2007).

1.1. Problem statement and research questions

A major challenge for SEA is to live up to the high expectations that have been placed on its role as an instrument to improve strategic planning. Principally, SEA is expected to serve as a fit-for-purpose tool with the potential to identify and include a plurality of key environmental and sustainability values in strategic planning (Sadler, 2011). However, the practice of SEA has shown slow progress towards reaching this ambition for SEA (van Doren et al., 2013). Until presently, the application of SEA has been dominated by the use and promotion of standardized and decontextualized SEA processes that focus on evaluating the environmental impacts caused by the implementation of strategic actions (Partidário, 2000; Bina, 2007; Jiliberto, 2007; Lobos and Partidário, 2014).

While SEA practice focusing on a better understanding of the strategic dimensions of context and aspiring to identify key values and alternative pathways for change has been largely limited (Vicente and Partidário, 2006; Partidário, 2007).

Moreover, other challenges for SEA seem to be difficulties in fostering a meaningful participation of a diversity actors and facilitating the inclusion of their views in strategic planning. The EU SEA Directive, for instance, only provides minimal requirements for public consultation and for the inclusion of varying perspectives in strategic planning (OJEC, 2001), which could have an effect on SEA practice. Apart from this, it has been claimed that engaging actors in deliberations on strategic issues is difficult or even impossible (Dalkmann et al., 2004; Vaughan, 2010), and that issues of power usually constrain and organize actor participation in such a way that only certain values are considered in strategic planning (Fischer, 2003). If SEA is to surpass these challenges and be considered a tool for enhancing public participation and the inclusion of the public's views in strategic planning, as is suggested by the Aarhus Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (UNECE, 1998), its practice should amply surpass the minimum requirements for public consultation that are put forth in formal SEA processes.

Additionally, while SEA monitoring is explicitly recognized as being essential to advance the implementation of strategic planning actions, research on SEA has generally focused on studying SEA as a tool to enhance the formulation of such actions, and much less so on its role to enhance their implementation (Partidário and Arts, 2005; Gachechiladze et al., 2009; Nilsson et al., 2009). Moreover, legal requirements for SEA monitoring are vague and minimum-level requirements (Partidário and Fischer, 2004), which fail to provide concrete guidance on how to organize monitoring and carry out scoping for monitoring (Persson and Nilsson 2007, Hanusch and Glasson 2008). As a consequence of both a limited research and a lack of guidance on SEA monitoring, there has been a general lack of its practical application (Partidário and Arts 2005; Hanusch and Glasson, 2008). In addition, when SEA monitoring has been applied, numerous challenges have been identified. Of significance is, for instance, the tendency for SEA monitoring to solely focus on controlling if the measures that have been set out in strategic planning are implemented (Lundberg et al., 2010; Wallgren and Nilsson, 2011), while conspicuously lacking strategic frameworks for uncertainty monitoring, which is needed to manage unexpected effects, address situations of gaps in knowledge, and link to adaptive management (Partidário and Fischer, 2004; Partidário, 2009). In relation to adaptive management, there also seems to be a lack of guidance on how to link SEA monitoring to existing environmental observation systems, and challenges to improve these systems as well as SEA monitoring application (Hanusch and Glasson, 2008; Gacheciladze et al., 2009; Wallgren and Nilsson, 2011).

Furthermore, due to its legal foundations in many countries and to its extending application as a strategic planning enhancing instrument, SEA is increasingly seen as appropriate to enable the inclusion of biodiversity and ecosystem services in strategic planning (Slootweg and van Beukering, 2008; Geneletti, 2011; Kumar et al., 2013). Various guidelines for including ecosystem services in SEA have recently been developed (Slootweg and van Beukering, 2008; OECD, 2010; Slootweg et al., 2010; Landsberg, 2011), as have several methodological frameworks (Geneletti, 2011; Helming et al., 2013; Partidário and Gomes, 2013; UNEP, 2014). However, various limitations for ecosystem services in SEA have been identified, including context related limitations regarding the actual potential benefits for strategic planning of including ecosystem services in SEA (Baker et al., 2013). Moreover, there is variation between the proposed methodological frameworks for ecosystem services in SEA.

Some promote informing strategic planning on ecosystem services through SEA (Geneletti, 2011; Kumar et al., 2013) and others aim to make ecosystem services part of the SEA assessment framework as a means to influence strategic planning (Partidário and Gomes, 2013). Furthermore, using SEA for the purpose of including ecosystem services in strategic planning is a fairly recent undertaking, and for this reason there are few practical examples that explicitly deal with this integration (Honrado et al. 2013).

From the above, it seems that research should focus on exploring ways in which SEA's role as an instrument for the enhancement of strategic planning can advance beyond the assessment of impacts. Specifically, it may be meaningful to explore ways in which SEA can adapt participation, monitoring and ecosystem services to strategic planning.

As a base to design such research and to directly address the challenges that have been put forth for SEA, the following research questions were formulated to guide the research that is contained in this thesis:

1) How can SEA adapt to context?
2) What can an active stakeholder participation and collaboration in SEA entail for strategic planning and how can this be reached?
3) Why should and how can gaps in knowledge and uncertainties be handled in SEA?
4) What type of tools can be developed within SEA to enhance dialogue on and the identification of key values and their interrelations?

1.2. Aim and specific objectives

The research questions contained in this thesis link to its overall aim, which is to contribute to the development of SEA by creating knowledge on ways in which SEA can be contextualized in different situations to foster the inclusion of multiple values in strategic planning.

Since the research that is included in this thesis is based on case study designs taking place in varying contexts, Colombia (Paper I), the Arctic (Paper II) and Sweden (Paper III, IV and V), specific objectives for each case study design are formulated and linked to the overall aim and research questions of the thesis.

The specific objectives of the thesis are to:

a) Analyse interrelations between data needs and objective formulation in SEA in data and strategic objective scarce planning contexts (Paper I)
b) Develop strategies to manage gaps in SEA application and monitoring in a transboundary context (Paper II)
c) Identify challenges and measures for the integration of green qualities in urban development (Paper III, IV and V)
d) Develop context adaptable SEA approaches to enable the consideration of multiple values in strategic planning (Paper I, II, III, IV and V)

1.3. Scope

The study of various strategic planning contexts set the scope of the thesis. The strategic planning contexts are studied to explore ways in which SEA can adapt to their different circumstances and situations, and to assess if SEA can be used as a support tool to improve strategic planning beyond impact assessment. The main intention of attempting to adapt SEA to context is to identify and foster the integration of multiple values in strategic planning processes.

Three strategic planning processes are included in the scope of the thesis: (1) The developing region of the Sonso Lagoon, Colombia; (2) The transboundary Arctic region; and (3) the Stockholm region, Sweden. The studied strategic planning processes varied widely in context and values, and hence provided valuable opportunities to address the aim of the thesis.

For instance, in the Sonso Lagoon the strategic planning ambition was to develop a lagoon management plan that should become a first concrete step toward supporting the declaration of the lagoon as a Ramsar site of international importance. Environmental, social and economic values and their interrelations were placed in focus, as well as principles for the wise use of wetlands (Ramsar, 2004a).

In the Arctic, the strategic planning intention focused on strategically shaping the development of the region's environmental observation systems and on improving the application of SEA monitoring. In this context, climate change values were placed in focus, and links were made to environmental observation systems and to adaptive management principles.

In the Stockholm region, the strategic planning aim was to highlight the importance of green areas, their qualities and ecosystem services so that these could be included in regional and local urban planning agendas. Here, focus was placed on a plurality of values linked to urban green areas, green qualities and ecosystem services.

Apart from specifically studying the above mentioned strategic planning processes, deliberative democracy, collaborative and communicative planning and implementation theories are included in the scope of the thesis. These theories support studying SEA's adaptation to varying strategic planning contexts.

The scope of the thesis is however limited with respect to full applications of SEA. In none of the studied strategic planning context is a full SEA applied, instead certain aspects of SEA, such as data collection, objective formulation, uncertainty handling and monitoring, and the inclusion ecosystem services, are studied. The intention with setting the scope of the thesis is to study the details surrounding these issues and less so on carrying out complete SEA processes.

1.4. Organization

The thesis is organized in eight (8) sections. Section one (1) introduces SEA, the research questions, aim and objectives, and sets the scope of the thesis. Section two (2) presents the theoretical framework. Section three (3) describes the used research strategy and designs, as well as their associated methodological approaches and techniques. Section four (4) provides details on the study areas of the Sonso Lagoon, the Arctic region and the Stockholm region. Section five (5) presents a state of the art review of SEA in the context of each of the above mentioned study areas. Section six (6) outlines the research results based on the five papers that are contained in the thesis. Section seven (7) discusses the results in light of the research questions, aim and objectives, and provides insights on potential future studies for SEA. Lastly, section eight (8) presents short concluding remarks.

2. THEORETICAL FRAMEWORK

Deliberative democracy, collaborative and communicative planning, and implementation theory were used as a theoretical framework for the research that is presented in this thesis. The theories constituting the theoretical framework were chosen because it was considered that they could provide a base from which to strengthen the role of SEA as an instrument that enables the inclusion of multiple values in strategic planning.

In the social sciences the critical theory of deliberative democracy was developed to counterbalance the governing liberal theories of capital mobility and a free market economy (Dryzek, 2000; Hajer and Wagenaar, 2003; Mouffe, 2005). In planning, the theory of collaborative, communicative planning was conceptualized as a reaction to the dominating, centralized and top down rational planning model (Lane, 2005; Healey, 1999; Innes and Booher, 1999). And, in policy making, the theory of implementation was developed to study how and why public policy is put into effect (Schofield and Sausman, 2004).

2.1. Critical theory and deliberative democracy

According to Dryzek (2000), critical theory is a school of thought that promotes citizen

competences through participation and democratic politics so that a progressive understanding of and an individual and societal emancipation from oppressive status quo ideologies can be reached. Deliberative democracy theory is derived out of critical theory, and even though it is a difficult concept to define (Crowley, 2009), it is claimed that Jürgen Habermas established its normative foundations (Elstub, 2010).

Habermas conceptualised two possible sorts of reason in social life under deliberative democracy: communicative rationality (an understanding between individuals) and instrumental rationality (the capacity to devise, select and effect good means to clarified ends), of which the latter dominated causing what Habermas calls the scientisation, commercialisation and bureaucratisation of modern society (Dryzek, 2000).

To address this problem, advocates of deliberative democracy argue that open and rational deliberations should be located in civil society so that a diversity of discourses will have the opportunity to interact and lead to a convergence of preferences and to consensus (Dryzek, 2000; Crowley, 2009).

Moreover, deliberative democrats argue that engaging the public in decision making processes will create public opinion that will influence decision making and result in just, inclusive and legitimate common outputs or well-argued development alternatives (Mouffe, 2005).

Achieving these outputs will contribute to accomplish the ultimate purpose of deliberative democracy theory, which is a revival of democracy and the improvement of policies through greater public involvement in decision making (Crowley, 2009).

2.2. Collaborative, communicative planning theory

The theory of deliberative democracy directly influenced collaborative, communicative planning theory, which links Haberman's concept of communicative rationality to the notion of space or place (Healey, 1999, 2003; Innes, 2004; Lane, 2005). The notion of space is a social construct made up of values where different social, cultural, economic and natural relationships take place and interact, and which, according to Healey (1999), should be understood to improve planning and its influence over decision making.

The main purpose of collaborative, communicative planning should then be to engage concerned actors in public debates and discourses so that intercultural dialogues for the understanding of space are developed (Healey, 1999; Innes and Booher, 1999; Lane, 2005).

Through intercultural dialogues, it will be possible to understand complex spatial relations, deal with conflict, respond to the changing conditions of an increasing networked society, and reach consensus to better plan and organise action (Innes and Booher, 1999).

Additionally, it is argued that a purpose of collaborative, communicative planning is to challenge and transform established approaches to governance that represent the interests of a few and poorly consider the impacts of decision making in multicultural contexts (Healey, 2003).

An expected output of collaborative, communicative planning would be to generate governance approaches that are inclusive, just and creative, and that encourage mutual learning, respect and advancement (Innes, 2004).

2.3. Implementation theory

Implementation theory explains the implementation process, from policy making to the effects of the implementation (Ferman, 1990; Parsons 2001). According to Pressman and Wildavsky (1973), the founding fathers of implementation theory, policy implementation can be viewed as a process of interaction between the setting of goals and actions geared to achieve them.

The literature defines key implementation factors as: imprecision of policy; unclear organizational responsibilities; lack of administrative capacity; inconsistent

legislation; lack of feedback procedures; insufficient resources; obstructive alliances; and knowledge gaps etc (Pressman & Wildavsky, 1973).

Since its birth in 1970s, the theory has emphasized top-down processes (Sabatier 1986), as well as bottom up processes (Lipsky, 1980). One studied condition for the bottom-up approach is "local level bureaucratic" practices, i.e. studying the processes and their outcomes from the practitioners who actually implement the policy at the local level. Moreover, implementation addresses the importance of implementation contexts, values and uncertainties (Schofield and Sausman, 2004; Paudel, 2009).

3. METHODOLOGY

A qualitative research strategy was selected in light of the nature of and to address the research aim, which focuses on the development of SEA. A qualitative research strategy can be appropriate to study the practice of SEA, as it allows gathering and analysing empirical data on the phenomenon within its specific contexts, as well as identifying data patterns from which meanings can emerge (Strauss and Corbin 1990).

The undertaken qualitative research strategy was based on a literature review of several themes and on three case study designs taking place in different contexts. The literature review focused on themes related to the aim and objectives of the research. Themes such as environmental assessment (SEA and EIA), urban planning theory (collaborative and communicative planning and compacting city planning), and environmental management (Ramsar wetland wise use principles, environmental monitoring and an ecosystem services approach) were placed in focus and explored. For each of the themes a state of the art was derived, which allowed to identify research gaps and needs, and to formulate the objectives of the research.

The case study designs were developed to complement the literature review by enabling in depth and comprehensive understandings of the studied phenomenon (Yin, 1984; Bryman, 2012), in this case SEA and its strategic planning contexts. Moreover, case study designs were chosen to provide flexibility in data collection and make predictions and generalizations more careful (Sokolovsky, 1996; Easton, 2010).

As the case study designs ran in parallel to the literature review, they too facilitated identifying reach gaps and needs, and (re)formulating the research aim and objectives. This meant that data needs, collection and analysis in the literature review set the stage for data needs, collection and analysis in the case study designs and vice versa, which led to an iterative process for the identification of research gaps and needs, and for the refinement of the aim and objectives of the research (Fig. 1).

The three case studies were designed, respectively, for the developing region of the Sonso Lagoon, Colombia (Paper I), the transboundary Arctic region (Paper II), and the compacting Stockholm region, Sweden (Paper III, IV and V). These case studies were chosen because they represented diverse strategic planning contextual conditions, which provided an opportunity

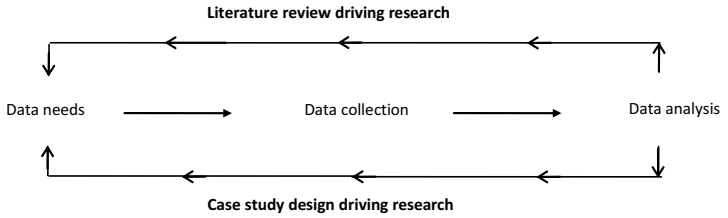

Fig. 1. Methodological iterative process driving the research and data needs, collection and analysis.

to study different ways in which SEA could adapt to context. The Sonso Lagoon case study represented a developing country context facing weak and data scarce planning. The Arctic region represented a transboundary context facing governance limitations in terms of poor environmental assessment and monitoring. While the Stockholm region represented a rapidly urbanizing context experiencing conflicts of goals between urbanization and ecosystem and ecosystem services preservation.

As the contexts and needs of each case study varied significantly, different methodological approaches and techniques were used to collect and analyse data.

In the Sonso Lagoon case study, action research was used as the main methodological approach. In action research, researchers are immersed in the study and actively participate to create an iterative data generation and collection process (Denscombe, 2003). In the Sonso Lagoon, such a process was established by carrying out literature reviews and an active involvement of the research team in interviews, a workshop and field visits. The research team was composed of four researchers with varying professional backgrounds, contributing with different insights and jointly carrying out all of the research activities. The interviews, workshop and field visits targeted and took place with local and regional actors from public institutions, industries, fishing communities, landowners, non-governmental organizations and environmental experts. Data was collected using these methodological techniques until it was considered that enough data had been collected.

Collaborative learning research was selected as the main methodological approach for the Arctic case study. Collaborative learning research is multidisciplinary in nature and entails engaging individuals in knowledge generation and sharing (Weinberger et al., 2007). In the case study, a research team composed of two researchers working with environmental monitoring and two researchers working with environmental governance was engaged in knowledge generation and sharing. Face-to-face meetings, which are basic for collaborative learning (Strijbos and Fischer, 2007), took place between the researchers from different disciplines as a means to structure the research and data collection. Moreover, literature reviews were carried out to collect data on SEA implementation and monitoring and on environmental observation systems in the Arctic.

In the Stockholm region case study, a mixed qualitative and quantitative methodological approach was used. The mixed approach used a spatial quantitative analysis based on a Geographic Information System (GIS) together with qualitative methodological techniques such as literature reviews, explorative interviews (Kvale and Brinkmann, 2009), and a workshop. The spatial quantitative GIS analysis aimed to quantify in monetary terms green area provision of cultural ecosystem services, as well as pressures on green areas in terms of number of potential users within walking distance to green areas. For this purpose, topographic, land cover and habitat data, as well as population statistics were used. The literature reviews focused on studying urban development plans in the region. While the explorative interviews were carried out with engaged practitioners in urban planning to collect their perspectives on conflicts and measures for green qualities in the Stockholm region. The workshop also focused on collecting practitioner perspectives on these issues, but researchers and students were also involved. The generated and collected data was then analysed using a content analysis to identify emerging patterns of meaning from the content and context of the data (Krippendorff, 2004).

4. STUDY AREAS

Three study areas were examined in the research. These were the developing region of the Sonso Lagoon, Colombia, the transboundary Arctic region and the compacting Stockholm region, Sweden.

4.1. The developing Sonso Lagoon region

Sonso Lagoon is located in the Cauca valley region in the western part of Colombia. It lies approximately 60 kilometres north of the major regional city of Cali (pop. 2.4 million) and about five kilometres south west of the city of Buga (pop. 131,000) (CVC, 2004). The lagoon is part of the Cauca River-wetland ecosystem, and has a total area of 2,045 ha (Escobar, 1998; CVC, 2002). The studied area comprises the Sonso Lagoon and its area of influence that stretches upstream to the city of Cali (Fig. 2).

Sonso Lagoon is the last wetland of significant size that remains in the Cauca valley (Patiño, 1991). It is a critical habitat for local flora and fauna, and for migratory birds that mainly come from North America (Álvarez-López, 1999). Moreover, local fishing communities have depended on the lagoon for their sustenance for many years (Escobar, 1998). For these reasons, the lagoon has been considered significant from both international and regional perspectives. However, the ecological state of the lagoon has degraded significantly due to human action (CVC, 2002). To avoid further ecological decline, local stakeholders would like the wetland to be declared a Ramsar Wetland of International Importance. To achieve this, a comprehensive management plan for the lagoon must be developed (Ramsar, 2004a). Moreover, it is recommended that an SEA be made an integral part of the management planning (Ramsar, 2004b). However, there is no previous experience with the development of such a plan, and in Colombia there are relatively few experiences with SEA implementation (Amaya and Bonilla, 2007). The Sonso Lagoon case is thus considered to be a good opportunity to introduce SEA as a suitable planning support tool having the potential to contribute to formulate strategic development objectives in data scarce planning contexts.

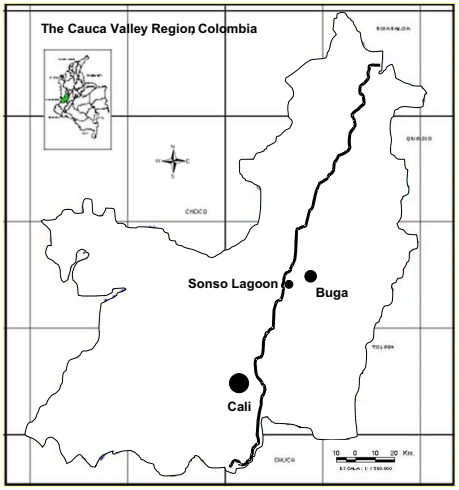

Fig. 2. Sonso lagoon and its area of influence (adapted from CVC, 2004).

4.2. The transboundary Arctic region

The Arctic region comprises the Arctic seas and their adjoining land areas, which vary in extent depending on the used delimiting approach (Hall and Saarinen, 2010) (Fig. 3). The unique natural and cultural features of the Arctic make it a fascinating place that should be preserved for future generations. However, its preservation is challenged by rapid and unprecedented environmental change caused by continuous raising temperatures (Serreze and Francis, 2006; Serreze et al., 2009; Serreze, 2010; Walsh et al., 2011).

Climate change in the Arctic could lead to a seasonally ice free Arctic Ocean in a near future (Stroeve et al., 2012), which can cause permanent impacts on Arctic ecosystems, its species, and the lifestyles of its indigenous peoples (ACIA, 2005, Hinzman et al., 2005). Moreover, such a significant sea ice retreat could mean an escalation of human activities in the region, exemplified by an increase in hydrocarbons exploitation (Serreze and Stroeve, 2008, Casper 2009), vessel transportation and other resource intensive industrial activities that could further impact the fragile Arctic socio-ecological systems (UNEP, 2007).

Governance mechanisms such as the Arctic Environmental Protection Strategy (AEPS), the Arctic Council, several international, multilateral and bilateral treaties, and legal frameworks for environmental assessment and monitoring have been established to frame the development of the Arctic (UNEP, 2007; Koivurova, 2008; Casper 2009). However, research indicates decline and deficiency in Arctic environmental monitoring (Lammers et al., 2001, Shiklomanov et al., 2002), with particular gaps in monitoring of hydrochemistry (Bring and Destouni 2009), in areas where climate change (Bring and Destouni, 2011) and ecosystem shifts (Karlsson et al., 2011) are expected to be the greatest. In addition, it appears that the national environmental assessment systems that have been established by the Arctic States vary considerably, poorly consider the specific characteristics of the Arctic, and are seldom applied in the region (Koivurova 2008).

The uniqueness and rapidly changing environment in the region makes the Arctic an interesting case to explore. Moreover, of special interest are the apparent regional governance limitations with environmental monitoring, which may be identified and addressed with the design of a transboundary SEA approach.

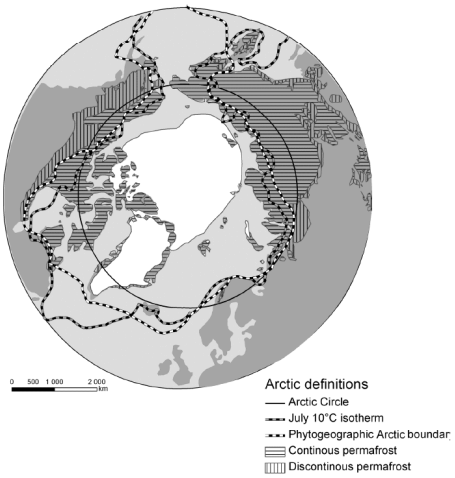

Fig. 3. Delimitation of the Arctic. Source: Hall and Saarinen (2010).

4.3. The compacting Stockholm region

The study area embraces a large part of the Stockholm region, Sweden. It includes central parts of Stockholm city, many of its suburbs, and the whole or larger parts of several municipalities such as Stockholm, Lidingö, Nacka, Sundbyberg, Solna, Danderyd, Haninge, Huddinge, and Tyresö (Fig. 4). The study area is located within the Stockholm County, one of Sweden's densest and fastest growing counties that, however, still offers varying green landscapes such as large forested areas and open agricultural areas that respectively account for 50 and 20 percent of the land area (Statistics Sweden, 2012).

From a European perspective, the Stockholm County and its urban areas can be considered to provide a high coverage in green areas (Elmqvist et al., 2004; Colding, 2013). Urban residents in county have access to ten green wedges that stretch from the region's rural-urban fringe to the centre of Stockholm City (Office of Regional Planning and Urban Transportation, ORPUT, 2010). Moreover, urban residents can access, at a close distance, other types of green areas, such as nature reserves, city parks and natural shore-lines, as well as a large number of golf courses, private gardens and allotment gardens that provide opportunities for biodiversity and ecosystem services in the urban region (Barthel et al. 2005; Colding el al 2006).

However, these green areas are affected by continuous and rapid urbanization (Bolund and Hunhammar 1999; Mörtberg 2009; Borgström 2011; Colding 2013). Population growth in the region has been estimated to be as much as 250.000 to 400.000 new households until 2030 2030 (ORPUT, 2010). To manage this population increase and its associated urbanization pressures, certain regional cores are planned to be intensively compacted and some strengthened with additional transport infrastructure (ORPUT, 2010). There is therefore a risk that these activities could negatively impact green areas

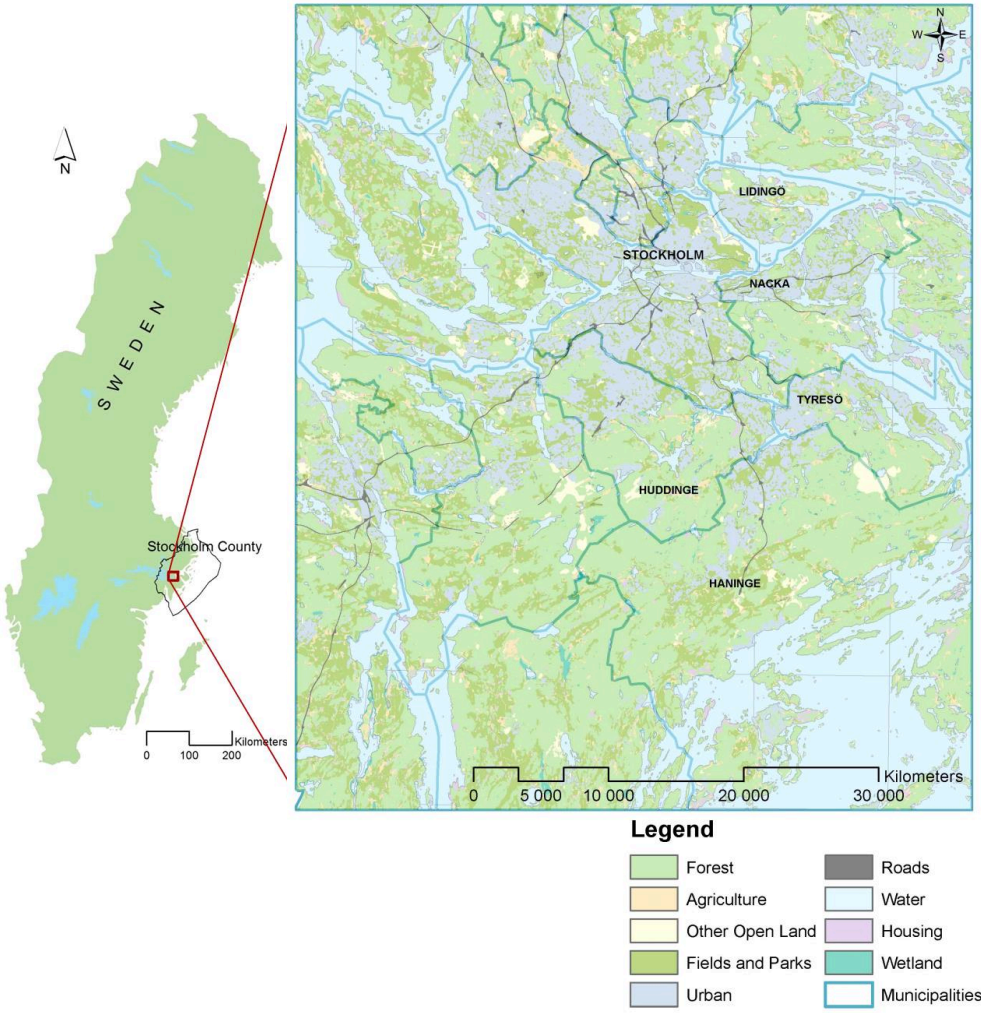

Fig. 4. The study area located within the Stockholm County, Sweden

and the provision ecosystem services within the intervened areas.

The study area in the Stockholm region offers an opportunity to analyse challenges and measures for green areas and their ecosystem services in a compacting city setting. Moreover, it provides an opportunity to explore different approaches that could contribute to simultaneously reach urban compaction and green area preservation objectives.

5. State of the art review for SEA

A state of the art review for SEA is presented in relation to the three case studies that are contained in the research. The review acts as a departing point for the development of SEA approaches in the specific contexts of the case studies.

5.1. SEA in developing countries

Even though empirical experiences that could facilitate to evaluate different SEA approaches are still missing in developed countries (Thissen, 2000), most of these

have adapted SEA systems (Dalal-Clayton and Sadler, 2005). However, in newly developed and developing countries, there is both a lack of adapted SEA systems (op. cit.) and of SEA experiences (Liou and Yu, 2004).

In developing countries, most of the limited applications of SEA have been related to international development cooperation and have been required by institutions such as the World Bank (Dalal-Clayton and Sadler, 2005). It is stated that a north-to-south exporting trend of westernised SEA models has developed, and that its consequences in developing countries have not yet been sufficiently studied (op. cit.). It is also mentioned that, for example, in Asia where westernised SEA models have been weakly implemented, environmental issues have been considered at a strategic level through Agenda 21 and with internationally treaties such as the Ramsar Convention on Wetlands (Briffett et al., 2003).

In addition, it is argued that SEA implementation in developing countries will be challenging due to poor existing institutional conditions, corruption and conflicts of interest (Dalal-Clayton and Sadler, 2005). Moreover, it is considered that factors such as the current lack of adequate planning, unclear development goals, unavailability of environmental data, lack of knowledge in SEA, inappropriate public participation, low awareness or concern for degraded environmental conditions and the poor results that have been achieved with EIA will affect SEA implementation in developing countries (Xiuzhen et al., 2002; Briffett et al., 2003; Liou and Yu, 2004).

Despite all this, SEA is seen to be an appropriate tool that can aid to meet the above-mentioned problems in developing countries. For instance, Briffett and colleagues (2003) and Rossouw and colleagues (2000) state that by considering key environmental and sustainability issues earlier in strategic decisions, SEA can improve conditions for project EIAs and hence strengthen their performance. Furthermore, in countries such as China where public participation is limited, SEA is deemed to improve transparency in decision making (Xiuzhen et al., 2002). Additionally, SEA is considered to aid in the planning of important country development strategies and to enhance sectoral and cross-sectoral plan and programme compatibility (ME & UNDP, 2005). Rossouw and colleagues (2000) also mention that SEA is an effective tool used to identify and make operable clear sustainability objectives in planning. Kessler (2000, 2003) states that by implementing participatory-based SEA type approaches, education and environmental awareness are enhanced and institutional constraints improved.

In Latin America, SEA type approaches have been applied to aid in the formulation of sustainable development plans at regional and municipal levels (op. cit.). However, the World Bank and the Inter-American Development Bank (IADB) have led most SEA experiences in the region (Dalal-Clayton and Sadler, 2005).

For instance, in Colombia these institutions have required that SEAs be applied for land use plans and in the energy, housing and transport sectors (op. cit.). Moreover, since 2003 the Ministry of Environment has organized workshops and carried out sector and regional SEA pilot studies together with other Ministries and governmental institutions to study and design a possible SEA model for the Colombian context (Bonilla and Pineda, 2007a).

Even though Colombia was the first country in Latin America to incorporate EIA concepts in its legislation to evaluate projects (Wathern, 1988), it has not yet incorporated SEA provision into its laws (Amaya and Bonilla, 2007). Discussions on the adequacy of legally requiring the SEA in Colombia have taken place but no consensus has been reached, as there are voices favouring its legalization and others considering that SEA application should be evaluated on a per case basis and that a transition period is needed before SEA can become legally binding (Amaya, 2007).

Despite this, SEA was incorporated into the National Development Plan for the periods of 2002–2006 and 2006-2010, mostly to be applied in sector planning and in some cases in regional and land use planning (DPN, 2003; Bonilla and Pineda, 2007b). In addition, the Ministry of Environment has included SEA in its strategic planning and is actively working to promote and increase institutional capacities to use SEA in the country (Bonilla and Pineda, 2007a). However, as of now, studies, guidance and experiences of SEA application in Colombia are very limited (op. cit).

5.2. SEA in the transboundary Arctic region

In the transboundary Arctic region all Arctic states have adopted EIA and SEA provisions in their national legal systems (Koivurova, 2008). After joining the European Union (EU), Sweden and Finland adopted the environmental assessment requirements of the EU Directives on EIA (OJEC, 1985) and SEA (OJEC, 2001), as did Norway and Iceland, even though they remain outside the EU. On the other hand, Greenland (Denmark) adopted its own environmental assessment regulations, Canada established EIA and SEA provisions through Cabinet Decisions, the USA regulated EIA and SEA in its 1969 National Environmental Policy Act (NEPA), and the Russian Federation established EIA- and SEA-like provisions under its SER/OVO system (Wood, 2003; Dalal-Clayton and Sadler, 2005; Koivurova, 2008).

In theory, by having adopted regulations for EIA and SEA in their national legal systems, the Arctic states are obligated to carry out environmental assessments for projects, plans and programs, and in some cases for policies, that potentially have a significant impact on Arctic environments. However, as variations exist between the legal environmental assessment systems of the different Arctic countries, the application of EIA and SEA has varied considerably in the circumpolar region (Koivurova, 2008).

Another form of environmental assessment that has recently been applied in the Arctic is Transboundary Environmental Assessments (TEA). TEA focus on improving the consideration of cross boundary effects in environmental assessment processes (Bastmeijer and Koivurova, 2008). TEA processes follow the standard procedures of EIAs and SEAs, but the transboundary issues that are dealt with in TEAs usually add administrative, political, and regulatory complexities (Bruch et al. 2008). The use of TEAs has been considered in various multilateral and bilateral treaties for the Arctic, and consideration of transboundary issues has been stimulated by the Arctic Environmental Protection Strategy (AEPS) and the United Nations Economic Commission for Europe's Convention on Environmental Impact Assessment in Transboundary Contexts (the Espoo Convention).

By signing the AEPS in 1991, the eight Arctic countries committed themselves to assess the potential environmental impacts of development activities in the Arctic (AEPS, 1991). The AEPS contains general guidance on environmental assessments, focusing on the assessment of Arctic environmental effects by different types of pollution, climate change and human activities like resource exploitation and transportation, but in the AEPS there is no direct reference to EIA, SEA or TEAs as possible tools for implementing environmental assessments.

However, through the Espoo Convention, the Arctic states did commit themselves in 1991 to specifically carry out EIAs on planned development activities taking place in transboudary contexts (UNECE, 1991). The activities requiring such EIAs are listed in Appendix I, and according to Article 2.3 if the planned activities are expected to cause significant impacts to the environment, signatory states should engage in discussions. As support to signatory states, guidelines on how to determine the significance of impacts have been included in Appendix III. SEAs for policies, plans and programs in transboundary contexts are also suggested to take place as stated in Article 2.7. However, as carrying out

SEAs for strategic actions above the project planning level is discretional, and as the parties to the Convention recognized the importance of including environmental and health issues in the preparation of plans and programs, and to a certain extent to policies and legislation, it was decided to develop and add a specific protocol on SEA to the Espoo Convention (UNECE, 2003).

The Protocol on SEA to the Espoo Convention (the SEA Protocol) was signed by 35 countries, including the four Arctic states of Norway, Finland, Sweden and Denmark, in May 2003 (Koivurova, 2008). The SEA Protocol requires that transboundary effects are explicitly addressed (Therivel, 2004), emphasizes public participation (Article 6 and 8.5 and Appendix V), and acknowledges the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (the Aarhus Convention). The protocol goes beyond the scope of the EU SEA Directive, and proposes, in Article 13, that SEAs be discretionally applied to legislation and policies. The SEA Protocol is open to all United Nation members, and came into force on July 2010 (UNECE, 2011).

To facilitate the implementation of environmental assessments, several guidelines on EIA and SEA have been formulated (Glasson et al., 1994 and Therivel, 2004). For the Arctic region, specific guidelines on environmental assessment have been established to support the implementation of the AEPS, the Espoo Convention and the SEA Protocol (Koivurova, 2008). The Guidelines for EIA and SEA in the Arctic (AEPS, 1997) address the uniqueness of Arctic ecosystems and conditions, they consider cumulative impacts, transboundary issues, participation of indigenous peoples, and suggest that SEAs should be carried out for plans and programs that take place before project planning. In the guidelines, SEAs for regional and sector planning in the Arctic are considered as a means to facilitate consideration of general sustainability issues, and set a strategic stage for the more specific EIAs of projects. Equally, the Guidelines for EIA and SEA in the Arctic highlight the assessment of transboundary aspects in human activities, such as oil and gas exploration, vessel transportation, tourism, infrastructure development and urbanization, which are expected to cause transboundary impacts to the Arctic's environment. Moreover, in Chapter 11 proposals are given to Arctic states on how to best consider transboundary issues in their environmental assessments.

Despite the existence of the Guidelines for EIA and SEA in the Arctic these appear to be rarely used. Reasons, according to Koivurova (2008), are a lack of awareness on their existence and that few EIAs, SEAs and TEAs have been reported for the Arctic as planned activities for the region have not yet taken place in a large scale. Moreover, there seems to be a lack of capacity and knowledge on how to implement environmental assessments (Bruch et al., 2008), and consultations with authorities and the public are considered to be poor and challenging due to a lack of clearly regulation (Albrecht, 2008). Accordingly then, many national and cross boundary activities having environmental and sustainability impacts in the Arctic are neither assessed nor monitored.

5.3. SEA in Sweden

Swedish legislation on SEA and EIA is based respectively on EU Directive 2001/42/EC (OJEC, 2001) and EU Directive 85/EG/EC (OJEC, 1985). Provisions for the SEA and EIA Directives are incorporated in chapter 6 of the Swedish Environmental Code and entered into force in 2004. Moreover, supplementary provisions were introduced 2005 in the Ordinance (1998:905) for both SEA reports and EIA environmental impact statements. In parallel, amendments in the Swedish Planning and Building Act (comprehensive plans and detailed development plans) and the Act on Municipal Energy Planning were made pursuant to the Environmental Code.

The context of application of SEA in Sweden is the Swedish planning system. The

Swedish planning system is comprised of sector planning and municipal land use planning, and lacks to a great extent regional and national statutory plans, although sector plans do include the local, regional and national planning levels (Emmelin and Lerman, 2005; Hilding-Rydevik and Fundingsland, 2005; Bjarnadóttir, 2006). In Sweden, there are only a few examples of SEAs applied to regional development plans. This is mostly because few regional development plans exist in Sweden, with the exception until recently of the regional plan for the Stockholm region (RUFS 2010) and that of the Gothenburg region (Hilding-Rydevik and Fundingsland, 2005).

To provide clarity on the way that SEA must, should and can be applied in Sweden, and to complement SEA guidance on its application to Swedish land use planning The National Board of Housing Building and Planning published SEA guidelines in 2006 and the Swedish Environmental Protection Agency (SEPA) has published SEA guidelines in 2010. The National Board of Housing, Building and Planning has particular responsibility for providing guidance on strategic environmental assessment relating to municipal comprehensive plans and detailed development plans.

It is considered that Sweden has taken a minimalist approach to the implementation of the SEA Directive (Emmelin and Lerman, 2005). This minimalist approach becomes apparent when comparing the aims and scope given to SEA in Swedish legislation with those of the SEA Directive and the SEA Protocol. According to the Swedish Environmental Code the aim of SEA is to "integrate environmental aspects into the plan or program so as to promote sustainable development". On the other hand, the SEA Directive sets out a more comprehensive aim for SEA by stating that SEA should intend to "provide for a high level of protection of the environment" (OJEC, 2001). Moreover, the SEA Protocol, which has been ratified by Sweden (Koivurova, 2008), intends for SEA "to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes" (UNECE, 2003), providing a more detailed scope for SEA application than what is mandated in Swedish SEA legislation.

Apart from the minimalist aims and scope for SEA in Swedish SEA legislation, it is claimed that this legislation lacks clarity in several issues relating to how the public should participate in SEA processes, the use of terminology, and the way that SEA should be implemented, all of which have led to potential resistance to SEA application (Emmelin and Lerman, 2005).

Clarifying the regulations for SEA and EIA are necessary to enhance their legal operalization and hence application (Carlman, 2005). It is therefore important to increase the understanding of and knowledge on the different components of the legal notions of SEA and EIA (Hörnberg, 2005).

However, the Swedish Environmental Protection Agency has indicated that the Swedish regulations on SEA are not functioning in practice as it is intended and has therefore in 2014 initiated a new research project, SPEAK (Sustainable Planning and Environmental Assessment Knowledge), to map and analyze Swedish environmental assessment practice in relation to prevailing regulations and policies.

Several reasons have been mentioned for a limited application of SEA in the Swedish planning system context. One is the confusion that has been generated amongst practitioners by the merging of SEA regulation with EIA regulations, the use of similar terminology for both assessment processes, and the lack of regulation on SEA quality and content requirements (Emmelin and Lerman, 2005; Isaksson and Storbjörk, 2012). Moreover, confusion has been caused by the discretion that has been left to public authorities to decide if strategic initiatives have or not significant impacts, which has led to frequent consideration of SEA as unnecessary (Nilsson et al., 2009). On the

other hand, the plans and programs that have been subject to SEA have often shown to have had very little strategic issues, which has led to missed opportunities for SEA to structure strategic decisions, facilitate dialogue and shape the design of the assessed initiatives (Wallgren and Nilsson, 2011).

Another reason for a limited application of SEA is a lack of study of the Swedish planning system context. While it has been argued that the role of SEA for regional planning would have to be very different from that at the local municipal planning level (Hilding-Rydevik and Bjarnadóttir, 2007), SEA in Sweden has been presented as a generic and decontextualized type of SEA, which has added resistance to its acceptance in a context that has traditionally hindered the integration of the environment and environmental assessment tools in its planning processes (Carlman, 2005; Emmelin and Lerman, 2005; Isaksson et al. 2009; Wallgren and Nilsson 2011). Hence, increasing knowledge on institutional, organizational, and cultural aspects of context is considered crucial for SEA's acceptability and implementation in Sweden (Bjarnadóttir, 2006; Hilding-Rydevik and Bjarnadóttir, 2007).

A lack of capacity on SEA has also influenced the level of its application in Swedish planning. For instance, it has been found that there is uneven distribution of knowledge on SEA processes and regulation (Lundberg et al., 2010; Wallgren and Nilsson, 2011), and a lack of discussion of these issues amongst authorities (Nilsson et al., 2009). Moreover, there seems to be a lack of resources to apply SEA especially in smaller municipalities (Emmelin and Lerman, 2005), and missing tools, frameworks and techniques for SEA (Nilsson et al., 2009; Lundberg et al., 2010).

In addition, it has been found that there has been limited monitoring and evaluation of SEA application in Sweden (Cherp et al. 2006; Persson and Nilsson, 2007; Nilsson et al., 2009; Lundberg et al., 2010; Wallgren and Nilsson, 2011). This has led to a lack of knowledge on SEA implementation difficulties (Åkerskog, 2006), SEA effectiveness and actual effects of its application on planning processes and plan preparation (Bjarnadóttir, 2006), and SEA adaptation to changing planning conditions (Nilsson et al., 2009).

Together, all of these issues have led to a slow adaptation and application of SEA in the Swedish context.

6. RESULTS

The results of the research are presented following the three case studies and five papers that are part of and structure the thesis.

6.1. SEA process for data collection and objective formulation in the Sonso Lagoon (Paper I)

An SEA process was designed to generate knowledge on key issues surrounding the development of the Sonso Lagoon. Input from the SEA process should serve the regional environmental authorities with jurisdiction over the lagoon to initiate the formulation of a comprehensive wetland management plan. Such a plan is a key requirement in the process of declaring opting lagoons as Ramsar sites of international importance (Ramsar, 2004a).

Moreover, the SEA process aimed at providing the environmental authorities with needed experience in the application of SEA, as the Ramsar Convention recommends that SEA be made an integral part of comprehensive wetland management plans (Ramsar, 2004b).

In this sense, the Sonso's SEA process had to be easy-to-use, flexible and adaptable to local conditions, as well as participative to include the perspectives of and gain support from the environmental authorities and other key actors, such as marginalised fishermen communities that depend on the lagoon for their survival.

Based on these context specific preconditions, a three step SEA process was developed for the lagoon in cooperation with its key actors. The three steps in the

process consisted of: a screening step, a participative context analysis step, and a scenario and recommendation step (Fig. 5).

Screening: Usually, in SEA a screening step is undertaken to determine the need of applying SEA (Thérivel, 2004; García-Montero et al, 2010). For the Sonso Lagoon SEA the screening step was carried out through consultations with the environmental authorities who, despite being positive to its application, considered that the need for the process would be determined in parallel with its application and based on obtained results. This decision was taken as SEA was new to the environmental authorities and practical experiences with SEA application were non-existing.

Participative context analysis: The participative context analysis step concentrated most of the activities in the lagoon's SEA. This step was started by reviewing related reports that led to the identification of preliminary actors and key issue categories. Using these categories, it was possible to structure field work and carry out interviews, which gave way to a participative and iterative data collection approach that facilitated the identification of conflicting issues and key issues for the lagoon. In the participative context analysis the scope and scale of the SEA process was continuously redefined, and the step was iterated until it was considered that enough actors had been approached and enough data had been collected. The data was then assessed and key issues and development objectives and visions were identified for the lagoon.

Scenario and recommendation: In the remaining step of the SEA process the key issues, objectives and visions were illustrated using scenarios in GIS. Two scenarios were designed: a "Business as Usual" scenario that depicted a deteriorating lagoon in 10 years, and an integrated "Ramsar Socio Economic" scenario that illustrated the integration of Ramsar wise use concepts for wetland management and the views and development interests of the actors that participated in the SEA process.

The three-step Sonso Lagoon SEA process was then the main result of the first case study of the research project (Paper I). Its application gave way to a flexible, adaptable and iterative dialogue framework that enabled a large diversity of actors to provide input for the formulation of multi-scaled objectives to shape the development of the Sonso Lagoon region (Fig. 6).

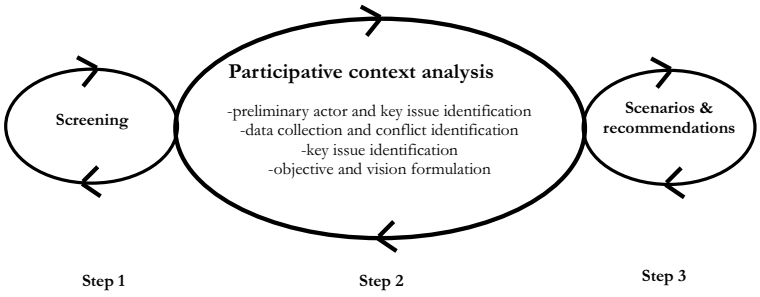

Fig. 5. Applied SEA process in the Sonso Lagoon region (Paper I)

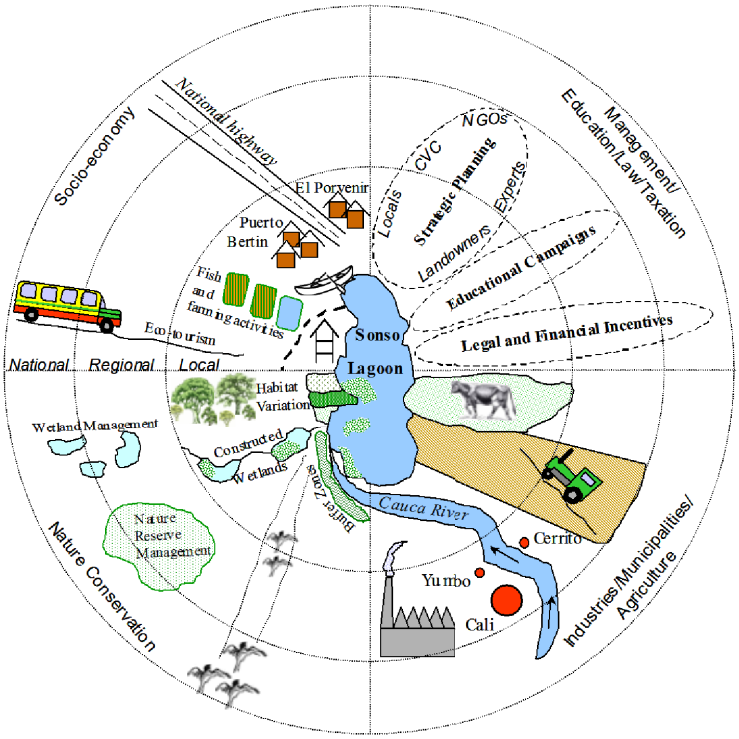

Fig. 6. Conceptual diagram of the SEA derived multi-scalar development objectives for the Sonso Lagoon.

6.2. SEA framework for knowledge gaps and uncertainty handling in Arctic environmental monitoring (Paper II)

An overarching SEA framework was proposed to explicitly address gaps in knowledge and uncertainties in decision-making in the transboundary Arctic context. Specifically, the proposed SEA framework focused on addressing knowledge gaps and uncertainties with respect to environmental change, in particular important hydroclimatic changes, in the region. Moreover, to improve SEA application for the assessment and monitoring of strategic actions in the Arctic, the proposed SEA framework was linked to existing environmental observation systems, which are important to monitor environmental change.

Motivations for proposing such an overarching SEA framework in the Arctic were the identification of gaps with SEA application in the region, as well as decline and deficiencies in Arctic environmental observation systems.

For instance, SEA application in the region was found to be variable, insufficient, and to poorly reflect specific Arctic characteristics (Koivurova, 2008). Reason for this were, respectively, identified to be: differences in Arctic State national environmental assessment systems (Hildén and Furman 2001, Koivurova 2005); the discretion left to the states to decide on significant impacts (Hildén and Furman, 2001; Bastmeijer and Koivurova, 2008), the need for extensive collaboration between countries (Tesli and Husby 1999); a lack of institutional capacities (Kersten 2009); and a limited use of environmental assessment guidelines for the Arctic (Koivurova, 2008).

Moreover, with regard to SEA monitoring in the Arctic, it was highlighted that its

feasibility would largely depend on its linkage to and on the effectiveness of existing environmental observation systems. It was found that SEA monitoring in the Arctic could encounter difficulties, as existing observation systems show decline and key deficiencies (Lammers et al., 2001, Shiklomanov et al., 2002). Particular gaps, for example, were identified for observations of hydrochemistry in Arctic rivers (Bring and Destouni, 2009), and for Arctic areas where ecological regime shifts have already occurred (Karlsson et al., 2011) and where future climate change is expected to be most severe (Bring and Destouni, 2011, 2013).

To effectively link and improve SEA application and environmental monitoring and observation in the region, gaps in knowledge, uncertainty handling and monitoring components were explicitly highlighted and made integral parts of all steps in the proposed SEA framework (Fig. 7, highlighted in yellow). The gap-uncertainty handling and monitoring parts include explicit gap and uncertainty analysis in the screening and scoping steps of SEA, gap and uncertainty reporting in its reporting step, and gap and uncertainty communication and discussion in its consultation step. Moreover, explicit monitoring decisions should be taken in the SEA decision-making step on measures to reduce critical knowledge gaps and uncertainties with respect to environmental monitoring, as well as to improve the assessed strategic action (Fig. 7, the "No" pathway). In addition, explicit monitoring decisions should be linked to an adaptive governance process (Fig. 7, right), which can inform the SEA process about development and monitoring objectives, and in turn receive information from the SEA process to enhance objective prioritization (Fig. 7, the "No" and "Yes" pathways).

6.3. Challenges and measures for green quality inclusion in compacting cities (Paper III)

Challenges and measures for the integration of green qualities in urban planning were identified by exploring the perspectives of practitioners that are actively engaged the planning and implementation of urban developments in the Stockholm region. The intention of collecting such information was to enable discussions on the importance of green areas and their qualities for city development, as well as to serve as a base to identify approaches that could contribute in the formulation of strategies for green qualities in urban planning.

Several data pattern elements were identified referring to challenges and measures for the integration of green areas and their qualities in the compacting Stockholm region. From

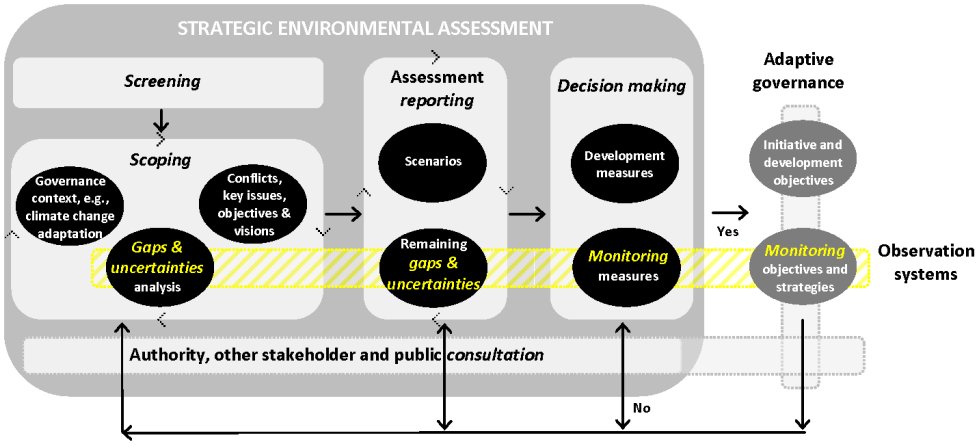

Fig. 7. SEA adaptive governance framework for gap/uncertainty handling and environmental monitoring linked to observation systems.

these, four data pattern categories were derived: (1) Compacting city; (2) Green areas and green qualities; (3) Tools and knowledge; and (4) Collaboration and participation. Moreover, based on these data pattern categories and their associated data pattern elements four key issues were inferred to further city development and green area planning in the Stockholm region (Table 1).

Strategic direction for green areas and their qualities: The first inferred key issue was the need for a strategic direction to integrate green areas and green qualities in urban planning. Based on the practitioners perspectives a lack of strategic analyses on the meaning of, the need for and the type of compacting activities that should take place in the Stockholm region was identified. In addition, it was identified that green qualities were considered in a late stage of the planning process, and that they are affected by the implementation of compacting city activities due to their low prioritization. To address these issues, it was suggested that a landscape perspective should be used, as well as broad strategies for biodiversity and connectivity among others.

Local context is basic to plan and implement compacting city activities and multiple green qualities: The second inferred key issue had to do with the need to understand and include local context in urban planning. Some of the practitioners pointed at an increased resistance to the implementation of compacting city activities at the local level, due to local social and environmental concerns.

Increase and make knowledge on green areas and green qualities operable by developing tools for their integration in urban development: The third inferred key issue suggested that the integration of green qualities in urban planning could be enhanced by developing tools that increase and make knowledge on green areas and their qualities operable. This key issue refers to limitations with the creation, retrieval and use of knowledge on green areas and their qualities. Moreover, it was mentioned that dominating knowledge on green areas and green qualities often led to limiting preconceptions on their role in urban planning. To address these issues, it was suggested that minimal requirements for green area qualities should be introduced in city developments. Moreover, the use of planning support instruments to enhance dialogue on green qualities was proposed, as was the use of environmental assessment to monitor changes on green qualities. Drafting ecological compensation measure guidelines and valuating green qualities were also considered ways to enhance knowledge on the integration of green qualities in urban development.

Robust participation for a diversity of actors in urban development and green area planning: The fourth key issue highlighted the need to structure robust and open participation in urban planning and to include green qualities. This is important because collaboration and participation on these issues in the Stockholm region were founded to be limited. Professional, institutional and structural barriers were pointed out as possible causes, together with a low diversity of participants and a lack of a regional entity responsible for driving collaboration efforts. Several measures to address these shortcomings were proposed, such as using bottom-up planning approaches, advice forums and public-private negotiations amongst others.

6.4. Green qualities SEA framework for compacting cities (Paper III)

A green qualities focused SEA framework was proposed to structure strategic dialogues and collaboration on green qualities to make these a recognized value in urban planning for the Stockholm region. The framework was based on and focused on addressing the practitioner perspectives on challenges and measures that were collected and analyzed concerning green qualities in the region (Table 1). Moreover, the framework combined certain elements of the ecosystem services inclusive SEA methodological frameworks that are proposed by Geneletti

Table 1. Key issues, data pattern categories and data pattern elements on challenges and measures for green areas and green qualities in the compacting Stockholm region.

Key issues	Data pattern category	Data pattern elements for challenges	Data pattern elements for measures
1. Strategic direction for green areas and their qualities	Compacting city	Lack of strategic analysis on the meaning of, the need for and the appropriate type of compacting cities activities	Use a strategic, holistic systems thinking approach
	Green areas and green qualities	Green areas and qualities come in too late in the planning process	Use a landscape perspective approach and formulate policies and strategies for green area planning and management
		Low priority is given to these issues due to a lack of a systems approach and high competition over space	
2. Local context is basic to plan and implement compacting city activities and multiple green qualities	Compacting city	Resistance to urban development, and challenges to reach multiple city functions	Make compacting developments more attractive by catering for different needs, focusing on accessibility issues and providing multiple city functions
	Green areas and green qualities	Dominance of technical and standardized solutions leading to low priority for multiple green area qualities	Link and use green areas, trees, vegetated streets and water to address green economy and social functions
3. Increase and make knowledge on green areas and green qualities operable by developing tools for their integration in compacting cities	Tools and knowledge	Difficulty in finding ways to create, retrieve, bring together and make knowledge operable	Place minimal requirements on green area qualities
			Use a landscape approaches and add an area planning level
			Monitor green area and quality inclusion using environmental assessments
		Dominating types of knowledge leads to preconceptions on the role of green areas and their qualities	Develop guidelines for ecological compensation measures
			Valve green areas and their qualities to communicate their importance and secure resources for their planning
4. Robust collaboration of a diversity of actors in creating green quality through urban planning	Collaboration and participation	Limited collaboration at all planning levels	Provide regional authority with the responsibility to coordinate collaboration for green qualities
		Few participants are involved	Carry out bottom-up planning to include a diversity of participants
		Lack of regional leadership for collaboration	Involve experts through advice forums, and focus on public-private negotiation

(2011), Partidário and Gomes (2013) and UNEP (2014). It was also linked to regional and municipal planning processes in the Stockholm region (ORPUT 2010), and identified the regional planning authorities and municipal planning authorities as actors that could be responsible for its application (Fig. 8).

The proposed green qualities SEA framework consisted of two iterative steps, a strategic context analysis for green qualities step and an assessment and monitoring for green qualities step. The steps had different purposes and contained various activities.

Strategic context analysis for green qualities: The purpose of the strategic context analysis step for green qualities was to highlight the importance of green areas and their green qualities so that they could be recognized as a value in the region's urban planning processes. The activities that were proposed to reach this purpose were to: identify and engage key actors in dialogue on green qualities; analyze and identify key issues for green qualities in urban development; establish a vision for green qualities; and formulate aims and strategies for green qualities.

Identified key actors were practitioners and politicians both at the regional and municipal level, representatives from different sectors, academia and civil society. Collaboration between key actors was suggested to address on key challenges and measures for green qualities, following research results (Table 1). Based on these discussions and linking to the available vision and the urban development strategy for the Stockholm region, establishing a vision and strategies for green qualities was proposed. Possible themes that could be addressed to develop strategies were considered to be: knowledge on the supply and demand for green qualities in the region; required habitat types and their qualities in terms of connectivity, location and levels of wear and tear; green area monitoring and compensation measures; accessibility to green qualities; and green area design for multiple green qualities.

Assessment and monitoring for green qualities: The purpose of the assessment and monitoring for green qualities step was to enhance the integration of green qualities in the strategic actions that are put forth at the municipal urban planning level. This step consists of three activities: identifying key actors and green qualities; shaping and assessing strategic action options; and establishing monitoring and compensation measures for the strategic actions.

The first activity focused on mapping green qualities and identifying the potential beneficiaries of these green qualities. Moreover, it entailed identifying pressures on green areas, measuring their ability to provide green qualities, and valuating green qualities. It also entailed prioritizing green qualities to shape and assess strategic actions.

The shaping and assessing activity highlighted using green qualities and their human well-being associations, in green economy and social terms, to shape as well as to assess strategic actions.

In addition, the monitoring and compensation measure activity was concerned with formulating strategies to monitor changes in green qualities after the implementation of strategic actions, and in the formulation, together with diverse actors, of compensation measures.

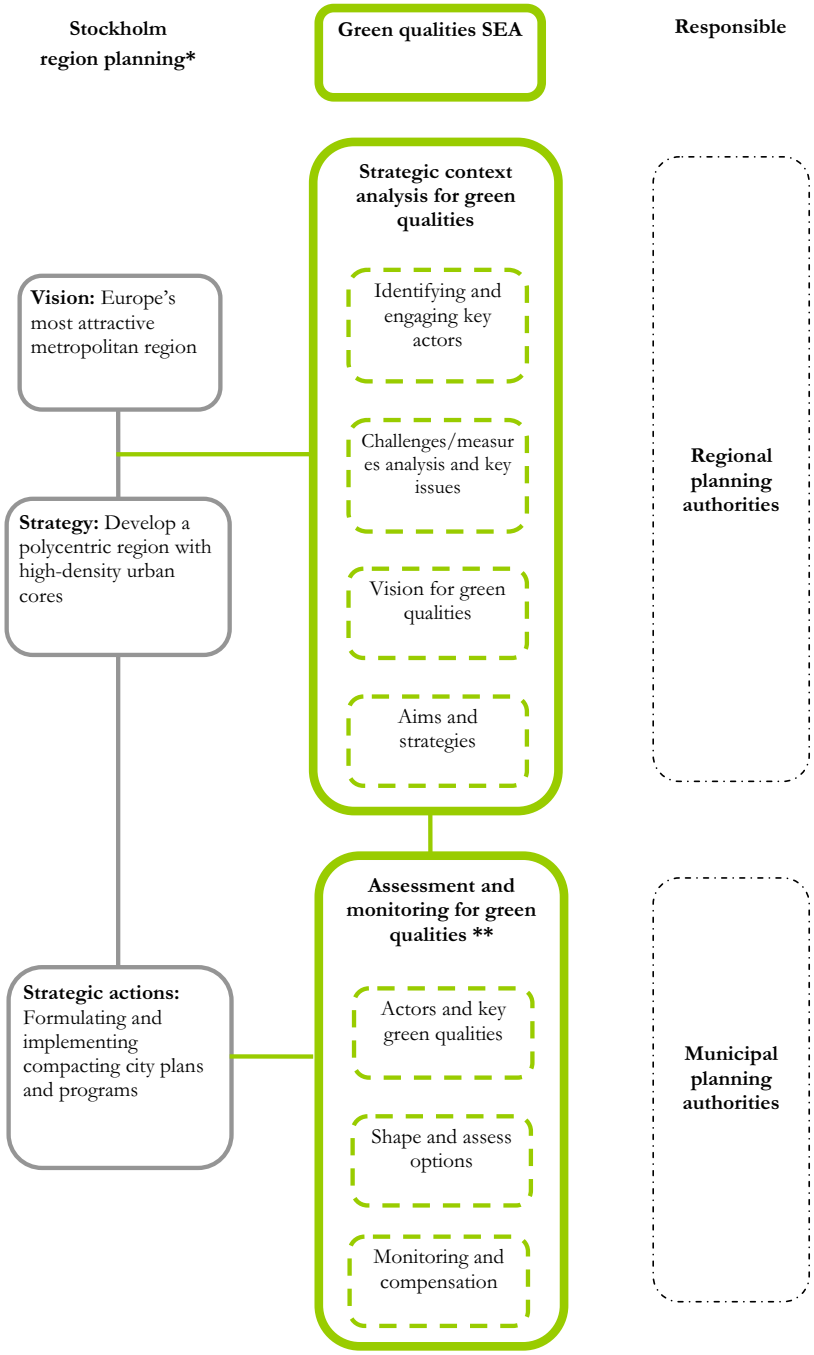

Fig 8. Proposed green qualities SEA framework for the compacting Stockholm region. *Based on ORPUT (2010). ** Based on Geneletti (2011), Partidário and Gomes (2013) and UNEP (2014).

6.5. Spatial analysis for the valuation of cultural ecosystem service provision and pressures in compacting cities (Paper IV and V)

A spatial analysis for the valuation of cultural ecosystems service (CES) provision and pressures was developed in the context of the compacting Stockholm region. The aim was to study the relation between city compaction pressures on green areas and their ability to provide CES, as a way to enhance the inclusion of CES in urban planning for compacting city activities. Estimations for CES provision values were calculated in monetary terms for 44 green areas in the region using the global ecosystem service valuation scheme of de Groot et al. (2012), with units of 2007 International dollars per hectare and year. City compaction pressures were calculated in terms of potential green area users within a one kilometre walking distance to each of the green areas. In addition, based on the obtained CES provision-pressure results and on on-going urban plans for compacting city activities, planning cases related to four of the green areas were selected for extended qualitative analysis.

CES provision values: The 44 outlined green areas in the Stockholm region showed a high variability in their potential provision of CES values (Fig. 9). The green area with lowest mean total provision of CES was also the smallest, Fatbursparken (2.3 ha), which accounted for 109 (2-366) Int.$/year, while the largest green area, Flaten (633 ha) accounted for the highest total provision of CES, 638,500 (122,990-4,730,810) Int.$/year. A majority of the green areas were of the size 15-200 hectares and showed mean CES provision values ranging between around 2,000 and 100,000 Int.$/year. Large green areas in size over 200 hectares showed high mean CES provision values ranging from around 100,000 to almost 650,000 Int.$/year. By contrast, green areas of 15 hectares and smaller showed mean CES provision values of around 5,000 Int.$/year and below. However, there were several cases where green areas of the same size showed either considerably higher or lower CES provision values. This variability was due to habitat type differences, as green areas containing larger amounts of wetlands

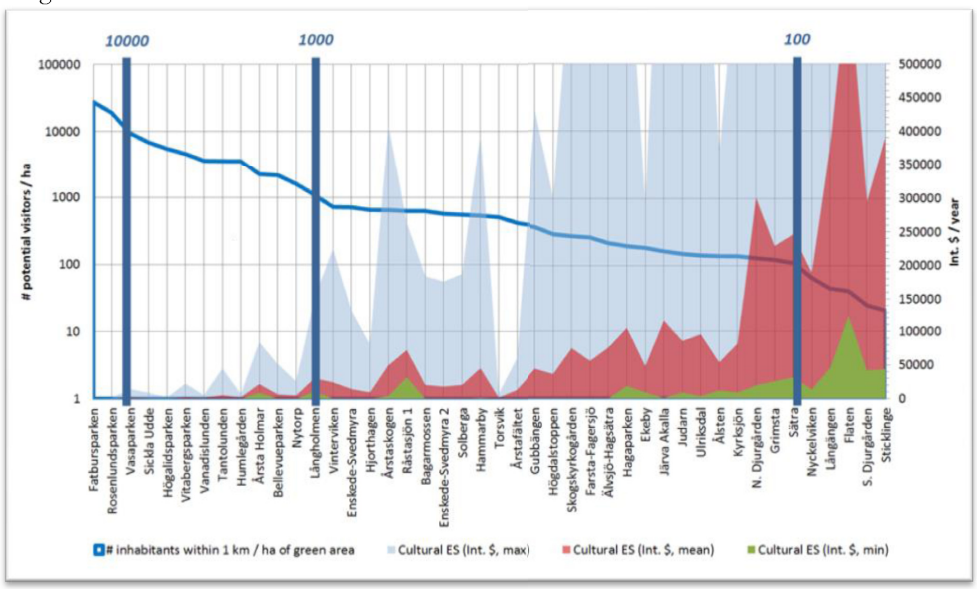

Fig. 9. The number of potential visitors per hectare for the 44 green areas, together with an estimate of the potential provision of CES in monetary terms from the direct spatial mapping. The break values for 100, 1,000 and 10,000 potential visitors per hectare are highlighted with vertical blue bars.

and water bodies in their habitat composition showed higher CES provision values than those containing only forest and grassland. The calculated CES provision values inherited the uncertainties from the de Groot et al. (2012) database, and only considered recreation and aesthetic values. Moreover, the calculations are based on green area size and habitat type, while aspects such as green area connectivity, location and quality were left out.

Pressure values: The pressure on the green areas in the form of potential visitors, i.e. number of citizens within one kilometer per hectare of the green area, varied widely so that a few green areas had over 10,000 potential visitors/ha, the highest being Fatbursparken with about 27,500 visitors/ha; yet a few had less than 100 visitors/ha, the lowest being Sticklinge with around 21 visitors/ha; while most green areas were in between (Fig. 9).

Green area size correlated with pressure ($p < 0.001$, $R2 = 0.88$). Several green areas with about 10,000 potential visitors/ha or more, were small (2.3-8.1 ha), and yielded low mean CES provision values below 2,500 Int.$/year. By contrast, some of the largest green areas (205-633 ha) had less than 100 potential visitors/ha, and showed high mean CES provision values over 180,000 up to almost 640,000 Int.$/year. In between were a set of green areas with a pressure of 1,000-10,000 potential visitors/ha, ranging in size between 3.9-44.4 ha and between around 700-30,000 Int. $/year. As well, there was a set of green areas with a pressure of 100-1,000 potential visitors/ha, ranging in size between 23,1-445 ha, and between 2,000 to over 300,000 Int. $/year.

The current analysis was coarse and could only give an indication on the potential pressure from users of CES, not the actual number and frequency of visits, or if there would be certain parts of the green areas that were used more than others, or if there would be several green areas within reach for some visitors.

When analysing the total number of potential visitors per green area (not per hectare), a different pattern however emerged where no significant correlation could be found between green area size and pressure. In many cases, the smallest green areas had the highest number of potential visitors, but there were also cases where small green areas had relatively low numbers of potential visitors (Fig. 10).

Likewise, there were large green areas with high potential provision of CES with both low and high total number of potential visitors. This means that on a metropolitan scale, green areas could have very different baseline conditions when it comes to size, potential provision of CES, pressure in the form of potential visitors per hectare, and total potential visitors for the whole green area. Since these parameters are highly sensitive to the implementation of urban plans for compacting city activities, changes to these parameters should be carefully examined.

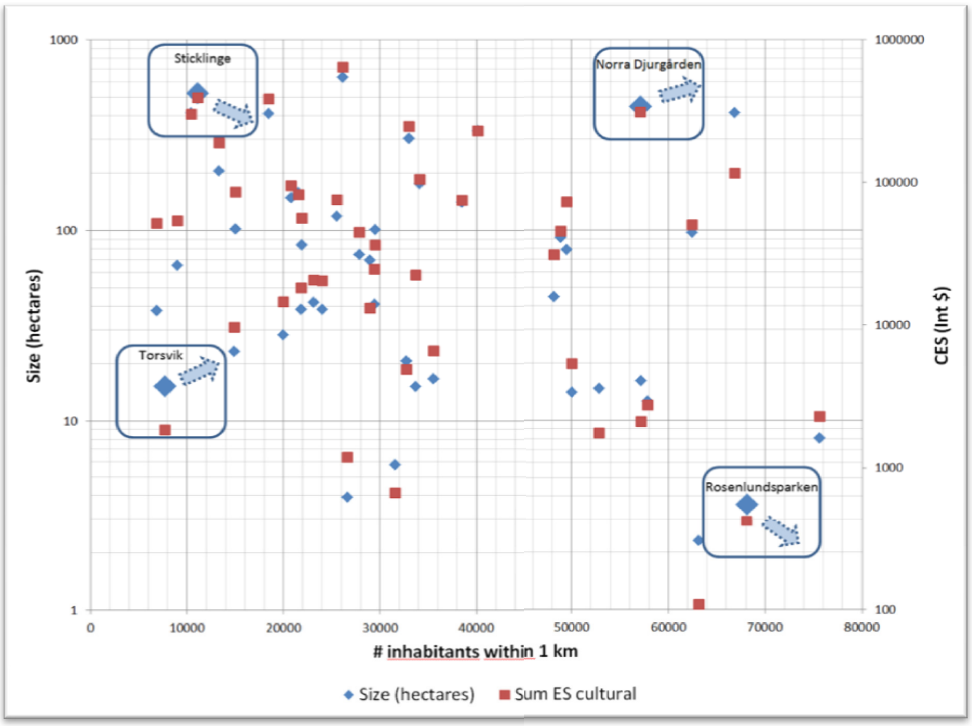

Fig. 10. Green area size, CES monetary values and number of potential users combined. The encircled green areas were further investigated as case studies and the arrows show the intended direction of change as expressed by the planning documents.

Planning case studies: Planning cases for the four green areas of Norra Djurgården, Torsvik, Rosenlundsparken and Sticklinge were selected to illustrate how the CES provision-pressure factors can be considered in urban planning for the Stockholm region. The four case studies represented different baseline conditions in terms of size, habitat composition, CES provision-pressure values and number of potential visitors, as well as different urban planning ambitions for both compacting city activities and green area planning (Fig. 10).

Rosenlundsparken was small, dominated by grassland, and showed low CES provision and high pressure values, while potentially benefiting a high number of citizens on the metropolitan scale; Torsvik was relatively small, dominated by grassland, and showed low values for both CES provision and pressure, while benefiting a relatively small number of citizens; Norra Djurgården was large, contained forest and tree-covered parks, grasslands, wetlands and water areas, and showed high values for CES provision and relatively low pressure due to its large area, while benefiting a high number of citizens; while Sticklinge was large, contained forest, grasslands, wetlands and water areas, and showed high CES provision and low pressure values, benefiting a relatively small number of citizens.

Moreover, the green areas involved urban plans that varied considerably with respect to compacting city activities and green area planning. For instance, the plans proposed different increases of housing and urban population, as well as other urban activities, and brought forth different issues such as conflicting goals, design trade-offs,

cumulative impacts, and incremental planning. Moreover, two of the compaction plans expressed ambitions to increase green area sizes by over-decking roads, while one plan proposed compensating for reductions in green area size by enhancing the quality of the green area.

The differences in urban planning ambitions were reflected in the CES provision-pressure values (Fig. 10). Ideally, both the total number of urban dwellers benefiting from CES and the CES provision values should increase. The results showed that all four planning cases would imply an increase of the number of potential visitors. However, only two cases showed increases in the provision of CES, while the other two showed decreases in these values.

7. DISCUSSION

7.1. Contextualizing SEA

The success of SEA largely depends on its ability to adapt to different situations and circumstances (Hildén, 1999; Kornov and Thissen, 2000; Nitz and Brown, 2001; Hilding-Rydevik and Bjarnadóttir, 2007; Bina, 2008). For this reason, this thesis attempts to foster ways in which SEA may adapt to context and include multiple values in strategic planning cases taking place in different circumstances and situations.

The identification of values and their analysis is fundamental to adapt SEA to context (Connelly and Richardson, 2005). Likewise, setting the right ambitions for SEA, addressing its scope and level of openness, that is how participative SEA should be, and communicating improvements to context are important to strengthen the role of SEA as a strategic planning support tool.

7.1.1 Values in the developed SEA processes

In the Sonso Lagoon case study the developed three-step SEA process (Fig. 5) is adapted to the particular context of the lagoon, which is characterized by the absence of environmental data and strategic planning objectives. The focus of the three step SEA process is to gain insights on the lagoon's key environmental, social and economic values and their relations, as well as to use this insight as a base to propose a development vision for the lagoon together with multi-scaled operable objectives for its management.

Additionally, in the Arctic region case study an overarching framework for SEA application is proposed for and adapted to the Arctic governance context. The main focus of the overarching SEA framework is to explicitly highlight and systematically integrate aspects such as gaps and uncertainties in the monitoring of environmental change caused by climate change in all steps of the SEA process (Fig. 7). Moreover, the framework is linked to adaptive governance to consider key knowledge and information gap aspects in SEA so that monitoring objectives can be formulated to contribute to the strategic development of the environmental observation systems in the Arctic region.

In the Stockholm region case study a green qualities SEA framework is proposed to highlight the importance of green areas and green qualities in urban planning (Fig. 8). The framework links to urban planning at the regional and municipal levels, and focuses specifically on addressing compacting city developments. Moreover, practitioner perspectives on challenges and measures for green qualities are addressed, as are the development of spatial analysis tools to valuate green area CES provision and pressure relations. The green qualities SEA framework should serve as a base to structure dialogue and collaboration for the inclusion of green qualities in urban planning at different scales in the Stockholm region.

7.1.2. Ambitions, nature and design of the SEA processes

Aiming to address the above mentioned values influenced the ambitions, nature, design, and outcomes of the developed SEA processes. Hence, the three proposed SEA processes differ with respect to each other, and with respect to standardized and decontextualized SEA processes.

For instance, the three step SEA process for the Sonso Lagoon differs significantly from a formal SEA as exemplified by the EU Directive on SEA, as the lagoon's SEA process was designed to contribute to improve the lagoon's strategic planning and not to carry out a standard impact assessment exercise. This difference in ambition is reflected in the design of the lagoon's SEA process, where the participative context analysis replaced the baseline study, scoping, and impact assessment steps that are typical of a formal SEA process (OJEC, 2001). Moreover, the participative context analysis step illustrates that the process is largely a baseline-led SEA process, again differing from formal western models of SEA that tend to use predefined objectives to assess how and if strategic actions can meet these objectives (e.g. ODPM, 2005). Choosing a baseline-led SEA over an objective-led SEA process in Sonso Lagoon allowed the SEA process to gradually and interactively mould to its context, directly addressing the issue of lacking environmental data and strategic objectives, which have been identified as problems in SEA (Dalkmann et al., 2004).

The proposed overarching SEA framework for the Arctic has the ambition to serve as a transparent and participatory decision-making base to improve the strategic planning of the region's environmental observation systems. As with the proposed three step SEA process for the Sonso Lagoon, the ambition of the overarching SEA framework differs greatly from the ambition of formal EIA-based SEA processes. The design of the overarching SEA framework reflects this ambition, as environmental observation system components are explicitly highlighted and linked to all the steps in the SEA framework. Moreover, as a complement and to improve the application of SEA and its monitoring in the Arctic, adaptive governance components are also linked to all of the steps in the SEA framework. Choosing to use the screening, scoping, consultation, reporting and decision-making steps of a formal SEA process is another explicit design choice. The reason for this choice is to enhance the framework's acceptance amongst its potential users and to place the framework inline with the national and transboundary SEA regulatory systems that are in place in the Arctic region.

The green qualities SEA framework for the Stockholm region is also purposely designed to differ from standard EIA-based SEAs. Instead of focusing on assessing impacts on specific environmental themes as depicted in Annex I (f) of the SEA Directive (OJEC, 2001), the framework proposes a strategic context analysis for green qualities at the regional planning level to formulate a strategic vision and strategies for green qualities. Moreover, the framework is designed to use green qualities and their linkages to human well-being to shape and assess urban plans and programs at the municipal level.

7.1.3. Participation

The lagoon's SEA process is participative in nature, as it engages actors to decide on the need of the process, in its development, in data collection, to identify and assess key values, and in the formulation of operative objectives for the lagoon. This comprehensive way of engaging actors in the Sonso Lagoon SEA process is in accordance to the main principles of the Aarhus Convention (UNECE, 1998), and far exceeds formal the SEA Directive's requirements on actor consultations (OJEC, 2001). The lagoon's SEA also provides a variety of actors, including traditionally alienated communities, with an informal arena to discuss the development of the lagoon. This allows to consider a plurality of views and to better understand the existing close interrelations between environmental, economic and social values.

Consultation with and participation of Arctic authorities, other actors and the public are emphasized by making these transversal across the proposed Arctic SEA framework. The involvement of Arctic actors is proposed to take place in the framework's scoping step to identify the values that should be handled in the SEA

process, as well as to determine the level of detail on these values. Moreover, actors are meant to be involved in the reporting step of the framework, so that they can review and be involved in the production of environmental reports. Furthermore, it is proposed that their views and comments should be taken in consideration in the decision making step of the framework, as a way for different actors to directly influence future developments in the region. The purpose of promoting a wide participation of Arctic actors in the proposed overarching SEA framework is to create transparency in discussions on the key values that can influence Arctic development, as well as in relation to discussions on gaps and uncertainties to improve Arctic environmental observation systems.

The green qualities SEA framework is proposed to structure comprehensive dialogue and collaboration on green qualities amongst key actors in the Stockholm region. The intention is to adapt dialogue and collaboration to urban planning processes at both regional and local levels in the Stockholm region. In this way it could be possible to foster strategic discussions on green qualities early on and through out the entirety of these processes. Moreover, the framework could become an informal and flexible dialogue and collaboration area that includes actors that are seldom involved in urban planning. In addition, by assigning coordination responsibilities for its implementation to regional as well as local planning authorities, the framework may be institutionalized in these organizations, and may gain momentum to agglutinate a wide variety of participants and establish different types of collaboration efforts. Similar to the proposed SEA processes for the Sonso Lagoon and the transboundary Arctic region, the green qualities SEA framework makes dialogue and collaboration core elements in its design.

7.1.4. Scope of the SEA

A multi-scaled and sustainability focused SEA in the Sonso Lagoon facilitated mapping and addressing complex interrelations between environmental, economic and social values at different planning scales (Fig. 6). Despite this, formulating operable objectives across different planning scales and multiple values proved to be challenging. When setting priorities, the handling of conflicts of scale and conflicts of interest among actors became a main issue that arose from using such a comprehensive scope in Sonso's SEA. To address this, the conflicts where mapped, and in cases of incompatibility, mitigation measures were considered when formulating operational objectives for the lagoon's management. This allowed for careful priority setting as the balancing of interests was considered to be a delicate exercise in the context of the Sonso Lagoon. However, the participatory nature of the SEA process, through which an open handling of values was achieved, facilitated the formulation of locally and regional anchored objectives for the Sonso Lagoon.

The overarching SEA process for the Arctic acts as a strategic framework for gap and uncertainty monitoring of unexpected environmental changes caused by climate change. In this respect, it can be stated that the scope of the proposed SEA framework focuses specifically on addressing climate change environmental values. However, as monitoring hydroclimatic change has many dimensions other values should also be considered in the SEA framework. These values are: water and food security values (Oki and Kanae, 2006; Nilsson and Evengard, 2013; Nilsson et al., 2013); changes in land and water use (Jarsjö et al., 2012; Destouni et al., 2013); and values of different sectors such as agriculture (Basu et al., 2010), mining (Banks et al., 1997), waste disposal (Rosqvist and Destouni, 2000), and combined industrial and household activities (Baresel and Destouni, 2005). The different values related to hydroclimatic change are all relevant for the development of the Arctic and its environmental observation systems, and they should be included and handled in the gap/uncertainty monitoring focused SEA framework that was proposed for the Arctic.

The scope of the SEA framework that is proposed for the Stockholm region focuses on increasing knowledge on green qualities. This means increasing knowledge on green area properties in terms of appropriate sizes, locations and habitat types, compositions and qualities, as well as increasing knowledge on green area potentials in terms of perceived green area capacity to provide ecosystem services (Bastian et al. 2012). Within this scope, the green qualities SEA framework may include tools for the mapping and valuation of ecosystem service provision and pressure relations (Paper IV), and landscape analyses (Paper V) to obtaining knowledge on green qualities. Additionally, as studying planning conflicts may enhance the inclusion of green areas and their services in urban planning (Hostetler et al. 2011), challenges and measures for green qualities are also included in the scope of the green qualities SEA framework (Paper III).

7.1.5. SEA's improvements to the studied strategic planning contexts

In the Sonso Lagoon, the developed SEA process adapted to a centralized and weak regional planning system, showing that it is possible to effectively collect data and identify and analyse complex value interrelations on which operable objectives can be formulated. At the same time, the SEA process became a parallel, inclusive and coherent planning alternative that encouraged institutional cooperation, gave a voice to marginalized actors, and minimized gap and objective conflicts between different planning levels and actors. Moreover, by becoming an informal and transparent framework for dialogue, awareness on otherwise unaddressed values, their conflicts and synergies was created, which aided to formulate anchored development visions and operational objectives for the lagoon. However, despite that the SEA process managed to set a strategic base on which to develop a management plan for the Sonso Lagoon, which is an important step towards the lagoon's declaration as a Ramsar site, much still needs to be achieved to advance coordinated actions within the planning systems linked to the lagoon.

The overarching SEA framework that is proposed for the Arctic addresses the implementation limitations of the environmental assessment and observation systems that are in place in the region (Hildén and Furman 2001; Lammers et al., 2001; Shiklomanov et al., 2002; Bastmeijer and Koivurova, 2008; Koivurova, 2008; Bring and Destouni, 2009, 2011, 2013). The framework attempts to link Arctic environmental observation systems to SEA monitoring by highlighting knowledge gaps and uncertainties in all steps of the proposed SEA framework. The purpose is to establish a strategic and transparent decision making base to improve existing environmental observation systems. Moreover, the framework aims to improve the application of SEA monitoring, which means detecting, understanding and evaluating, ongoing environmental change, as well as monitoring the effectiveness of introduced strategic planning actions that aim to control, mitigate or adapt to environmental change. It is in this sense that the proposed overarching SEA framework for the Arctic intends to improve Arctic governance and strategic planning.

The green qualities SEA framework aims to bring various improvements to urban planning in the Stockholm region. First, it intends to engage key actors in strategic discussions and collaboration for the planning of green qualities. Practitioner perspectives are put forth as an example on a way to identify key issues for green qualities. Moreover, a green area service provision and pressure valuation approach is developed to enable actor dialogues and collaboration on green qualities. From these dialogues, a vision and strategies for green qualities may be formulated. Knowledge on green quality supply and demand, accessibility to green qualities, and monitoring and compensation measures are highlighted and proposed as key themes to develop strategies for green qualities in urban planning. Moreover, the green qualities SEA framework proposes several

activities to assess and monitoring urban development strategic actions, which may enhance the inclusion of green qualities in urban planning.

7.2. Lessons learned to strengthen the implementation of SEA

The studied SEA cases demonstrate that contextualizing SEA to strategic planning is important to advance its implementation beyond the assessment of impacts. In this sense, SEA should focus on identifying and addressing the underlying strategic intensions of the planning contexts to which it is applied. For the Sonso Lagoon (Paper I), the Arctic region (Paper II), and the Stockholm region (Paper III, IV and V) SEA case studies this meant, respectively, adapting to the intensions of developing a lagoon management plan, directing development priorities for environmental observation systems, and enhancing urban development planning at different scales.

Contextualizing SEA to strategic planning also means identifying and addressing the fundamental values that influence strategic planning processes. In the Sonso Lagoon SEA study it was important to identify and analyze relations between environmental, social and economic values at different scales (Paper I). For the Arctic SEA study including climate change values and their associated information gaps and uncertainties in monitoring became the priority (Paper II). And in the Stockholm region SEA study highlighting green qualities values and their links to human-well was central.

In addition, when contextualizing SEA participation should be adapted to strategic planning. This is challenging to achieve but required if different values are to be treated with transparency and included in strategic planning process to influence decision making. Adapting participation entails mapping key actors and identifying their interests, as well as engaging these actors in dialogue and collaboration to construct conditions to improve strategic planning.

A main implementation aim for SEA could then be to establish a strategic framework where key institutional actors, the private sector and civil society can engage in transparent dialogue and collaboration on a plurality of values so that strategic planning and its actions can be incrementally improved. In other words, SEA processes should aim to be strategic focused, value driven and participation based to realize its potentials beyond the assessment of impacts.

Implementing this type of SEA processes may enable addressing the lack of objectives and strategic information or data in SEA (Paper I), highlight the importance of SEA monitoring to address gaps and uncertainties in environmental information (Paper II), and link to environmental planning and management concepts such as ecosystem services (Paper III, IV, and V).

Moreover, by enabling strategic dialogues and transparently enabling the inclusion of a plurality of values in planning the acceptability of SEA as planning support tool might increase. However, determining what is strategic, what should be prioritized, and how to identify and engage actors in strategic dialogues is challenging. This demands creativity, time, using experienced facilitators, engaging willing participants and carrying out specific analyses on a case by case basis.

Furthermore, there is a need to assess the relevance of applying strategic, value driven and participative SEA processes as not all planning contexts are suitable for this type of SEA processes. Determining the need of these types of SEA processes will ensure their legitimacy and the probability that they will influence planning and decision making.

To internalize and institutionalize this alternative and comprehensive approach to SEA application, there might be a need to designate implementation responsibilities to specific actors and to develop their capacities to implement SEA. For instance, in the context of the Stockholm region, coordination responsibility for the application of green quality SEA framework may be assigned to regional and municipal planning authorities (Paper III). In the

context of the Arctic region the Arctic Monitoring and Assessment Program could be grant this responsibility (Paper II), and in the Sonso Lagoon the regional environmental authority could take up this role (Paper I).

7.3. Future research

Continuing to explore the role of SEA as a proactive strategic planning support tool is needed given that SEA is still largely preconceived and practiced as an impact assessment tool. This implies that there is a need to find creative ways to convert SEA preconceptions and implementation challenges into opportunities for its development and promotion.

A creative way to achieve this and that could be worth exploring is to study the contextualization of SEA to strategic planning and decision making contexts where SEA has seldom been applied or would not typically be applied. Examples could be, for instance, studying SEA contextualization to private sector initiatives having strategic planning character, to the internal strategic planning of non-governmental organization networks aiming to raise the capacities of their members (Supplement), or for instance to shape a strategic planning context for the transboundary Amazons region.

Furthermore, it would be interesting to continue studying how SEA can adapt participation to strategic planning. In particular, it would be valuable to study ways in which SEA can adapt participation to urban planning contexts as a means to enhance the creation of knowledge on ecosystem services in terms of their demand and of the needed green qualities for their provision.

Advancing research on participation in SEA may also enable developing capacities to handle gaps in and uncertainties with environmental data in strategic planning, as well as linking to and creating opportunities to carry out research in SEA monitoring.

8. CONCLUSIONS

A common characteristic with the Sonso Lagoon, the Arctic, and the Stockholm region case studies was a limited consideration of key values in strategic planning, leading to risks for sustainable development. In the Sonso Lagoon sustainability conditions were deteriorating, in the Arctic potential risks to the region's development were associated to limited environmental assessment and monitoring, and in the Stockholm region green qualities could be affected by increasing urbanization.

The SEA frameworks that were proposed in each of the case studies aimed to enhance dialogue, collaboration and knowledge generation to identify and integrate key values in and incrementally improve strategic planning and decision-making.

Challenges such as the lack of data and objectives, gaps in knowledge and uncertainty, and the recognition of the value of green qualities could be addressed through the use of the proposed SEA frameworks.

In the Sonso Lagoon, a plurality of actors was involved using the developed SEA approach, and it was possible to identify various environmental, social and economic values and to facilitate their analysis at different planning levels. Moreover, the participative SEA approach enabled identifying key issues and formulating development objectives for the lagoon in parallel to data collection. In this sense, the SEA approach acted as the lagoon's strategic planning process and enabled setting a base on which to formulate a comprehensive management plan for the lagoon.

In the Arctic case study, shortcomings in the application of SEA particularly related to environmental change and uncertainty monitoring were identified and concretized by studying main gaps in Arctic hydroclimatic change observation. An overarching SEA framework was proposed for the Arctic to systematically and explicitly address gap and uncertainty monitoring in all of its steps. The SEA framework was also linked to adaptive management to allow

considering key knowledge and information gaps for the (re)formulation and promotion of necessary new or modified observation objectives for bridging these gaps.

To address conflicts of goals in urban planning for the Stockholm region, challenges and measures for green qualities were identified by analyzing practitioner perspectives. Based on these perspectives, a green qualities SEA framework was proposed with the intension of setting a strategic direction of green qualities and to enable the integration of green qualities in urban planning. Moreover, as an element in the green qualities SEA framework, a spatial analysis tool was developed to create concrete knowledge on the provision and pressures for ecosystem services in urbanizing regions.

It is of importance that SEA provides opportunities for the transparent identification, recognition and negotiation of values in strategic planning if it is to become a credible, valued and legitimate planning enhancement support instrument. The Sonso Lagoon, the Arctic, and the Stockholm region case studies contributed to strengthen SEA by providing experiences on how SEA can be contextualized to varying strategic planning contexts.

In theses cases, adapting to context meant addressing strategic planning intentions, identifying and engaging actors, deriving and prioritizing key values, collaborating to generate knowledge on the key issues, and to use this knowledge to shape and assess different development options.

Adapting SEA to context may lead to accepted outcomes and to an incremental improvement of strategic planning. However, it is considered important to monitor the implementation of these outcomes to establish compliance but also to identify unaddressed and unexpected issues on which knowledge should be generated to improve strategic planning.

Furthermore, adapting SEA to strategic planning contexts has implications for SEA design and development. In strategic planning contexts, SEA will necessarily have to increasingly act as a flexible and fit for purpose tool, and leave behind its traditional application as an environmental impact assessment tool. SEA should focus in becoming a strategic oriented process, promoting spaces for dialogue, collaboration, and knowledge generation early on and in all stages of strategic planning.

Future studies that could contribute to enable SEA to evolve its role as a strategic planning enhancing instrument could be to study the application of SEA in realms where it has rarely been applied. In particular, it would be of interest to study SEA application in organizational and transboundary contexts. Moreover, studying how SEA can strengthen the adaptation of participation, monitoring, and ecosystem services in strategic planning could further the development of SEA.

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PARTICIPATIVE SEA APPROACH FOR DATA COLLECTION AND OBJECTIVE FORMULATION

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This paper analyses the interaction between data needs and objective formulation in Strategic Environmental Assessment (SEA). This topic is discussed from the experiences that were gained by designing and applying a participative SEA pre-study process in the developing region of the Sonso Lagoon, Colombia. Data collection and issue identification are described, as are the different purposes and similarities with objective-led and baseline-led SEAs. It is argued that the participative framework used in Sonso can be applied in similar developing country contexts where there is a lack of environmental data and clear development goals. Finally, it is stressed that the participative SEA pre-study process can be implemented in situations where different sector objectives conflict or in circumstances where there is a need to formulate regional or municipal development objectives.

Keywords: Strategic Environmental Assessment; scale and data; public participation; objective formulation; developing countries.

Introduction

In many countries, the lack of environmental data and clear developmental goals cause problems in planning and decision making (Kessler, 2000). To meet these

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challenges, innovative approaches are needed to collect data and to define objectives that set the basis for future development strategies. These approaches should involve all relevant stakeholders, and they should utilise local knowledge to obtain environmental data and identify future needs.

Within planning and decision-making contexts, strategic environmental assessment (SEA) is considered to be a tool that provides strategic actions, policies, plans and programmes, with sustainability issue inputs (Thérivel and Partidário, 1996; DEAT, 2000; Sheate *et al.*, 2001; EC DG TREN, 2005). SEA improves strategic actions by focusing on key sustainability issues, providing transparency through stakeholder involvement, shaping and identifying the best development options, and by assessing and mitigating the impacts of the chosen options (Thérivel, 2004; ODPM, 2005). SEA can run as a stand alone parallel process to planning; it can be integrated to the planning process and in cases where planning processes are weak or absent, SEA can structure or represent the planning process (CEA, 2006).

Since the enactment of the EU Directive concerning the assessment of the effects of certain plans and programmes on the environment or the SEA directive (OJEC, 2001) and the United Nations Economic Commission for Europe's SEA Protocol (UNECE, 2003) most industrialised nations have included SEA requirements in their legislation (Thérivel, 2004; Fischer, 2007). In newly developed and developing countries, interest for SEA has increased although presently few of these countries have a formal requirement for SEA (Dalal-Clayton and Sadler, 2005). However, the growing interest in SEA has led to a worldwide development of various types of SEA approaches that differ in their comprehensiveness (e.g. environmental or sustainability focus), nature (e.g. baseline or objective led SEAs), openness (e.g. public inclusion) and duration (e.g. short or very lengthy) (Verheem and Tonk, 2000). These variations in SEA processes arise from the diverse conditions in each country and from the different nature of the strategic actions to which SEA is applied. For instance, SEA processes are influenced by different information availabilities, different planning and decision-making systems and by diverse strategic action objectives.

According to Hildén (1999), the success of SEA is dependent on its adaptability to different situations and circumstances. Hence, studying the aspects to which SEA should be moulded to is of considerable importance. For this reason, this paper discusses how SEA processes could adapt to situations where there is an absence of environmental data and where strategic objectives are unclear, conflicting or missing. Specifically, the article discusses the interrelations that exist between data needs and objective formulation in SEA. This discussion is based on the empirical experiences that were gained through a case study in the developing region of the Sonso Lagoon, Colombia, where a participative SEA pre-study process was proposed to aid in the collection of data and in the formulation of operable development objectives.

It is argued that this participative SEA pre-study process may well be applied in developing countries where there is high interest in SEA but where experiences with the process have been limited due to unavailable environmental data, unclear developing goals and inappropriate planning systems. However, it is considered that the proposed participative SEA pre-study process can also be applied in circumstances where different sector objectives conflict, or in situations where there is an absence of data but where there is a need to formulate regional or municipal development objectives.

The article is divided into four main sections starting with a review of a number of key issues in SEA application, a case study of the application of the participative SEA at the Sonso Lagoon in Colombia, a discussion section where an analysis of the importance of such a process is put forth and finally a conclusions section that summarises the main findings in relation to the proposed SEA pre-study process and where future research suggestions on the process are made.

Controversies in SEA

Objectives and SEA

The ultimate aim of SEA is to protect the environment and promote sustainable development (Thérivel, 2004). Environmental assessment practitioners have agreed on this fundamental SEA concept but the existence of different definitions as to the nature and scope of SEA have led to the development of different approaches that have caused confusion amongst other professionals (Verheem and Tonk, 2000). Despite this, Eggenberger and Partidário (2000) argue that the usage of different SEA processes is less important than defining a clear objective for what SEA is to achieve. Verheem and Tonk (2000) state that SEA processes should be designed in light of the objectives that SEA intends to accomplish and according to local decision-making contexts. Additionally, Fischer (1999, 2003) states that with clear SEA objectives, conflicting goals derived from different administrative tiers, strategic actions and sectors can be reconciled.

In SEA, objectives form a hierarchy that starts from general objectives statements and that leads to more specific targets and indicators (Thérivel, 2004). SEA objectives can be derived from previously identified strategic action objectives, from earlier assessments or from existing baseline data and environmental information (ODPM, 2005). Although in situations where no strategic action objectives are available or are unclear, where no previous environmental assessments have been carried out and where there is no baseline data, no such SEA objectives can be identified. This issue has been raised by Dalal-Clayton and Sadler (2005) who argue that western models of SEA are being exported to developing countries where the

realities pertaining the availability of environmental data and clear planning goals are very different from those of the first world.

A possible solution to formulate SEA objectives in the absence of clear planning goals and environmental data would be to carry out consultations with key stakeholders. For example, in the South African guidelines for SEA, public participation is deemed to particularly enhance the setting of SEA objectives (DEAT, 2000). Moreover, in the Lebanese training manual for SEA, it is stated that early consultation with stakeholders at the scoping stage of the SEA process aids to provide insights on priorities, concerns and interests (ME & UNDP, 2005). Hedo and Bina (1999) stress that the involvement of the public in the development of plan goals and alternative selection is of particular importance when dealing with development strategies in rural areas, and lastly Thérivel (2004) states that public participation aids in SEA objective setting by ensuring that a full range of environmental and sustainability problems are understood. However, it has been found that the use of public participation processes in SEA practice has been limited (Rauschmayer and Risse, 2005). Most SEA systems, including the EU Directive on SEA, only include minimal requirements for public participation that mostly take place as report revisions (Thérivel, 2004). Moreover, according to Dalkmann and colleagues (2004), public participation in strategic decision making is difficult to achieve because strategic decisions are unspecific and not related to the everyday concerns of the public. In addition, Fischer (2003) states that stakeholder participation in decision making has a tendency to organise and to constrain itself, leading to only include the views of powerful interest groups while the powerless are left unheard.

Types of SEAs and implications for data and issues

According to Dalal-Clayton and Sadler (2005), internationally there exist many different types of SEA approaches, which can be divided into three general categories: formal EIA-based SEA procedures exemplified by the EU Directive on SEA, near-equivalent SEA processes that are broader types of SEA and para-SEA processes that have the same characteristics and overall goals of SEA but that do not meet its formal definitions. A few examples of near-equivalent SEA and para-SEA processes are the Dutch E-test, the ODPM guidelines on SEA (ODPM, 2005), Analytical SEA (ANSEA) where decision windows or openings in decision-making processes are identified to include environmental and sustainability issues (Dalkmann *et al.*, 2004) and Strategic Environmental Analysis (SEAN) a 10-step participative process aimed to aid in the formulation of sustainable development visions in emerging countries (Kessler, 2003).

Apart from the aforementioned SEA process categories, two types of SEA systems are widely cited in SEA literature; these are baseline-led and objective-led

SEAs. Thérivel (2004) defines a baseline-led SEA as a distinct environmental yardstick of discrete SEA themes, objectives and indicators that are used to describe the baseline environment, identify problems and influence the objectives of a strategic action. On the other hand, in objective-led SEAs, sustainable objectives for strategic actions are developed and then different alternatives are tested through the use of indicators to see if these objectives can be reached (*op. cit.*). When considering an objective-led SEA approach, Fischer (2003) states that pre-structured EIA-based SEAs systematically and effectively assist the consideration of environmental issues in decision making. Noble (2002) also states that to assist in reaching desirable futures, strategic actions should be evaluated against a set of prescribed sustainability criteria or objectives.

Objective-led SEAs are also thought to help reduce the need for baseline data by focusing the SEA process on preset issues (Thérivel, 2004). However, objective-led SEAs could have the effect of excluding important issues from environmental assessments and may even lead to biased appraisals. According to Berzok (1986), a narrow set of objectives will lead to narrow programme and project definitions and to the exclusion of public views and creative alternative solutions. Additionally, in objective-led SEAs data related to the objectives is assumed to be available. In fact, Dalkmann and colleagues (2004) mention that data limitations, data incompatibility, missing data and increasing complexity of data collection are current major challenges to SEA. Baseline-led SEA systems are, on the other hand, rigorous, broad and more flexible assessments that aid to identify environmental and sustainability issues, allow for public consultation and make it easier to understand cumulative impacts (Thérivel, 2004). However, practising baseline-led SEA can be limited because, according to Nilsson and Dalkmann (2001), decision makers take shortcuts and set goals that will allow them to economise on information collection requirements. It has been argued that the actual differences between baseline-led and objective-led SEAs are symbolic and that these SEA systems could be seen as complementary to each other instead of conflicting (Thérivel, 2004). By using both types of SEA systems jointly, first by setting preliminary objectives and then by revising them as sustainability issues are identified, an iterative, effective and context-relevant data collection process can be established that could aid to solve the current data collection challenges accompanying SEA.

Scope of SEA

Another issue for debate is whether SEA should solely focus on the environment or if it should also consider socio-economic issues (Eggenberger and Partidário, 2000). According to Morrison-Saunders and colleagues (2005), SEA should focus on the environment, because if socio-economic issues are considered in SEA processes, the

environment will loose out due to power imbalances that currently favour economic issues over environmental issues in decision making. Thérivel (2004) states that environmental protection requirements such as the EU Directive on SEA and the UNECE Protocol on SEA were promoted precisely to compensate for the dominant position of economic issues in policy. Additionally, Fischer (2003) argues that the main rationale of SEA is to create a better environment by systematically considering environment issues in planning and in decision making. However, Hildén (1999) stresses that keeping a pure environmental assessment would lead to the proliferation of numerous types of assessments that would make integrated result interpretation difficult.

According to Verheem and Tonk (2000), socio-economic issues should be included in SEA when considered necessary. For example, the Dutch Strategic EIA process (SEIA) for plans and programmes focuses mostly on environmental issues since in the Netherlands there has been a strong focus on socio-economic assessment in decision making, and instruments for their assessment are already in place. However in the Dutch E-test for policies, socio-economic issues are considered in parallel to environmental issues and integrated in the legislation process.

Internationally, there has also been a trend to increasingly consider SEA as a step towards integrated assessment or sustainability assessment (Eggenberger and Partidário, 2000; Dalal-Clayton and Sadler, 2005; Lee, 2006). This is the case for South Africa, Lebanon and the United Kingdom, where sustainability-led SEA guidelines have been produced (DEAT, 2000; ME & UNDP, 2005; ODPM, 2005). The recent focus on poverty reduction strategies promulgated by the Millennium Development Goals and by the plan of implementation agreed at the World Summit for Sustainable Development has implicitly advocated for integrated and sustainability-based SEA approaches (Dalal-Clayton and Sadler, 2005).

This push towards integrated assessments can be attributed to the fact that sustainability-based SEAs allow enhanced cooperation among different institutions, prevent objective conflicts between economic and environmental sectors and encourage raised awareness and improved understanding of the interrelations that take place between the environment and key development sectors (Hedo and Bina, 1999). However, it is also argued that integrated assessment methods are not fully developed, are difficult to use, and that if too many aspects are considered, the assessments can become inefficient and not credible (Kirkpatrick and Lee, 1999). Despite the diverging views on what is the most appropriate scope for SEA, it is argued that environmental assessments will only be successful if they are adapted from the beginning to the circumstances of the strategic action and to its decision-making contexts (Hildén, 1999; Nitz and Brown, 2001).

Developing countries and SEA

Even though empirical experiences that could help to evaluate different SEA approaches are still missing in developed countries (Thissen, 2000; Retief, 2007), most of these have adapted SEA systems (Dalal-Clayton and Sadler, 2005). However, in newly developed and developing countries, there is both a lack of adapted SEA systems (*op. cit.*) and of SEA experiences (Liou and Yu, 2004). In developing countries, most of the limited applications of SEA have been related to international development cooperation and have been required by institutions such as the World Bank (Dalal-Clayton and Sadler, 2005). It is stated that a north-to-south exporting trend of westernised SEA models has developed, and that its consequences in developing countries have not yet been sufficiently studied (*op. cit.*). It is also mentioned that, for example, in Asia where westernised SEA models have been weakly implemented, environmental issues have been considered at a strategic level through Agenda 21 and with internationally treaties such as the Ramsar Convention on Wetlands (Briffett *et al.*, 2003). In addition, it is argued that SEA implementation in developing countries will be challenging due to poor existing institutional conditions, corruption and conflicts of interest (Dalal-Clayton and Sadler, 2005). Moreover, it is considered that factors such as the current lack of adequate planning, unclear development goals, unavailability of environmental data, lack of knowledge in SEA, inappropriate public participation, low awareness or concern for degraded environmental conditions and the poor results that have been achieved with EIA will affect SEA implementation in developing countries (Xiuzhen *et al.*, 2002; Briffett *et al.*, 2003; Liou and Yu, 2004).

Despite all this, SEA is seen to be an appropriate tool that can aid to meet the above-mentioned problems in developing countries. For example, Briffett and colleagues (2003) and Rossouw and colleagues (2000) state that by considering key environmental and sustainability issues earlier in strategic decisions, SEA can improve conditions for project EIAs and hence strengthen their performance. Furthermore, in countries such as China where public participation is limited, SEA is deemed to improve transparency in decision making (Xiuzhen *et al.*, 2002). Additionally, SEA is considered to aid in the planning of important country development strategies and to enhance sectoral and cross-sectoral plan and programme compatibility (ME & UNDP, 2005). Rossouw and colleagues (2000) also mention that SEA is an effective tool used to identify and operationalise clear sustainability objectives in planning. Kessler (2000, 2003) states that by implementing participatory-based SEAN approaches, education and environmental awareness are enhanced and institutional constraints improved.

In Latin America, SEAN approaches have been applied in Honduras and Nicaragua by SNV, a Netherlands-based international development organisation,

to aid in the formulation of sustainable development plans at regional and municipal levels. However, the World Bank and the Inter-American Development Bank (IADB) have led most regional SEA experiences (Dalal-Clayton and Sadler, 2005). In Colombia, for example, these institutions have required that SEAs be applied for land use plans and in the energy, housing and transport sectors (*op. cit.*). The IADB has also recently required an SEA for an integrated bus transit system in the city of Cali (Metrocali, 2005). However, even though Colombia was the first country in Latin America to incorporate EIA concepts in its legislation to evaluate projects (Wathern, 1988), it has not yet incorporated SEA in the evaluation of policies, plans and programmes. Despite this, according to the National Development Plan for 2002–2006, SEAs will be carried out for sector and regional development policies (DPN, 2003). It is stated in this plan that SEAs will also be carried out in large and intermediate cities together with their municipal planning processes (*op. cit.*).

The SEA Pre-study in the Sonso Lagoon Region

The Sonso Lagoon

Sonso Lagoon is located in the Cauca Valley region in the western part of Colombia approximately 60 km north of the major regional city of Cali (population: 2.4 million) and about 5 km south west of the city of Buga (population: 131,000) (CVC, 2004). The lagoon is part of the Cauca River–Wetland ecosystem, and has a total area of 2,045 ha (Escobar, 1998; CVC, 2002). The studied area comprised the Sonso Lagoon and its area of influence that stretches upstream to the city of Cali (Fig. 1).

Sonso Lagoon is the last wetland of significant size that remains in the Cauca Valley (Patiño, 1991). It is a critical habitat for local flora and fauna, and for migratory birds that mainly come from North America (Álvarez-López, 1999). Moreover, local fishing communities have depended on the lagoon for their sustenance for many years (Escobar, 1998). For these reasons, the lagoon has been considered significant from both a regional and an international perspective. However, the ecological state of the lagoon has degraded and in order to avoid further decline, local stakeholders would like the wetland to be declared a Ramsar Wetland of International Importance. To successfully declare the Sonso Lagoon a Ramsar site, a comprehensive management plan must be developed (Ramsar, 2004a). It is also recommended that an SEA be made an integral part of the management planning for the wetland (Ramsar, 2004b). However, there is no comprehensive management plan for Sonso Lagoon, and there is little previous experience with SEA implementation in Colombia.

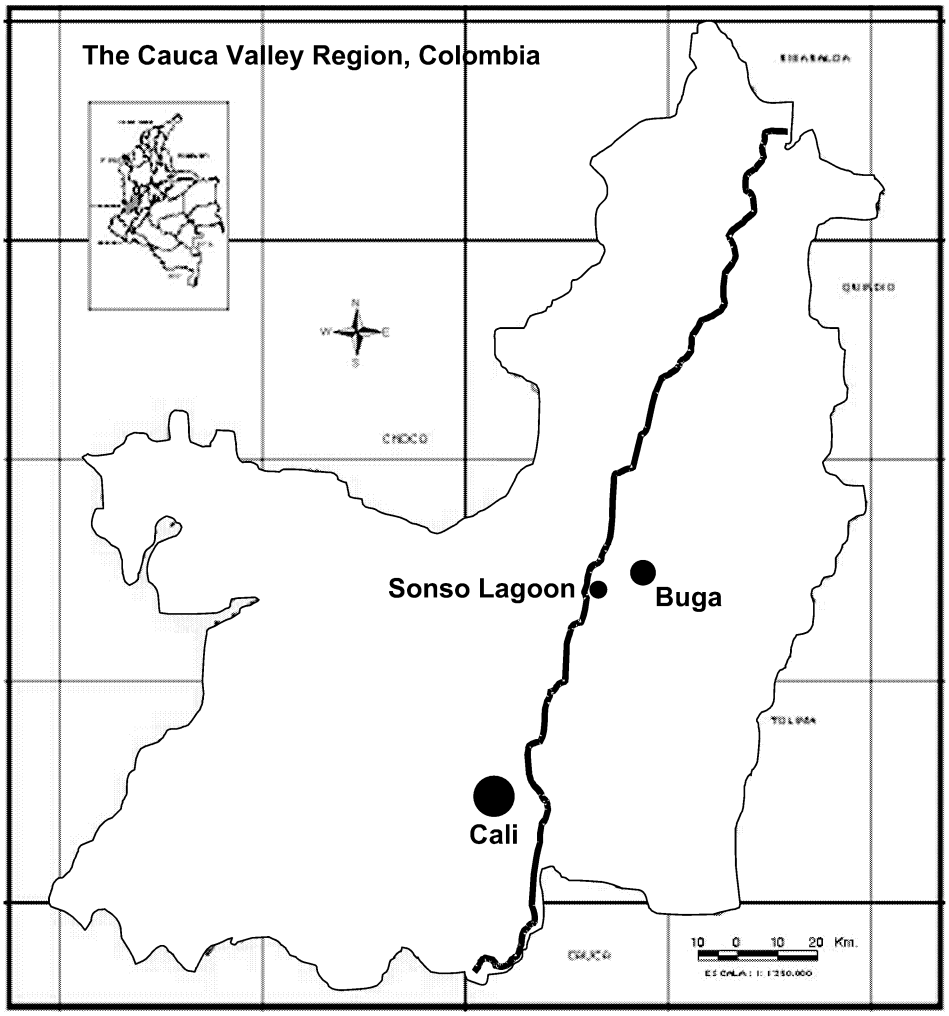

Fig. 1. Shows the study area map (adapted from CVC, 2004).

The applied SEA pre-study process

The Regional Environmental Agency (Cauca Valley Corporation—CVC) has the ambition to declare Sonso Lagoon a Ramsar site (CVC, 2002). The SEA pre-study process was initiated to generate knowledge on key issues for the management planning of Sonso Lagoon and to explore how the process towards Ramsar recognition could be designed. The study was carried out as a separate research study and was not conducted as an integrated part of the official CVC procedures. However, the CVC was considered to be an important stakeholder, and was involved and consulted in all key stages of the SEA study.

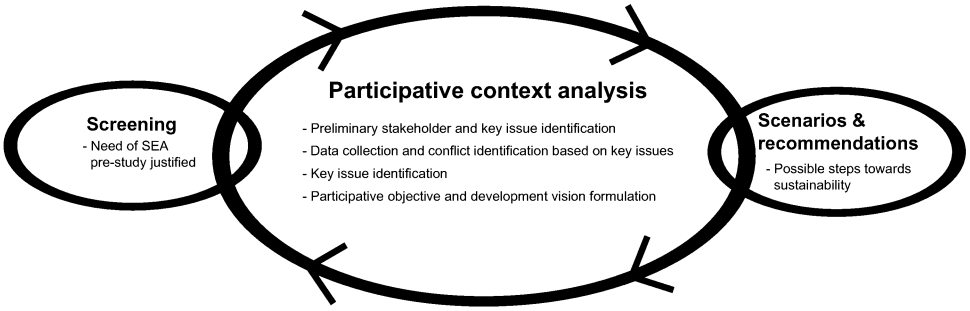

Fig. 2. Applied SEA pre-study process in the Sonso Lagoon (adapted from Andersson and Azcárate, 2005).

The SEA pre-study process that was applied in the Sonso Lagoon case was designed to provide flexibility and adaptability to local conditions (Fig. 2). In addition, the methodology that was used in this case study attempted to enhance the participation of local stakeholders in the SEA pre-study through interviews, workshops and field visits. However, the SEA pre-study process was implemented separately to any planning for the lagoon by an independent multidisciplinary team since at the time of its implementation managerial planning processes for the lagoon had not yet officially begun. Hence, the intention of carrying out an SEA pre-study in the lagoon was to aid in the future formulation of such plans.

Normally, the first step that is carried out in an SEA process is a screening step where the need of the assessment is determined (EC DG TREN, 2005). However, due to the pre-study nature of this SEA investigation, to the lack of SEA guidance and regulations in Colombia, and because no SEAs had previously been implemented in the region, it was agreed together with the CVC and representatives from local NGOs that the need of the SEA pre-study would be determined in parallel to a participative context analysis.

A participative context analysis was carried out to collect data to better understand the environmental and socio-economic issues surrounding the Sonso Lagoon and to formulate sustainable development visions for the wetland. To accomplish this, preliminary stakeholders and key issues were identified and baseline data was collected through stakeholder interviews, workshop and report analysis. In total 35 interviews were conducted with community leaders, staff members of CVC, landowners, representatives of local industries, local NGOs and experts. In addition, a community workshop was organised with local fishers, community leaders and others. Collected baseline data aided to identify new key issues, that required new information, and to identify stakeholders that could supply the newly needed baseline data. During this process, multiple interest conflicts were revealed and potential

synergies identified. Within this data collection process, the scope and scale of the SEA were continuously defined and development objectives for the Sonso Lagoon were specified together with area stakeholders. Based on the development objectives, alternative development visions were formulated. The participative context analysis step proceeded until, in consultation with area stakeholders, it was deemed that data collection ceased to aid in key issue identification.

In the scenario and recommendation step of the applied SEA pre-study process, the suggested development visions for the wetland were illustrated with the use of two scenarios, representing "business as usual" and an integrated Ramsar and Socio-Economic (RSE) Development. These scenarios were presented as narrative descriptions for a 10-year period and illustrated with maps. Also in this step, the alternative development visions for the Sonso Lagoon were made operative by suggesting a large number of specific recommendations, related to technical, management and educational issues, on how to reach the formulated objectives.

The outcome of the participative SEA pre-study process

After applying the described participative SEA pre-study process in the Sonso Lagoon, the following results were obtained:

Preliminary stakeholders and key issue identification

Based on initial stakeholder consultations and reviews of reports, key stakeholder categories were identified as being: public institutions, industries, fishing communities, landowners, lagoon experts and non-governmental organisations. Additionally, two general preliminary key issue categories were identified as being a biophysical and socio-economic key issues category, and a planning and managerial key issues category.

Data collection and conflict identification based on key issues

Data collection and conflict identification in the Sonso Lagoon were carried out in an iterative manner based on identified key issues. However, initially they were based on the preliminary key issue categories that were identified in the preceding step.

Biophysical and socio-economic preliminary key issue category: it was found that in the lagoon, the interrelations between socio-economic development and the environment were very closely knit together. The lagoon provides innumerable ecological and socio-economic services to local flora, fauna and human populations (Patiño, 1991). According to Escobar (1998), 75% of the families settled around the lagoon

derive their daily sustenance from fishing activities in the wetland, and according to Álvarez-López (1999), the ecological richness of the lagoon and its diversity in local and migratory birds have made it one of the most attractive places for birdwatchers to visit in Colombia. However, the region has recently experienced an uncontrolled urban and economic development that has negatively affected its environment to the point that fishing communities can no longer depend on the lagoon for their sustenance (Patiño 1991; CVC, 2002).

Planning and managerial preliminary key issues category: it was found that the Colombian Planning System (Fig. 3) does not provide an effective protection of environmental concerns in the Sonso Lagoon. The overall framework, which is defined at the national level, is transferred into local and regional environmental policy plans. However, important actions that could contribute to the preservation of the Sonso Lagoon are missing. For example, the area has not been given conservation priority in national and regional policy documents (CVC, 2003; MMA, 2001), and at the local level, no actions for the future management of the lagoon have been considered (MGB, 2000). In addition, there is a general lack of environmental data at all institutional levels (CVC, 2002; IDEAM, 2002; DPN, 2005). Furthermore, factors such as corruption, a lack of institutional planning coordination and a lack of environmental consciousness have also contributed to the exclusion of environmental issues from strategic planning in the country (CVC, 2002). As well, the Colombian Planning System is still considered to be centralised and unsuccessful to secure public participation (CVC, 2002; IDEAM, 2002; Rueda, 2004; DPN, 2005).

Due to the nature of the Colombian Planning System, inappropriate environmental resource management practices have arisen. For example, in the country valuable ecosystems such as its 20 million hectares of wetlands have been seriously impacted due to a lack of adequate planning and management (IDEAM, 2002). In the Sonso Lagoon, environmental authorities have not been able to control illegal

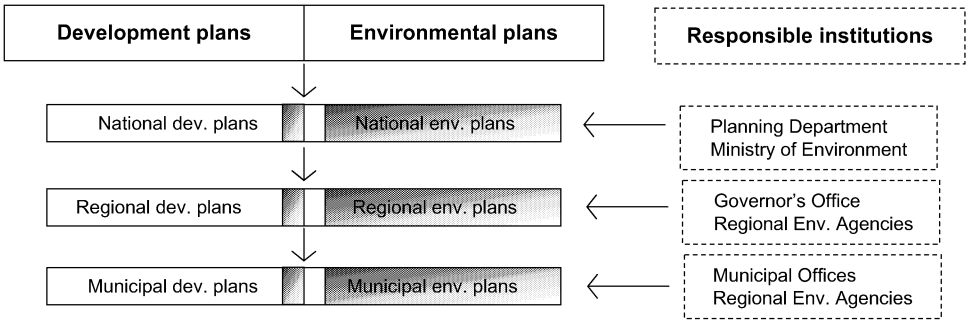

Fig. 3. Colombian planning system and environmental issue consideration (adapted from Andersson and Azcárate, 2005).

land use activities and water pumping, and according to area stakeholders, public participation in the management of the lagoon has been very limited and ineffective.

Key issue identification

Key issues for the Sonso Lagoon were refined from preliminary key issue categories and identified through iterative data collection. Due to the comprehensive scope of the case study key issues for the Sonso Lagoon were divided into national, regional and local levels as shown in Table 1.

Participative objective and development vision formulation

Within the iterative process, stakeholder input was collected and processed to formulate two development visions for the Sonso Lagoon. The first development vision

Table 1. Detailed key issues per level for the Sonso Lagoon and a selection of objectives for the RSE development scenario.

Level	Key issues	Development objectives
National	• National environmental policy assessment and integration to regional and local strategic actions • Ramsar Convention in laws and regulations • National road infrastructure • Eco-tourism	• Declare Sonso Lagoon a Ramsar area • Prioritise bottom-up approaches for national policy making
Regional	• Regional environmental plan assessment and integration to national and local strategic actions • Ramsar Convention lagoon management guidelines • Regional road infrastructure • Eco-tourism • Upstream industries and municipalities • Agricultural and cattle-raising activities • Environmental awareness	• Improve nature reserve's infrastructure • Prioritise wetland habitat characteristics to counteract threatened types of ecosystems • Utilise current CVC infrastructure to support eco-tourism • Establish a proactive lagoon management style • Resolve pending border conflicts between local authorities • Introduce economic incentives to motivate land use practice changes • Strengthen the status of Sonso Lagoon in the strategic environmental development plan

Table 1. (*Continued*)

Level	Key issues	Development objectives
Local	*Physical:* • Water supply and depth • Water quality • Sedimentation rate	• Secure water depth and water supply • Reduce water hyacinths coverage • Improve water quality of the lagoon
	Flora and fauna: • Habitat degradation • Human disturbances • Fish migration paths • Overgrowth of aquatic plants • Introduced species	• Improve and secure habitat diversity • Reduce traffic disturbance close to the wetlands
	Socio-economic: • Community and road infrastructure • Economic reactivation • Education and health • Land use practices • Economic incentives • Alliances with private sector	• Isolate natural areas from disturbing human activities • Provide educational and health resources to fishers communities • Generate employment through proposed area economical activities • Introduce land use practice changes and economic incentives
	Legal/Managerial/Planning: • Pending legal matters • Lagoon management • Assessment of municipal planning and coordination with lagoon development	• Transformation towards ecological sugarcane production • Establish a proactive lagoon management style
	Public Participation: • Stakeholder involvement in lagoon recuperation and conservation	

that was defined was the "business as usual" or zero-alternative development vision. In this vision, neither the recommended Ramsar Wetland Management Concepts (Ramsar, 2004a) nor the ideas proposed by area stakeholders would be considered. A scenario was used to illustrate this vision where a decaying lagoon was depicted in 10 years, and where its disappearance was predicted in 25 years. The second development vision that was defined for the Sonso Lagoon was the integrated RSE Development vision. In this vision, development objectives were formulated (see Table 1) based on the opinions and interests of local stakeholders and on the recommended Ramsar Wetland Management Concepts (*op. cit.*). Finally, to aid in reaching these objectives, objective-specific actions were suggested and explained for each objective, and the proposed RSE Development vision was illustrated in a scenario.

Discussion

Identifying data and issues through participative SEA

In the context of the Sonso Lagoon where baseline data and clear development objectives were missing, a baseline-led SEA approach was applied to understand the environmental and sustainability conditions of the region. This type of SEA approach aided to effectively collect needed area baseline data by focusing on identified key issues. Initially, the types of data that were collected in the lagoon were largely bound to preliminary key issue categories. However, as the data collection process progressed and as more area stakeholders participated in the process, detailed key issues were identified that gave rise to new information needs. By collecting data and identifying key issues in an iterative way, the differences between baseline-led and objectives-led SEA approaches became subtle. In the Sonso Lagoon, these different types of formal SEA approaches were complementary rather than opposing to each other (Fig. 4).

However, since the intention with the case study was to design and implement a flexible, adaptable and easy-to-use participative SEA pre-study process, the scoping, baseline description and the key issue identification steps of a formal SEA process

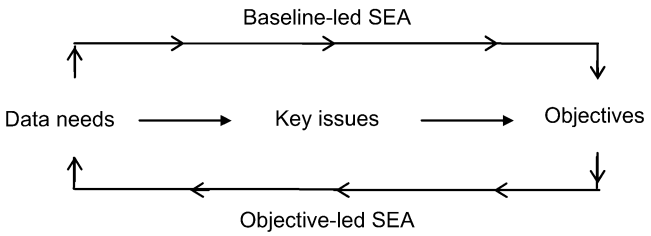

Fig. 4. The complementary use of baseline-led and objective-led SEA types in the Sonso Lagoon.

were merged into one step, the participative context analysis step. In doing so, it was possible to mould the participative SEA pre-study process to existing lagoon conditions gradually and interactively, as data became available and as key issues were identified. By actively including regional alienated communities from the beginning in the participative SEA pre-study process, a more comprehensive baseline on the conditions in the region could be obtained. Additionally, local environmental knowledge provided a better understanding of the existing close interrelations between environmental and socio-economic aspects of the lagoon. Through the applied SEA process, local traditional and expert knowledge were integrated so that complex environmental and socio-economic key issues could be better understood. Once these issues and their interrelationships were clear, objectives addressing local concerns could be formulated.

Multi-level approach to formulate and harmonise objectives

Since it was found that the environmental and socio-economic development of Sonso Lagoon were intrinsically linked to each other, it was acknowledged that a multi-levelled, sustainability focused and integrated SEA pre-study analysis was needed. Hence, in the SEA pre-study process, local, regional and national environmental and socio-economic issues having a bearing on the lagoon were considered (Fig. 5). This entailed that issues that were identified on the local level could be analysed in their regional and national context and vice versa. The scope and the scale of the SEA pre-study were not restricted to a particular level, but instead a multiple scale or a range of scales appropriate for the analysis was considered in accordance with João (2002). The interaction between levels or scales adds an additional aspect to the complexity of the analysis that raises questions that become more difficult to answer (Wolfe *et al.*, 2001) and call for methods of switching scales (Fox, 1992).

Due to the different scales that were considered and due to the complexity of the environmental and socio-economic aspect interrelations in the region, identifying key issues and formulating objectives for the Sonso Lagoon was challenging. Conflicts of interest arose between different stakeholders at different scales making key issue prioritisation difficult. For instance, while local fishing communities were interested in improving the ecological conditions of the lagoon so that fishing activities could resume, regional landowners were mostly interested in protecting their lands from floods and in maximising the productivity in their parcels. Similarly, conflicts arose between regional conservationists and local fishers in that the former envisioned a lagoon that served mostly for bird observation. Conflicts and positive synergies between different issues and scales were mapped to aid in objective formulation, but it was considered difficult to decide what was more or less important. In cases of incompatible interests, the objectives and scenarios aimed at cooperate

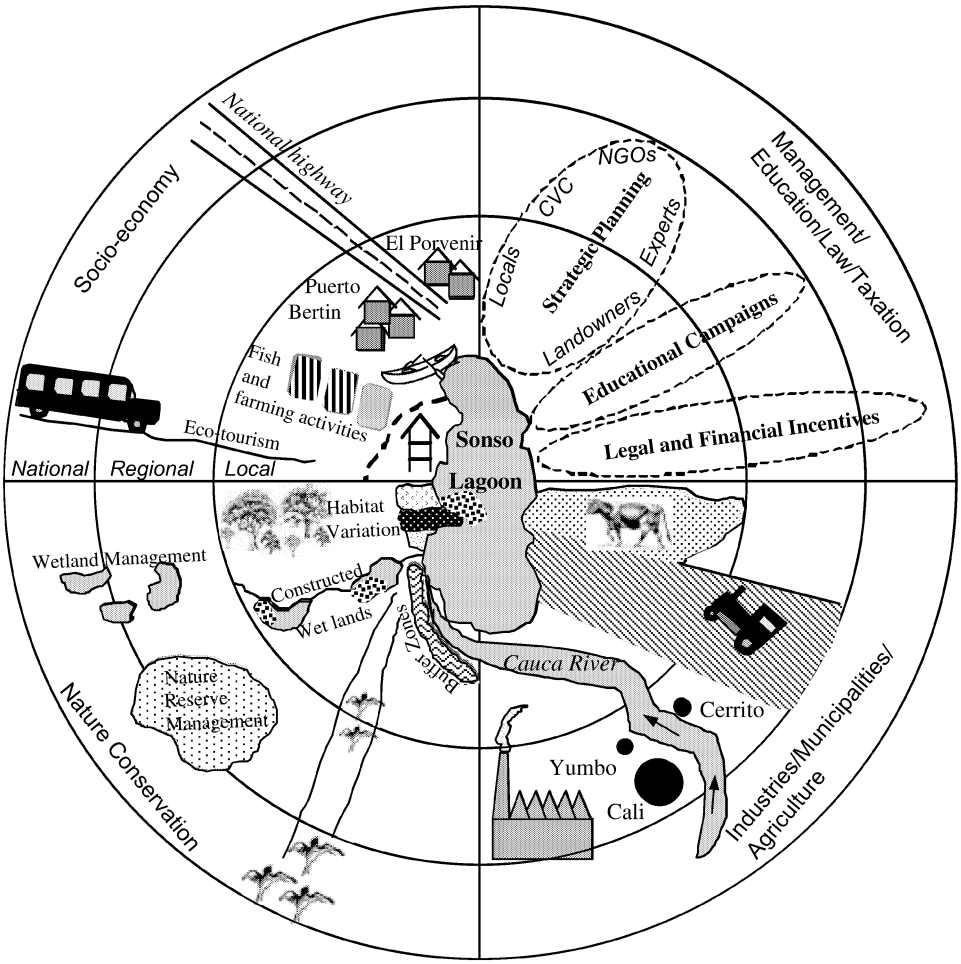

Fig. 5. Shows the scope and scale of the participative SEA for the Sonso Lagoon (Andersson and Azcárate, 2005).

solutions, involving maximum mitigation to minimise the negative impacts on the local environment.

Hence, as part of the objective formulation priorities had to be set, which could jeopardise the entire study if any of the stakeholders would perceive that their interests were not considered. In the case of Sonso Lagoon, the situation was even more intricate as the participative approach challenged existing social structures in the region. However, the proposed RSE Development scenario offers benefits for all stakeholders. The close cooperation with diverse stakeholders in the process resulted in regional and locally anchored objectives and bolstered the commitment to the solutions that were agreed upon. This commitment also defined and limited the scope

for the scenario alternatives, which implies that actions that were not agreed upon could not be considered in the development scenarios. Nevertheless, the case of the Sonso Lagoon shows that the participative SEA process facilitates the identification and balancing of diverse interests and that can be integrated into appropriately scaled objectives as suggested in Thérivel (2004). Hence, the application of an SEA process can provide an alternative to top-down goal formulation.

Planning context

The current planning structure in the Sonso Lagoon region provides a weak institutional context for the application of SEA. The lack of planning coordination entails limitations for the formalisation and implementation of the outcome of the SEA pre-study. This involves that the development of the proposed RSE vision depends to a large extent on the stakeholders' commitment and willingness to take steps towards the implementation of the vision. On the other hand, the lack of coherent planning practice requires tools to bridge the gaps between different actors in the planning process. In the case of the Sonso Lagoon, SEA offered such a tool providing an informal framework to facilitate the dialogue between stakeholders in the region. The participative SEA approach contributed to the transparency of the planning and decision-making processes. It created better opportunities to address equity issues by giving a voice in decision making to the poorest most marginalised groups in society, it minimised planning gaps and objective conflicts between different planning levels, and it encouraged institutional cooperation. Furthermore, the proposed participative SEA pre-study process increased environmental awareness among the stakeholders in the region. The participative approach also provided a framework to develop an SEA process that is adaptable to local conditions and that provides flexibility in data collection and in key issue identification. However, improvements in the planning context are needed at all levels to enhance the effectiveness of the planning system, in particular if the vision of the establishment of a Ramsar Wetland of International Importance in the Sonso Lagoon should be implemented. This requires, not at least, coordinated actions from governmental organisations at all levels to support the declaration of the Sonso Lagoon as a Ramsar area. Moreover, there is a need to maintain the dialogue in the region and create transparency in the process, which may advance the implementation of the proposed development and hold back negative aspects such as corruption. In a long-term perspective, the legitimacy and the legislative basis of local and regional planning need to be strengthened.

Apart from the developing country context of the Sonso Lagoon where the participative SEA pre-study process was used, it can be argued that a participative SEA approach can be applied in situations with more comprehensive planning and

decision-making frameworks. For example, the application of the participative SEA pre-study process in industrial nation contexts can contribute to a better understanding of the linkages between environmental and socio-economic issues. By better understanding these issues and their relationships, conflicting goals between sectors will be minimised and the chances of reaching sustainable outcomes would increase. For instance, Balfors and colleagues (2005) discuss the role of SEA as a tool to reveal conflicting goals between urbanisation and biodiversity in the Mälaren region in Sweden. Moreover, Hedo and Bina (1999) stated that SEA frameworks could reduce objective conflicts between environmental and economic objectives for sector planning in Spain. Lastly, the process could strengthen the bottom-up forces in planning and policy making, where identified environmental and sustainability issues in one decision-making tier could influence other decision-making tiers.

In order to establish an effective SEA process, it is important to create acceptance for the approach at all governmental levels. Without this support, the SEA process will lack legitimacy and so SEA will fail to appropriately transfer process knowledge to local personnel in charge of its future implementation, making the process unviable. Additionally, a participative SEA pre-study process takes time and resources and it requires interdisciplinary cooperation, factors that together might influence decision makers to find decision-making support data elsewhere. Yet, the problem of limited time and resources may be addressed by using a combination of more realistic specifications of the priority tasks together with a more effective use of existing resources (Lee, 2006).

Conclusions and Future Research

The SEA pre-study investigation that was carried out in the Sonso Lagoon provided valuable experiences in regards to a possible way of designing and implementing SEA processes. The applied SEA pre-study model offered a flexible, iterative and participative SEA pre-study process within which it was possible to collect data by stimulating public participation, to analyse complex relations between environmental and socio-economic issues at different scales, and to formulate scaled and operable development objectives for the Sonso Lagoon region. The experiences that were gained from the application of the SEA pre-study in the Sonso Lagoon region showed that a baseline-led SEA approach offers a framework for a communicative process where key issues are identified according as baseline data is collected. In doing so, a lack of pre-defined objectives does not hold back the application of SEA.

The Sonso Lagoon case also showed the need to discuss environmental issues together with socio-economic issues at different levels. In particular, for situations such as the Sonso Lagoon, where nature conservation issues need to be harmonised with local, regional and national interests, SEA offers an important framework for a

debate on sustainable regional development. In such situations, the scope and scale of SEA should not be limited but instead open for a comprehensive approach so that data related to local, regional and national issues is considered and analysed.

Finally, the case of Sonso Lagoon showed that SEA is an important tool for planning and decision making in developing countries. However, its application needs to be adapted to the conditions on site rather than importing westernised types of SEA processes just to comply with external requirements or to meet international trends. The lack of environmental data, the shortcomings in planning and decision-making processes as well as the reservations towards local stakeholder involvement are major obstacles for the implementation of SEA. On the other hand, SEA is able to offer a flexible tool for an open debate on sustainable development. With this prospect, further development of tools to collect local and expert knowledge and methodologies that support the application of SEA in developing country contexts is a main challenge in the near future.

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Strategic environmental assessment and monitoring: Arctic key gaps and bridging pathways

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Abstract
The Arctic region undergoes rapid and unprecedented environmental change. Environmental assessment and monitoring is needed to understand and decide how to mitigate and/or adapt to the changes and their impacts on society and ecosystems. This letter analyzes the application of strategic environmental assessment (SEA) and the monitoring, based on environmental observations, that should be part of SEA, elucidates main gaps in both, and proposes an overarching SEA framework to systematically link and improve both with focus on the rapidly changing Arctic region. Shortcomings in the monitoring of environmental change are concretized by examples of main gaps in the observations of Arctic hydroclimatic changes. For relevant identification and efficient reduction of such gaps and remaining uncertainties under typical conditions of limited monitoring resources, the proposed overarching framework for SEA application includes components for explicit gap/uncertainty handling and monitoring, systematically integrated within all steps of the SEA process. The framework further links to adaptive governance, which should explicitly consider key knowledge and information gaps that are identified through and must be handled in the SEA process, and accordingly (re)formulate and promote necessary new or modified monitoring objectives for bridging these gaps.

Keywords: Arctic, strategic environmental assessment, hydroclimatic change, climate change, environmental change, environmental observation, monitoring, adaptive governance, adaptation, monitoring gaps, uncertainty

1. Introduction

Systems for environmental assessment and environmental monitoring are needed to understand the large ongoing and future environmental changes in the Arctic, their impacts on society and ecosystems, and to decide on appropriate change mitigation and adaptation strategies and measures (UNEP 2007, Koivurova 2008, Casper 2009). With regard to policy and practice of environmental assessment, all Arctic states have in principle established national environmental assessment systems, and some have also signed international treaties on transboundary environmental assessment. Koivurova (2008), however,

argues that the environmental assessment implementation varies considerably among Arctic states, is insufficiently applied across the region, and poorly considers specific Arctic characteristics.

With environmental *monitoring*, we refer to the ability to detect, understand and evaluate changes in the physical environment, within the framework of environmental assessment. Such monitoring in turn fundamentally relies on actual *observations* of the environment. Monitoring is explicitly recognized as a critical component of strategic environmental assessment (SEA) in relevant scientific literature (Thérivel and Partidário 1996, Partidário and Fischer 2004, Persson and Nilsson 2007) as well as in concrete SEA conceptualization and implementation, such as the European Union (EU) SEA Directive on the assessment of the effects of certain plans and programmes on the environment (OJEC 2001). SEA differs from environmental impact assessment (EIA) in that EIA regards individual projects (Wood 2003) while SEA regards higher-level development initiatives, i.e., overarching policies, plans and programmes (João 2005). Environmental monitoring has further been a fundamental component of SEA since its initial development stages (Lee and Walsh 1992, Thérivel and Partidário 1996), explicitly recognized as a good SEA practice principle (IAIA 2002) and an essential SEA tool for accountability and learning (Persson and Nilsson 2007). Legal provisions established in the EU SEA directive (OJEC 2001) and in several countries (Partidário and Fischer 2004) also formally require environmental monitoring within SEA. However, despite legal requirements and overall recognition of the importance of environmental monitoring in SEA, reporting or communication of SEA monitoring results are found to be absent in practice (Gacheciladze *et al* 2009, Lundberg *et al* 2010).

With regard to environmental changes that should be monitored as a main component of SEA application, water-related changes are essential for water and food security (Oki and Kanae 2006), environmental flows (Tharme 2003), and because water is a key integrating and change propagating-regulating factor for various other environmental changes. For example, water flow changes relate closely to changes in climate and in human land-use and water-use (Jarsjö *et al* 2012, Destouni *et al* 2013). Furthermore, water quality changes follow from activities in different human sectors, such as: agriculture (Basu *et al* 2010); mining (Banks *et al* 1997), waste disposal (Rosqvist and Destouni 2000); and several combined industrial and household activities (Baresel and Destouni 2005) along with climate change (Darracq *et al* 2005). Both water flow and water quality changes can in turn also affect climate change (Destouni and Darracq 2009, Destouni *et al* 2010a) and ecosystems (Poff *et al* 1997, Poff and Zimmerman 2010). These examples also highlight that observation systems must be in place in order for environmental monitoring to be feasible.

Such water and water-related changes, in the following referred to as hydroclimatic changes, are not least important in the rapidly changing Arctic region, where they are among the most recognized Arctic indications of environmental change. They include, for instance, increasing river flows (Peterson *et al* 2002, 2006, McClelland *et al* 2006, Shiklomanov and Lammers 2009, Overeem and Syvitski 2010) and increased (Smith *et al* 2007) or changed seasonality (Frampton *et al* 2011, 2013) of the groundwater contribution to those flows, in addition to increased mass loss from glaciers (Kaser *et al* 2006, Gardner *et al* 2011), permafrost degradation (Hinzman *et al* 2005, Lyon and Destouni 2010, White *et al* 2007, Brutsaert and Hiyama 2012), shorter extent of snow cover season (Brown *et al* 2010, Callaghan *et al* 2011) and water-related ecosystem shifts in the Arctic landscape (Smol *et al* 2005, Karlsson *et al* 2011). Various water changes have also been identified as key indicators for Arctic food and water security (Nilsson and Evengård 2013, Nilsson *et al* 2013). However, with regard to the observation systems that are needed to monitor such important hydroclimatic changes in the Arctic, research shows decline and key deficiencies (Lammers *et al* 2001, Shiklomanov *et al* 2002). Particular gaps are for example found for observations of hydrochemistry in Arctic rivers (Bring and Destouni 2009), and for Arctic areas where ecological regime shifts have already occurred (Karlsson *et al* 2011) and future climate change is expected to be most severe (Bring and Destouni 2011, 2013).

With regard to the rapidly changing Arctic system, there are thus gaps in both the implementation of SEA (Koivurova 2008) and the observation systems required for the environmental change monitoring that should be part of that implementation. Furthermore, the literature proposes different approaches to required SEA monitoring (Partidário and Fischer 2004). As a starting step to address the inherent complexity in strategic decision-making and to systematically monitor its effects, Partidário and Arts (2005) articulate key monitoring concepts in a multi-track approach to SEA monitoring. Cherp *et al* (2011) build on this approach and integrate key elements of SEA ex post evaluation and management of strategic initiatives. Additionally, Persson and Nilsson (2007) suggest principles for SEA monitoring, emphasizing, among other issues, the importance of deciding if and when to link SEA monitoring with observation systems. Nilsson *et al* (2009) further introduce an analytical tool kit for SEA monitoring, proposed to serve as a systematic stand-alone monitoring framework. Moreover, Lundberg *et al* (2010) suggest how SEA monitoring processes can be linked to SEA processes for regional transport infrastructure plans, while Wallgren *et al* (2011) proposes how SEA monitoring can link to planning and programming processes, and Gacheciladze-Bozhesku (2012) explores the integration of stakeholder participation in SEA monitoring.

However, despite growing research on and application of strategic approaches to SEA (Azcárate and Balfors 2009, Partidário and Coutinho 2011, Teigão dos Santos and Partidário 2011, Azcárate and Balfors 2013, Partidário and Gomes 2013), project-based EIA-type of approaches still dominate SEA practice, with conspicuously missing strategic frameworks for the uncertainty monitoring that is needed to manage unexpected effects, address situations of uncertainty, and link to adaptive management (Partidário and

Fischer 2004, Partidário 2009). This letter focuses on such strategic gaps in SEA application for the rapidly changing, transboundary Arctic region, with particular regard to actual environmental observation systems in the region and their links to strategic uncertainty monitoring in regional SEA application. Based on a concrete gap analysis for the Arctic, the letter proposes an overarching framework for systematic consideration of available environmental observations and remaining key uncertainties in regional SEA application and monitoring. The framework departs from the EU SEA Directive as a model basis for introducing necessary strategic connections between SEA uncertainty monitoring and environmental observations, with the aim to improve both the regional SEA application and the environmental observation systems across the Arctic.

In the following, section 2 extends first the above general background and gap analysis for SEA and environmental monitoring (2.1), and continues with the corresponding specific background and gap analysis for the Arctic region (2.2). Section 3 outlines and discusses the proposed overarching framework for systematically linking and improving SEA application and environmental monitoring in the Arctic, and section 4 summarizes main conclusions from the study.

2. SEA and environmental monitoring

2.1. General background and gap analysis

Initial SEA development took place in the USA under the 1969 National Environmental Protection Act (NEPA) for strategic initiative assessment beyond the project-focused EIA (Glasson *et al* 2003). Since NEPA, SEA has been regulated in the legal systems of many countries (Fischer 2007), different approaches to SEA have been developed (Verheem and Tonk 2000), and SEA application has increased worldwide due to its promotion by international organizations such as the World Bank, Regional Development Banks, the United Nations and the European Union (Dalal-Clayton and Sadler 2005).

In Europe, discussions on the need of regulating environmental assessments of strategic initiatives started as early as 1975 (Thérivel 2004), with the EU SEA Directive (OJEC 2001) being a main current result of the further development after these early discussions. The SEA Directive is a procedural provision aiming to harmonize SEA processes in member countries. In particular, the monitoring requirements in the EU SEA Directive differ from those in the EU EIA Directive (OJEC 1985) where monitoring is not mandatory. However, even the SEA monitoring requirements are considered to be vague and minimum-level requirements (Partidário and Fischer 2004) that fail to provide concrete guidance on how to organize monitoring, carry out scoping for monitoring, and establish causality relations to monitored environmental impacts (Persson and Nilsson 2007, Hanusch and Glasson 2008). Perhaps as a consequence of vagueness and concretization failure, despite the explicit recognition and acceptance of the importance of monitoring in SEA, there is limited literature on the subject and a general lack of practical application experiences (Partidário and Arts 2005).

Empirical evidence of SEA monitoring application, for instance in England, Germany and Canada, shows that the identification and evaluation of unforeseen, emerging and external issues have not been a focal point in SEA monitoring (Hanusch and Glasson 2008, Gacheciladze *et al* 2009). Moreover, in their studies of different regional planning schemes in Sweden, both Lundberg *et al* (2010) and Wallgren *et al* (2011) found that monitoring was limited to controlling if measures set out in strategic initiatives were implemented, completely overlooking the observations of the actual measured impacts on the physical environment. Overall, a lack of methodological application and formalized routines for monitoring and evaluating the effects of strategic initiatives has been found in the studies of concrete SEA monitoring applications (Gacheciladze *et al* 2009, Lundberg *et al* 2010, Wallgren *et al* 2011).

An additional issue that has been poorly considered in both SEA theory and practice is that of whether and how to link SEA monitoring with existing observation systems (Gacheciladze-Bozhesku and Fischer 2012). Linking SEA monitoring with existing observation systems is for instance recommended in the EU SEA Directive, stating that: '*existing monitoring systems may be used if appropriate, with a view to avoiding duplication of monitoring*' (OJEC 2001). As information availability is fundamental, and collecting such information and data requires considerable amounts of time, effort and investment, SEA monitoring should clearly make best possible use of already existing observation systems (Partidário and Fischer 2004). This means that there is a separation of responsibilities, with existing observation systems often operated and funded by long-term government programmes and agencies, whereas the direct interpretation of these observations and monitoring changes related to specific plans, programmes or policies rests with the institutional body that coordinates the corresponding SEA process. However, guidance on how these systems can and should be effectively connected to SEA monitoring is lacking, and various limitations and challenges exist in practice.

For instance, the available environmental observation system in Sweden is only weakly linked to the monitoring of strategic initiative effects due to analytical, organizational and institutional barriers (Wallgren *et al* 2011). In England and Germany, where SEA monitoring is based on existing environmental observation systems, it has further been found that available observation systems do not cover the information needs of SEA monitoring and that there are problems with data collection frequencies, scales and compatibilities (Hanusch and Glasson 2008). Also in Canada, similar challenges of linking SEA monitoring with existing environmental observations were found, for instance, in the forest sector due to inconsistencies between existing industry and government observing systems (Gacheciladze *et al* 2009).

2.2. Arctic background and gap analysis

All Arctic states, that is to say Finland, Sweden, Norway, Denmark (including Greenland and the Faroe Islands),

Iceland, Canada, the United States of America, and the Russian Federation, have adopted EIA and SEA provisions in their national legal systems (Koivurova 2008). As EU member states, Sweden and Finland have also adopted the environmental assessment requirements of the EU SEA Directive (OJEC 2001); Norway and Iceland have done the same even though they remain outside the EU. Greenland (Denmark) adopted its own environmental assessment regulations, Canada established SEA provisions through Cabinet Decisions, USA regulated SEA in its 1969 NEPA, and the Russian Federation established SEA-like provisions under its SER/OVO system (Wood 2003, Dalal-Clayton and Sadler 2005, Koivurova 2008).

In theory, by having adopted regulations for SEA in their national legal systems, Arctic states are obligated to carry out environmental assessments for overarching policies, plans and programmes that could potentially harm their Arctic environments. However, the established SEA legal systems vary among Arctic countries, as does also concrete SEA application (Koivurova 2008).

Through the Espoo Convention, the Arctic states agreed already in 1991 to carry out EIA on planned development projects taking place in transboundary contexts (UNECE 1991). Furthermore, as stated in Article 2.7 of the Convention, SEA should be carried out for policies, plans and programmes in transboundary contexts. However, the use of SEA for such strategic actions above the individual project level was here expressed as discretional. Even though a specific protocol on SEA has thereafter been added to the Espoo Convention, and signed by the Arctic states of Norway, Finland, Sweden and Denmark (UNECE 2003, Koivurova 2008), the implementation of SEA in the Arctic has been limited by the discretion left to states to decide what are significant impacts (Hildén and Furman 2001, Bastmeijer and Koivurova 2008). In addition, SEA application limitations are due to differences in national environmental assessment systems (Hildén and Furman 2001, Koivurova 2005), needs for extensive collaboration between countries (Tesli and Husby 1999), and lack of institutional capacities (Kersten 2009).

With regard to environmental monitoring, it is an essential part of SEA for revealing, quantifying and following up the actual reality of historic, through ongoing, to future environmental variability and change, and the effectiveness of introduced policies, plans and programmes that aim specifically at controlling, mitigating or adapting to such variability and change. To achieve all this, SEA monitoring must rely on already available environmental observation systems, as discussed above in the general section, even though these systems may be broader and serve also other information goals than just SEA requirements. Thereby, SEA monitoring in the Arctic is faced with similar challenges and uncertainties as the currently operated environmental observation systems in the Arctic.

With regard to observations of environmental changes in the Arctic, hydroclimatic changes should be central, including hydrological, hydrochemical, water-related ecological, and water management changes, in addition to large-scale climate change. All of these different aspects of hydroclimatic change are linked, for instance because both climate change and water management practices directly affect water flow changes, which in turn propagate the change effects to and partition them among different water subsystems (soil moisture, groundwater, stream networks, lakes, wetlands and snow–ice subsystems) and associated water fluxes in the landscape (Bosson *et al* 2012, Karlsson *et al* 2012). Moreover, water is a main carrier of different constituents (dissolved tracers and other chemicals, sediments, colloids), and the spatiotemporal concentration and mass-flux variability of these depend on the fluxes and partitioning of water (Cvetkovic *et al* 2012), in addition to the distribution of waterborne source inputs (Destouni *et al* 2010b) through the landscape. Changes to water in the landscape, and in the fluxes and concentrations of its constituents in turn affect Arctic ecosystems (Karlsson *et al* 2011), the Arctic Ocean (Cauwet and Sidorov 1996, Amon and Meon 2004, Dyurgerov *et al* 2010), and Arctic food and water security (Nilsson and Evengård 2013, Nilsson *et al* 2013).

In spite of such key roles for water in the landscape in multiple environmental changes, its observation in the Arctic has large gaps (Lammers *et al* 2001, Shiklomanov *et al* 2002, Hinzman *et al* 2005, Walsh *et al* 2005, Arctic-HYDRA consortium 2010), particularly regarding water chemistry (Bring and Destouni 2009) and hydrologically mediated ecological regime shifts (Karlsson *et al* 2011). Arctic hydrological observations have also declined the most, and is most deficient, in areas where future climate changes are expected to be the most severe (Bring and Destouni 2011, 2013). International assessments of the status of transboundary water management, latest in the Second Assessment of Transboundary Rivers, Lakes and Groundwaters (UNECE 2011), have further pointed out a lack of relevant water and water quality observations in Eastern Europe and Central Asia, which are parts of the pan-Arctic drainage basin. Furthermore, a global survey of UN-related international initiatives and programmes for water observations (FAO 2006), identified key problems of data quality, irregular data updates, limited data accessibility and data fragmentation, several of which also apply to the Arctic. With particular regard to Arctic food and water security, an international assessment has also recently called for urgent initiation of observations that underlie several, currently unmonitored, freshwater quantity and quality indicators in the Arctic (Nilsson and Evengård 2013, Nilsson *et al* 2013).

3. Linking and improving Arctic SEA application and environmental monitoring

We have in the above section identified and exemplified main gaps and limitations, which imply major improvement needs and challenges for both SEA application and relevant observations and monitoring of environmental change in the Arctic. Increased interest in the Arctic region is beginning to partly address these challenges. A main focal point for efforts to coordinate monitoring and assessment activities is then the Arctic Monitoring and Assessment Programme (AMAP),

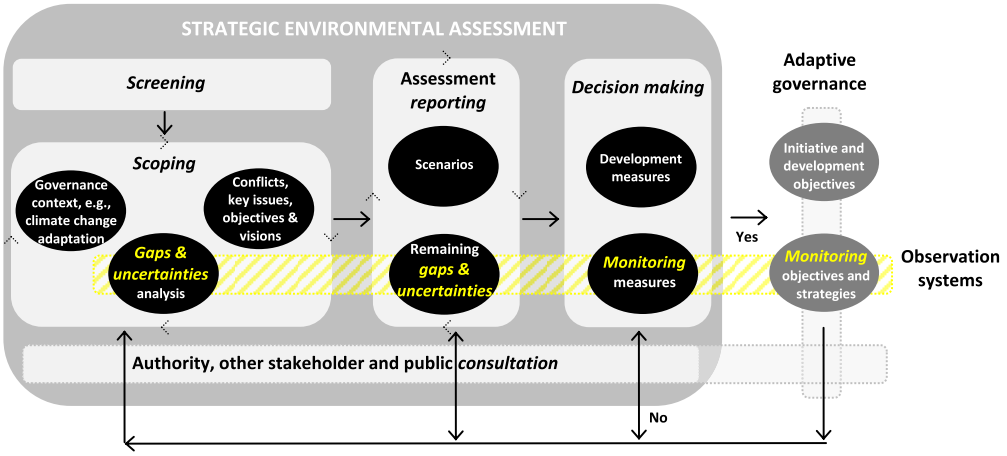

Figure 1. SEA adaptive governance framework for gap/uncertainty handling and environmental monitoring linked to observation systems.

established in 1991 and now a programme committee under the Arctic Council. AMAP was originally established to implement the Arctic Environmental Protection Strategy (AEPS), but has now a broader scope and is an umbrella for a range of programmes and assessments related to Arctic observations and monitoring. Recent examples of AMAP assessments include the snow, water, ice and permafrost in the Arctic (SWIPA) report (AMAP 2011a), and the assessment of mercury in the Arctic (AMAP 2011b). Under the umbrella of the Arctic Council and the International Arctic Science Committee (IASC), an effort at securing commitment to maintain the capacity of Arctic observation networks (the SAON process) has also recently been initiated. More generally within the UN framework, the Federated Water Monitoring System (FWMS) has been initiated to alleviate the particular problem of water data fragmentation (FAO 2006), which is also relevant for the Arctic.

However, even with such coordination initiatives in place, limited funding in combination with competing information goals still imply a critical need for prioritization and optimization of current and future observation systems in the Arctic. For example, regarding the key hydroclimatic change observations in the Arctic, Bring and Destouni (2013) have shown that global climate model (GCM) projections differ both from each other and from change observations in their indications of how (e.g., in which direction precipitation is/will be changing) and which Arctic areas will be most severely affected by climate change under current conditions and various future change scenarios. These differences imply that different observation improvement or optimization strategies are needed to meet competing information goals regarding Arctic hydroclimatic change. A rational strategy to improve observation systems based on the spatiotemporal severity distribution of hydroclimatic change is thereby currently not possible just by reconciliation of change observations and GCM projections. Instead, explicit decisions are needed for which information goals should be prioritized for first fulfilment with limited observation system resources, along with a transparent basis for such decision-making.

We here propose that such a transparent and participatory decision-making basis can and should be developed as integral part of the SEA process, which has potential to link and improve both SEA application and environmental monitoring in the Arctic. We depart then from the EU SEA Directive as a starting model for achieving such connection. With regard to environmental monitoring, Article 10 of the SEA Directive states that '*Member states shall monitor the significant environmental effects of the implementation of plans and programmes, inter alia, to identify at an early stage unforeseen effects, and to be able to undertake appropriate remedial action*' (OJEC 2001). SEA should further include the following main steps: *screening, scoping, reporting, consulting* and *decision-making*, in addition to *monitoring* (Wood 2003, Thérivel 2004).

The aim of the *screening* step is to determine the need to carry out an SEA for a strategic initiative, i.e. for an overarching national or international policy, plan or programme. *Scoping* deals with establishing the issues and the level of detail that should be addressed in the SEA for such a strategic initiative; the scope and level of detail of the SEA must be consulted with relevant authorities, as one *consulting* step. *Reporting* produces a written environmental assessment report that must also be reviewed in a *consulting* step by relevant authorities and the public. Additionally, the comments made by the consulted authorities and public should be included in the environmental assessment report with an account given as to how these comments influenced the *decision-making* on the assessed strategic initiative. Figure 1 illustrates the SEA process flow and the place of the different steps within it.

The *monitoring* requirement of the SEA Directive should further address the significant environmental impacts and

results expected from the assessed strategic initiative. If monitoring is then understood and introduced only as a last independent step, after decisions have been made, its function in SEA may be limited to only following up whether decisions are formally implemented (Lundberg *et al* 2010, Wallgren *et al* 2011). With regard to the actual environmental change that is affected by the assessed initiative, however, the example of hydroclimatic change observations shows that they are deficient, with the major gaps in and remaining uncertainties from such deficient observations limiting our ability to monitor actual environmental changes with some sufficient degree of accuracy and certainty. Such deficiencies apply to ongoing environmental changes, and even more so to the change development from past to present or from present to future environmental conditions, and to the environmental change effects of strategic national or international initiatives that require SEA application. Furthermore, because we cannot observe and have not observed everything everywhere and at every point in time, the interpretations and implications of data from even improved environmental observations will always be subject to some uncertainty and inaccuracy. To systematically consider, account for, and handle our knowledge gaps and uncertainties regarding actual environmental changes through the whole SEA process, uncertainty handling and monitoring components should be integral and interactive parts of all (other) steps in SEA application.

Figure 1 illustrates the overarching framework that we propose for explicit gap–uncertainty handling and monitoring parts (emphasized with italic and yellow text) within all the different steps of the SEA process. The gap–uncertainty handling and monitoring parts include explicit gap and uncertainty analysis in the *screening* and *scoping* steps of SEA, gap and uncertainty reporting in its *reporting* step, and gap and uncertainty communication and discussion in its *consultation* step, identifying through the latter also possible key stakeholder conflicts that result from such remaining gaps and uncertainties, which hinder decision agreements and could be resolved by improved availability to observational data and associated uncertainty reduction. They further include explicit monitoring decisions in the SEA *decision-making* step, about whether and which observation system addition or improvement measures are needed for potential approval of the assessed strategic initiative after bridging or reducing remaining critical knowledge gaps and uncertainties in a new SEA cycle (the 'No' pathway in figure 1). Moreover, explicit monitoring decisions should also be part of an adaptive governance process (figure 1, right). This should guide and inform the SEA process about main development and environmental objectives of the assessed strategic initiative, and main objectives and strategies of relevance for monitoring prioritization decisions within SEA. It should further also itself be guided by the SEA result ('Yes' or 'No' pathway in figure 1) with regard to new or modified monitoring objectives/prioritizations needed for reaching the environmental objectives of assessed strategic initiatives with sufficient accuracy and certainty. The yellow beam in figure 1 particularly illustrates the fundamental role of monitoring and gap/uncertainty analysis, which must link to actual available observations of the concerned environment, across all main steps of the SEA process.

As an example, with regard to the previously identified gaps and uncertainties relating to hydroclimatic changes in the Arctic, consider a policy of changed forestry practices in a larger transboundary Arctic region. Already for the *scoping* step to be fulfilled in a satisfactory manner, a gap and uncertainty analysis is required to indicate possible critical needs for hydrological–hydrochemical observation improvements, to both project and follow up the effects of the new forestry policy on water quantity, quality and interactions with climate change in the region. Limited observations, and their influence on the ability to project and follow up such policy effects, should further be explicitly presented in the *consultation* and *reporting* steps, and considered in the *decision-making* step. In the latter, decisions must be made on whether the environmental observation systems will be improved to reduce key knowledge gaps and uncertainties. At any rate, decision makers must consider remaining gaps and uncertainties, even after possible observation improvement measures, as observation limitations may leave open a wider range of opportunities and risks associated with different policy options than those apparent from only some assumed scenario projection without explicit uncertainty consideration. Furthermore, after implementation of the assessed policy/plan/programme, environmental observation systems are key monitoring components for following up the resulting environmental change effects; especially observation of actual environmental changes that differ from those expected in the performed SEA provide then a basis for policy/plan/programme modification by *adaptive governance*.

We believe that the explicit gap and uncertainty handling in the proposed framework would improve SEA application by explicitly showing concrete observation limitations that are not necessarily related to institutional incapacity, political reluctance, or similar obstacles to successful SEA implementation. The shortcomings related to environmental observation limitations call for action to increase the capacity to observe the physical environment and systematically monitor its ongoing changes to reduce key knowledge gaps and uncertainties, with multiple benefits to be gained from this also for other sectors of public management. Examples of the latter may include mitigation of health risks relating to environmental conditions, and improved reliability of environmental projections for spatial planning, among other issues.

4. Conclusions

This letter has analyzed and elucidated critical shortcomings in the application of SEA, and particularly the environmental change and related uncertainty monitoring that should be part of this application, with focus on the rapidly changing transboundary Arctic region. Shortcomings in environmental monitoring have here been concretized by examples of main gaps in the monitoring of Arctic hydroclimatic changes reported in the scientific literature. For relevant

identification and efficient reduction of such gaps, and of remaining uncertainties under typical conditions of limited resources for observation systems and monitoring, we have proposed explicit gap/uncertainty handling and monitoring components, systematically integrated within all steps of the SEA process.

The fate and possible success of various coordination initiatives for environmental monitoring in the Arctic (such as AMAP and SAON specifically for the Arctic, and the general FWMS with Arctic relevance) may ultimately depend on the success of implementing such an overarching SEA framework that systematically links and consistently pursues clear goals of both environmental assessment and environmental change observations and monitoring. As suggested here (figure 1, right), such a framework also links to adaptive governance. This should explicitly consider key knowledge and information gaps that are identified through and must be handled in the SEA process, and accordingly (re)formulate and promote necessary new or modified observation objectives for bridging these gaps. The linked SEA and adaptive governance framework, which has here been proposed with an Arctic focus, is also relevant and should be useful for improved SEA and monitoring in other parts of the world.

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III

Practitioner perspectives on challenges and measures for green qualities in the Stockholm region

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ABSTRACT

Urban green areas and their green qualities are increasingly being recognized as important factors to reach sustainable and attractive cities due to their potential to provide a plurality of services and benefits. Despite this, the integration of green areas and green qualities in urban planning and implementation is still limited. Reaching dense, energy efficient and intensely used urban areas, usually overrides the preservation of green areas and decreases their green qualities. The aim of this paper is to present practitioner perspectives on how to address and assess urban green areas in urban planning and how to develop green qualities in the compacting Stockholm region. In addition, the paper presents a proposal for a framework on the formulation of strategies to include green qualities in urban development. The perspectives of practitioners faced with the challenge to simultaneously plan for urban development and green qualities in the Stockholm region are collected based on interviews, a workshop and a content analysis approach. The results indicate that green qualities in urban development could be enhanced by setting a strategic direction for green qualities, better understanding local planning contexts, making knowledge on green qualities operable, and by structuring strategic dialogues on green qualities. As a means to increase the consideration of these aspects in urban planning at different scales, enable the formulation of strategies for green qualities, and assess city compaction activities, a strategic environmental assessment framework focusing on green qualities is proposed

Key words: Green areas; Green qualities; Urban planning; City compaction; Dialogue; Strategic environmental assessment

1. INTRODUCTION

In urban planning green areas have traditionally been used to connect urban areas with their suburbs and rural areas (Sandström 2002; Colding 2011). Recently, green areas located in cities have been given increased importance due to their role as providers of services and benefits (Bolund and Hunhammar 1999). Due to this role, urban green areas are increasingly being considered a key aspect for city sustainability and attractiveness (Douglas and Ravets 2011; Pickett et al. 2011; Kabisch et al. 2015), and an important issue to address in cities experiencing population and compaction increases (Jim 2004; James et al. 2009). Moreover, the presence of green areas and their provided services in and around cities

is gaining increased support from urban dwellers (De Ridder et al. 2004).

However, despite the recognized importance of green areas and their services for city development, their integration in urban planning is still limited (Wilkinson 2012; Haase et al. 2014; Kabisch et al. 2015). In particular, in compacting cities, as green areas and their services tend to be neglected and tend to decrease (Jim 2004; Lin and Yang 2006; Hofstad 2012). One reason for this is that the value of green areas and their services is given too little weight and not all dimensions of value are included in planning and decision making (Costanza et al. 1997; Chan et al. 2012).

An increase of knowledge and understanding on how the biophysical and human processes in urban settings interact with each other across multiple spatial and temporal scales could enable recognizing the value of green areas and their services in urban planning (Pickett et al. 2011). More specifically, as the services that are provided by green areas depend on their qualities, that is both green area properties (size, location and habitat type, composition and quality) and potential (capacity to deliver services) (Bastian et al. 2012), studying how green qualities are affected by different land use interventions increase knowledge on green areas and enable a grounded analysis of the impacts of alternative urban developments in planning.

Green area proximity to urban dwellers, coherence and sufficient size, variation, and adequate maintenance are qualities that have been identified in the literature as being important for the provision of green area services in compacting cities (Jansson 2014). This knowledge facilitates the identification of urban development alternatives that minimize the impact on these qualities and enhance the consideration of green areas and their services in urban planning. In addition, possible ways to achieve city compactt-ion and maintain and/or develop green qualities need to be studied, which is an important part of including and enhancing green areas and their services in urban planning (Hostetler et al. 2011). Specifically, studying the perceptions of practitioners that have to simultaneously plan for urban compaction and enhance urban green qualities are valuable to gain insights on how green qualities are considered and assessed in urban planning. Moreover, by studying such practitioner perspectives it may be possible to gain insights on measures to address conflicts for green qualities in compacting cities.

For these reasons, a research study was designed to gain knowledge from practitioners on how to enhance the inclusion of green qualities in urban planning. Specifically, the study aimed to answer the research questions of: (i) what challenges are encountered when attempting to include green qualities in urban development when compacting the city? And (ii) what measures and strategies are carried out to preserve and create green qualities in urban planning?

To answer these research questions, a qualitative research strategy based on explorative interviews, a workshop and content analysis was carried out to collect and analyse the perspectives of actively involved practitioners in the planning and implementation of city compaction activities taking place at various locations in the Stockholm region.

The aim of this paper is to present practitioner perspectives on how to address and assess urban green areas in urban planning and how to develop green qualities in the compacting Stockholm region. Moreover, based on the collected practitioner perspectives, the paper presents a proposal using strategic environmental assessment (SEA) as a planning support instrument to further discussion and collaboration for the formulation of strategies to integrate green qualities in compacting cities.

2. STUDY AREA

The study area for this research is composed of several municipalities located within the wider Stockholm region. It includes the Stockholm, Lidingö and Nacka municipali-

ties, as well as the Haninge, Huddinge and Tyresö municipalities that are part of the Södertörn area (Figure 1). The study area is included in the Stockholm County, one of Sweden's densest and fastest growing counties that still offers varying green landscapes such as large forested areas and open agricultural areas that respectively account for 50 and 20 percent of the land area (Statistics Sweden 2012).

The Stockholm County and its urban areas are considered to provide a high coverage in green areas (Elmqvist et al. 2004; Colding 2013). Urban residents in the county have access to interconnected green areas which compose ten green wedges that stretch from the region's rural-urban fringe to the centre of Stockholm City (Office of Regional Planning and Urban Transportation, ORPUT, 2010). Moreover, urban residents can access, at a close distance, other types of green areas, such as nature reserves, city parks and natural shore-lines, as well as, private gardens and allotment gardens that provide opportunities for biodiversity and green qualities in the urban region (Barthel et al. 2005; Colding et al. 2006).

However, these green areas are affected by continuous and rapid urbanization (Bolund and Hunhammar 1999; Mörtberg 2009;

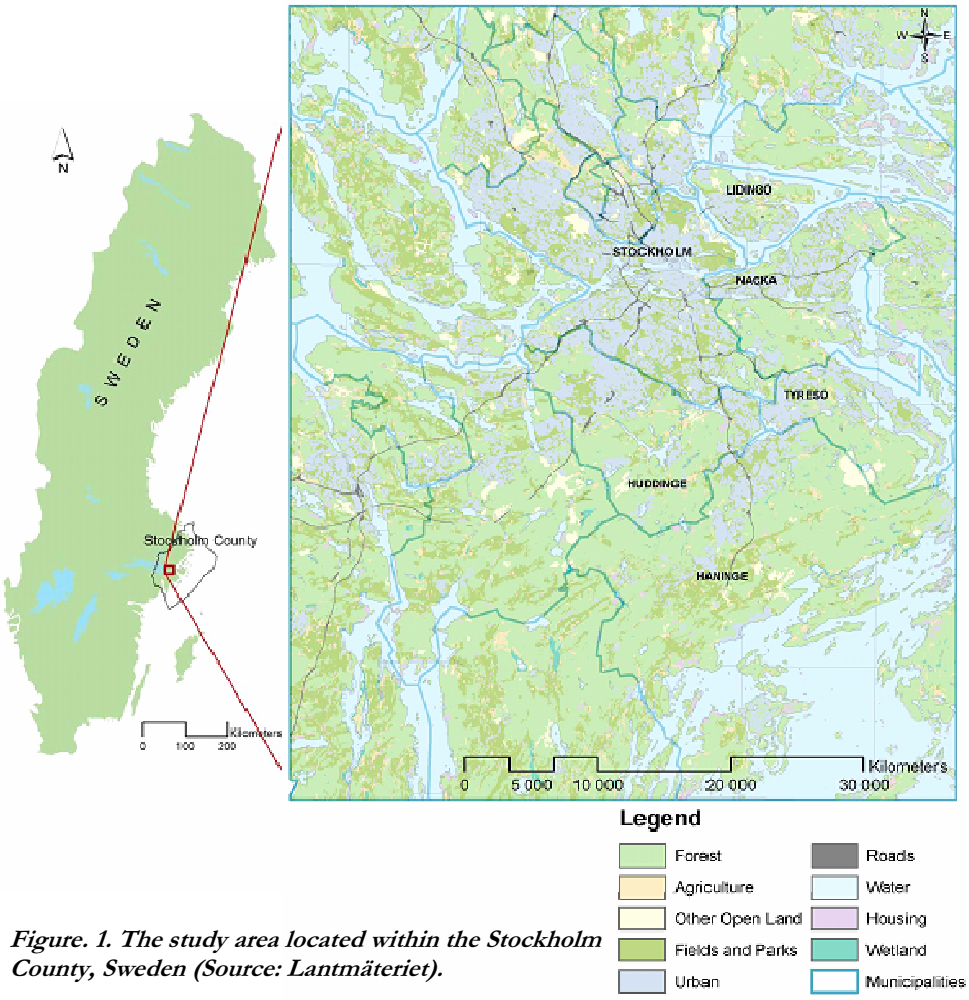

Figure. 1. The study area located within the Stockholm County, Sweden (Source: Lantmäteriet).

Borgström 2011; Colding 2013). Population growth in the region has been estimated to be as much as 250.000 to 400.000 new households until 2030 2030 (ORPUT 2010). To manage this population increase and its associated urbanization pressures, densification of existing built-up areas is proposed e.g. in nine regional cores some of which will be strengthened with additional transport infrastructure (ORPUT 2010).

The central regional core that is planned to be intensively compacted affects four different municipalities, which includes Stockholm and Nacka. Moreover, four regional cores are located in the Södertörn area, one within the Haninge municipality and two within the Huddinge municipality.

As there is a risk that the planned urban developments could negatively impact the green areas and their provision of services within the selected regional cores, these offer an opportunity to analyse how green areas are addressed and assessed in a compacting city setting. Moreover, to explore different approaches that could contribute to simultaneously reach urban compaction and green quality objectives.

3. METHODS

A qualitative research strategy, based on explorative interviews, a workshop and a content analysis approach, was used to collect and analyze practitioner perspectives on conflicts and measures for green area and green quality inclusion in the Stockholm region (Figure 2). The explorative interviews and workshop were designed using the research questions, as a way to collect and enhance focused dialogue and knowledge sharing amongst a variety of practitioners actively involved in urban planning at different scales in the Stockholm region. Once collected, the practitioner perspectives were categorized and analyzed using a content analysis approach to derive patterns of meaning from which suggestions were drawn on ways to include green areas and their qualities in compacting cities.

3.1. Explorative interviews

Explorative interviews were used to interview practitioners. This interview format was chosen because it promotes open conversation as a basis to obtain knowledge (Kvale and Brinkmann 2009). The explorative interviews were structured using an adaptable hierarchy of discussion questions that allowed for varying question sequences (Bryman 2001), and provided interviewees with flexibility to openly elaborate on important issues (Gill et al. 2008).

Two discussion question categories were formulated based on the research questions. The first category addressed challenges for green area and green quality integration in urban development, and the second category addressed measures to meet these challenges. Several supporting questions were formulated to enable interviewees to address the discussion questions. These questions were grouped initially into seven themes that were derived from a literature study on challenges and measures for green qualities in urban areas. The themes, as well as the supporting questions, were continuously fine tuned during the interviewing process. Moreover, the selection and sequencing of the supporting questions varied on a per interview basis depending on the particular context of the interview.

A total of 15 practitioners were interviewed between one and two hours using the above mentioned question structure. The interviewed practitioners had different professsional backgrounds, positions and sector affiliations. They were architects, landscape architects, ecologists, development leaders, planners and nature strategists, 12 of which worked at the municipal planning level within Stockholm, Lidingö, Nacka, Haninge, Huddinge and Tyresö and three at the regional planning level from the County Administrative Board and the Growth and Regional Planning Administration. The practitioners held strategic planning positions, were heads of compacting city projects, and worked with the planning and implementation details of these projects. Selecting to explore the perspectives of these specific

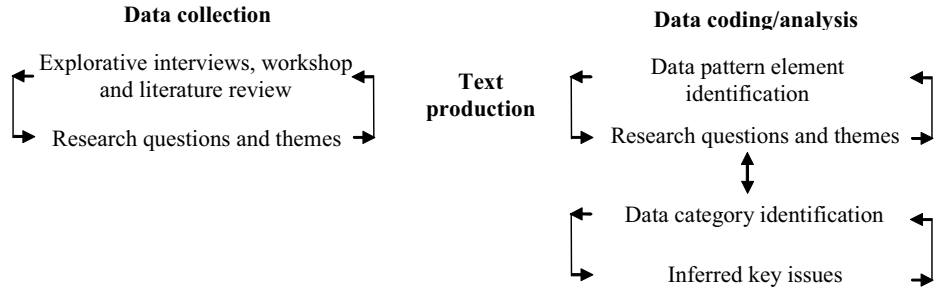

Figure 2: Used methodological framework in the research

types of practitioners was considered fundamental because they play a key role in planning and implementing city development, which has a bearing on the inclusion of green areas and green qualities in urban planning.

3.2. Dialogue workshop

The dialogue workshop consisted of a one day program, entailing presentations, group discussions and informal activities designed to address the research questions. The workshop started with short introductory presentations to inspire critical reflections amongst participants on the research questions. After the introductory presentations, participants were placed in four working groups of four participants each. As the workshop participants had varying backgrounds, ranging from urban planning researchers and students to practitioners from both the public and private sectors, their placing in the working groups was carefully considered to enhance interactions and cater for different points of view. In a first working group discussion session, participants discussed challenges for green areas and green qualities in urban areas. Subsequently, in a second working group discussion session participants discussed measures to manage the identified challenges. During each of the discussion sessions, a set of thematic questions was used by the working groups to enable and focus the discussions. Each working group took hand written notes on and shortly reported their discussions at the end of the discussion sessions. In addition, short and open discussions were held after each working group had reported their results, serving to expand the ideas that were discussed within the working groups. As a last workshop activity, participants were engaged in an open discussion session on possible measures to simultaneously plan for compact, low traffic, green cities.

3.3. Qualitative content analysis approach

A qualitative content analysis approach was designed to guide the categorization and analysis of the collected practitioner perspectives. The approach was designed to identify emerging patterns of meaning from the content and context of the analysed data (Krippendorff 2004). Open data coding was used as in grounded theory where emerging data patterns are identified and categorized (Strauss and Corbin 1990). The open data coding was carried out in a sequence of iterative steps, where the first step was to study the collected data, and identify and name various data pattern elements. In a second step, the data pattern elements and the thematic questions that were used in the interviews and workshop were analysed and resulted in four data pattern categories. The development of the data pattern categories can be seen as an explorative process that combines inductive (the data pattern elements) and deductive (the used thematic questions) forms of data analysis (Neuen-

dorf 2002). Moreover, in a third step the data contained in the data pattern categories was analyzed to make abductive inferences to give meaning to the data. According to Krippendorff (2004), abductive inferences are central to content analysis as they point to phenomena that need not to be directly observed in the data. Based on these inferences four key issues were drawn and formulated as action points to contribute to integrate green areas and their qualities in urban planning contexts.

4. RESULTS

4.1. Key issues, challenges and measures for green qualities in urban planning

Several data pattern elements were identified for challenges and measures for the integration of green areas and their qualities in the compacting Stockholm region. From these, four data pattern categories were derived: (1) Compacting city; (2) Green areas and green qualities; (3) Tools and knowledge; and (4) Collaboration and participation. Moreover, based on these data pattern categories and their associated data pattern elements four key issues were inferred (Table 1). A description of each of the inferred key issues and their associated data pattern categories and elements on challenges and measures for green qualities follows below.

4.1.1 Key issue 1: Strategic direction for green areas and their qualities

The analysis of the collected practitioner perspectives reveal a lack of strategies to guide ongoing urban development activities in the Stockholm region and the integration of green qualities in the planning of these activities. The following associated challenges and measures provide suggestions on the need of a strategic direction for green qualities in the region.

Challenges: In regards to compacting city activities taking place in the Stockholm region, the results from the interviews and the workshop points to weak linkages between vision, objectives and planning instruments, as well as to the existence of organizational and power relation issues that lead to internal working and goal conflicts. Moreover, the results show that there may be a poor understanding on the meaning of compacting city activities and what they entail for the region. The results indicate that reasons for compacting certain areas of the region are based on political and economic issues rather than on strategic analyses. In addition, the results reveal that compacting city activities in the Stockholm region are planned for and tend to take place in areas that are already compact.

Furthermore, the results show that ongoing compacting city developments mostly focus on the details, related to infrastructure and technological issues, and less on strategic issues that determine why and how these developments should take place. Several practitioners mention that compacting city activities in the Stockholm region are often based on imported city development trends, and respond to interests related to urban growth, housing and technical issues e.g. energy systems, waste collection and water supply.

In regards to the integration of green areas and their qualities in urban development in the Stockholm region, the results point out that these come in too late in planning processes. Different reasons are mentioned such as lack of a systems view on green area planning, excessive focus on technical solutions e.g. water and waste handling and sustainable buildings, and a high competition over space that prioritizes buildings and other urban infrastructure over green areas.

A low priority for green areas and green qualities in urban planning places these at a disadvantage when deciding where to locate city developments. Several practitioners that were interviewed stated that compacting activities in the Stockholm region mostly take place on brown sites, close to transport nodes, on and besides green areas inside the city, and also on the region's protected green wedges.

Table 1. Key issues, data pattern categories and data pattern elements on challenges and measures for green areas and green qualities in the compacting Stockholm region.

Key issues	Data pattern category	Data pattern elements for challenges	Data pattern elements for measures
1. Strategic direction for green areas and their qualities	Compacting city	Lack of strategic analysis on the meaning of, the need for and the appropriate type of compacting cities activities	Use a strategic, holistic systems thinking approach
	Green areas and green qualities	Green areas and qualities come in too late in the planning process Low priority is given to these issues due to a lack of a systems approach and high competition over space	Use a landscape perspective approach and formulate policies and strategies for green area planning and management
2. Local context is basic to plan and implement compacting city activities and multiple green qualities	Compacting city	Resistance to urban development, and challenges to reach multiple city functions	Make compacting developments more attractive by catering for different needs, focusing on accessibility issues and providing multiple city functions
	Green areas and green qualities	Dominance of technical and standardized solutions leading to low priority for multiple green area qualities	Link and use green areas, trees, vegetated streets and water to address green economy and social functions
3. Increase and make knowledge on green areas and green qualities operable by developing tools for their integration in compacting cities	Tools and knowledge	Difficulty in finding ways to create, retrieve, bring together and make knowledge operable Dominating types of knowledge leads to preconceptions on the role of green areas and their qualities	Place minimal requirements on green area qualities Use a landscape approaches and add an area planning level Monitor green area and quality inclusion using environmental assessments Develop guidelines for ecological compensation measures Value green areas and their qualities to communicate their importance and secure resources for their planning
4. Robust collaboration of a diversity of actors in creating green quality through urban planning	Collaboration and participation	Limited collaboration at all planning levels Few participants are involved Lack of regional leadership for collaboration	Provide regional authority with the responsibility to coordinate collaboration for green qualities Carry out bottom-up planning to include a diversity of participants Involve experts through advice forums, and focus on public-private negotiation

Measures: As compacting city developments in the Stockholm region are expected to cause significant pressure on its green areas, strategic analyses are required to study how urban development affects green qualities in the region and to lower risks and enhance opportunities for green area and green quality protection. To achieve this, practitioners express the need for a comprehensive understanding on green areas and their qualities from a landscape perspective that can enable their identification and connection from the landscape level to the local level. In addition, policies and strategies for the preservation of green areas and their qualities are needed according to several interviewees. These policies and strategies should focus on biodiversity, climate change and green area connectivity, as well as on green area management, maintenance, accessibility and ecological compensation measures. This will provide a coordinated and legitimate basis for discussions on green areas in the Stockholm region.

4.1.2. Key issue 2: Local context is basic to plan and implement compacting city activities and multiple green qualities

The results indicate that understanding and including local context issues in the planning and implementation of the compacting city activities that are taking place in the Stockholm region enables addressing challenges related to these activities and facilitate including and reaching multiple green qualities.

Challenges: The results reveal several implementation challenges for compacting city developments in the Stockholm region. One such challenge is resistance to new urban developments, as there seems to be increased polarization between development and conservation supporters, tensions between private and public interests, and challenges related to land ownership. For instance, three interviewees mentioned that ownership can determine what decisions are taken with respect to where and what is made more compact.

In addition the results point to difficulties in reaching multiple functionalities, including green qualities, in urban developments in several parts of the Stockholm region. Mentioned reasons by several practitioners are: preferences for small city characters over the intensely used and multifunctional city; the high costs involved in introducing multiple city functions; and the lack of municipal bargaining power to require developers to implement multiple functionalities, especially in the suburbs and in municipalities that are located outside of central Stockholm.

The results show, that there is a tendency to use quantitative measures to include green areas and green qualities in the compacting Stockholm region. For instance, green area factors are mentioned to be frequently used to estimate green area sizes in compacting city developments. However, these estimations do not necessarily recognize context nor how or which green qualities should be included in compacting city activities.

Moreover, the results show that important issues such as landscape and topography are seldom introduced in urban development due to difficulties and high costs. Instead, focus is placed on introducing green elements in urban areas for instance, green roofs and facades. These solutions provide green qualities, but need to be complemented with other types of green spaces, e.g. landscape and topography issues, to achieve a multiplicity of green qualities.

The prevalence of standardized solutions impoverishes green qualities on local and regional scale. According to some practitioners this is due to perceived high costs with the development of multiple qualities for green areas, as well as to tensions arising from priority setting when planning and deciding on the qualities. For instance, whether a green area should be primary designed for recreational purposes or for biodiversity enhancement.

Measures: To meet these challenges, practitioners suggested several measures that can be considered to reach green areas offering

multiple qualities in compacting cities. For instance, trees that are used for aesthetical reasons may simultaneously contribute to mitigate air pollution, noise and climate change. Moreover, using treed or vegetated streets can connect green areas located within and outside cities into a network of green areas. Such green networks provide multiple functions and qualities in urban areas related to e.g. recreation, reduce noise and local climate. Also, introducing water in green area planning enhances multiple green qualities. Ponds, wetlands and watercourses increase species population dynamics and provide at the same time recreation opportunities for urban dwellers.

Furthermore, an opportunity to stimulate the inclusion of multiple green qualities in compacting city planning can be to combine these with green economy activities such as recreation, sports, art and culture. The use of multiple green qualities may be promoted in planning if they are associated with lower costs of various social functions related to the needs of children, elderly and disabled and address gender and intergenerational issues.

However, the results show that planning for green areas and their multiple qualities, as well as addressing their associated implementation conflicts, is context dependent. Therefore, a local planning perspective focusing on multiple green qualities at a neighbourhood level needs to be strengthened and included within a strategic framework for urban planning.

4.1.3. Key issue 3: Increase and make knowledge on green areas and green qualities operable by developing tools for their integration in compacting cities

Several challenges and measure data patterns indicate that making knowledge on green areas and their qualities operable, as well as enhancing knowledge on green qualities in the Stockholm region is challenging.

Challenges: A major issue is to find ways to create, retrieve, bring together and make knowledge on these issues operable. The results show that the domination of certain types of perceptions on green areas and their green qualities can lead to preconceptions among e.g. planners and politicians, on the roles that green areas play in urban settings. For instance, in certain areas of the Stockholm region green areas are considered to be too abundant, and to act as barriers that disconnect urban nodes and urban functions. Green areas are also perceived as being unattractive and insecure due to a lack of maintenance and to the poor design of their surrounding built environments. As well, green areas and green qualities are considered to be expensive in terms of lost development opportunities and the high costs related to their introduction and maintenance. These preconceived perspectives on green areas and green qualities can lead to their low prioritization and exclusion from compacting city planning.

Measures: In the interviews several practitioners expressed the need for research and tools to bring together and expand knowledge on green areas and their qualities so that these can be recognized and integrated in compacting city developments. In addition, minimal and specific requirements on green areas and their qualities should be introduced for the construction sector, for instance on the integration of green qualities in buildings, and different types of infrastructure such as roads and bridges. However, placing such requirements is challenging, especially in areas where it is less attractive to build. Moreover, municipalities lack the tools to enforce minimal and specific requirements regarding green areas on the construction sector. To address this challenge, financial incentives can be provided to support construction companies to include green areas and green qualities in their projects.

As for planning tools to guide the integration of green areas and their green qualities in city development projects, the results indicate that landscape approaches are important to identify and connect stepping-stone patches of green areas. Moreover, the practitioners suggest that an additional planning level, acting between the

comprehensive and detailed development plan instead of the detailed comprehensive plan, could be introduced to more effectively engage actors and stimulate dialogue on key issues concerning urban development activities and the integration of green areas and green qualities.

Another tool to strengthen green qualities in urban developments is the monitoring of compacting city activities. This should be achieved by environmental assessments which provide a framework for the identification of mitigation and compensation measures for the conservation and enhancement of green areas and their qualities. These proposed measures can be monitored in an ex-post evaluation of compact city developments.

However, the environmental assessment application emphasizes the assessment of impacts while mitigation and compensation measures are poorly addressed. Furthermore, environmental assessments tend to fade out in planning processes, ancillary to the detailed development plan for the proposed development.

In regards to compensation measures for green areas and their green qualities, it is proposed that guidance on ecological and green quality focused compensation measures should be derived from a strategic framework on green qualities.

In addition, one interviewee considers monetary valuation and mapping tools for green areas to be useful to communicate importance of green area qualities to decision makers, and as a way to secure resources for their planning. Another interviewee considers that monetary valuation of green areas and their qualities can be carried out to recognize and demonstrate their value, but considers that it is important to understand how to capture their value.

Developing and using a variety of tools will enable the creation of knowledge and making this knowledge operable so that green areas and their multiple qualities can be identified and valued, and their integration in compacting city planning activities can be monitored and, in certain cases, even compensated.

4.1.4. Key issue 4: Robust collaboration of a diversity of actors in creating green quality through urban planning.

The results indicate that collaboration and public participation in compacting city and green area planning in the Stockholm region is limited and should be strengthened.

Challenges: Professional and sector collaboration barriers, especially between municipal practitioners and those working in the construction sector create difficulties in the planning of green qualities in urban densification plans. Also between different national, regional and local authorities, as well as within municipalities and between municipalities, communication links are weak and hence collaboration and knowledge transfer on green area and green quality planning is largely missing.

Another challenge is the limited number of participating actors. Usually, only representatives from the real estate and construction sectors, politicians and municipal practitioners are involved in decision making for green qualities in urban development. The involvement of the public and other actors such as academia is limited and takes often place in the final stages of the planning process, when developments are mostly set and their direction can rarely be changed.

Additionally, results point at a lack of regional leadership driving compacting city and green area issues, as well as a lack of arenas for actors to engage in dialogue on these issues. In a regional perspective, this affects collaboration and connections between rural and urban areas, and between municipalities.

Measures: There is a need for more structured collaboration on urban development planning in the Stockholm region and its green areas. A proposed measure is to strengthen the regional planning authority to take the lead in structuring and supervising collaboration efforts on these issues. It is also suggested that academia should support this role, and become more actively involved in

this type of collaboration processes to increase its interaction with practice.

Moreover, to capture innovative capital and to loosen-up locked creativity, bottom-up planning approaches are suggested to involve the public in compacting city and green area planning processes. However, it is also suggested that specific knowledge needs to be included to support these planning processes. In the interviews and at the workshop, practitioners expressed that senior experts should be involved at all planning levels. Moreover, negotiations between public and private should be encouraged, and advice forums with representatives from industry and academia should be linked to municipalities.

Establishing a more structured and open collaboration will allow to create appropriate arenas for a diversity of actors to come together, interact, exchange knowledge, and engage with compacting city and green area issues at multiple scales and early on in their planning processes.

5. DISCUSSION

5.1. Dialogue and collaboration as backbones for the integration of green qualities in urban development

In this study, interviews and a workshop with practitioners allowed to identify several challenges and measures related to the integration of green qualities in the development of Stockholm region. In addition, key issues were derived from practitioner perspectives, which summarize core areas for action to highlight green quality issues on the Stockholm region's urban development agenda. However, for this to take place dialogue and collaboration needs to be expanded, enabled and fostered amongst actors to agree on a joint strategy for the development of green qualities as part of urban densification.

Accordingly, initial focus for comprehensive dialogue and collaboration on green qualities in cities should be placed on setting a strategic direction for green qualities. This entails reaching agreements amongst various actors on a vision, objectives and strategies for green qualities, supported by a knowledge-based appraisal of green areas, their qualities and services. A main intention with such strategic outcomes should be to stimulate the recognition of green qualities as a value, on par with other values, e.g. infrastructure and technological issues, in strategic urban planning. If this is reached, the integration of green qualities in urban development activities, such as plans, programs and projects, could be facilitated. Moreover, dialogues and collaboration on green qualities should also be structured to shape, assess and monitor the integration of green qualities in urban planning.

Strategic environmental assessment (SEA) is a planning support tool that can potentially serve to structure dialogue and collaboration on green qualities in the urban planning and implementation. A main objective of SEA is to promote a plurality of values in the assessment of planning instruments by framing consultations with and the participation of multiple actors (Connelly and Richardson 2005; Sinclair et al. 2009). Internationally, through the SEA Protocol (UNECE 2003), and in Europe with the European Union Directive on SEA (OJEC 2001), SEA sets minimum consultation and participation requirements in line with the Aarhus Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (UNECE 1998).

Furthermore, SEA serves as mechanism to formally recognize green area and their services in urban planning (Kolhoff and Slootweg 2004), and recently several guidelines and methodological frameworks for the integration of green areas and their services in SEA have been developed (Geneletti 2011; Landsberg 2011; Kumar et al. 2013; Partidário and Gomes 2013; UNEP 2014). Using these guidelines could serve to structure strategic dialogues and collaboration on green qualities in compacting cities.

5.2. Green qualities SEA framework for compacting cities

A green qualities focused SEA framework is proposed to structure strategic dialogues and collaboration for strengthening the integration of green qualities in urban planning in Stockholm region. This SEA framework is based on and addresses the practitioner perspectives on challenges and measures that were collected and analyzed for green qualities in the region. Moreover, the framework uses and combines certain elements of the ecosystem services inclusive SEA methodological frameworks that are proposed by Geneletti (2011), Partidário and Gomes (2013) and UNEP (2014). The framework links to regional and municipal planning processes in the Stockholm region (ORPUT 2010), and engages potential actors that could become responsible for applying the framework (Figure 3).

The proposed green qualities SEA framework consists of two iterative steps, a strategic context analysis for green qualities step and an assessment and monitoring for green qualities step. The purpose of the strategic context analysis step for green qualities is to highlight the importance of green areas and their green qualities so that they are recognized as a value in the region's urban planning processes. As for the assessment and monitoring for green qualities step, its purpose is to enhance the inclusion of green qualities in the strategic actions that are put forth at the municipal planning level.

5.2.1. Strategic context analysis for green qualities

The strategic context analysis for green qualities step consists of several proposed activities. The first activity is to identify and engage key actors in dialogues on green qualities. Based on the research results key actors to engage in such dialogues would be practitioners and politicians both at the regional and municipal level, the real estate and construction sectors, academia and civil society. Moreover, it is suggested that the regional planning authority coordinates the engagement of these actors in dialogues for green qualities as a complement of their work.

The key actor dialogues should initially focus on discussing and possibly agreeing on key challenges and measures for green qualities, which is the second proposed activity in the strategic context analysis for green qualities step. The results presented in this study (Table 1), may be used as a starting point to focus practitioner dialogues when carrying out a comprehensive green qualities SEA. However, these results should be used with caution as they are based on practitioner perspectives. In a full-fletched green qualities SEA process, focused dialogues on challenges and measures for green qualities require the inclusion of various actor perspectives.

After having established and focused key actor dialogues on green qualities, a subsequent activity in the strategic context analysis for green qualities step would be to agree upon and formulate a vision for green qualities in the region. Agreeing on such a vision might provide a strategic direction for green qualities and highlight their importance at regional and municipal planning levels. The research results (Table 1) and the development vision that has been established for the Stockholm region (ORPUT 2010) could serve as discussion inputs to formulate a vision for green qualities in the Stockholm region.

Linked to the establishment of a vision for green qualities is the need to formulate aims and strategies, which is the last proposed activity of the strategic context analysis for green qualities step. Formulating aims and strategies could enable concretizing a vision for green qualities, as well as informing urban development strategies for the Stockholm region, which focus on developing a polycentric region with high-density urban cores (ORPUT 2010).

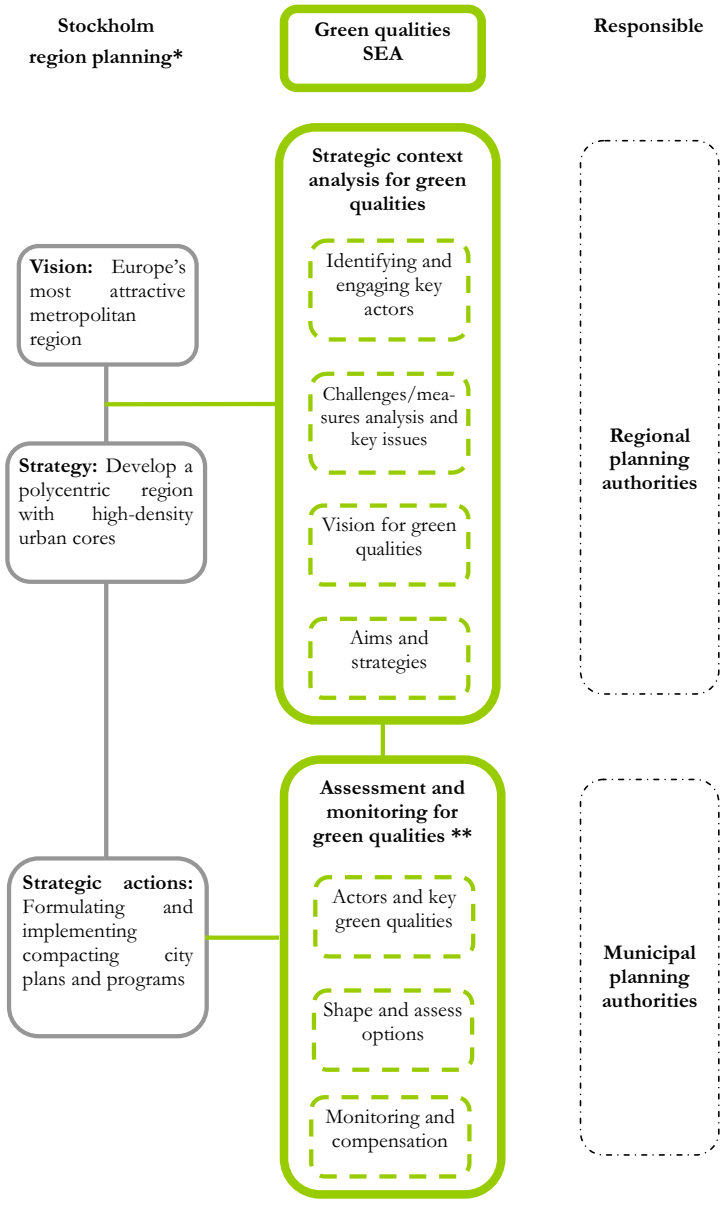

Figure. 3: Proposed green qualities SEA framework for the compacting Stockholm region. *Based on ORPUT (2010). ** Based on Geneletti (2011), Partidário and Gomes (2013) and UNEP (2014).

The results contained in Table 1 may serve as a basis for dialogue to formulate aims and strategies for green qualities in the Stockholm region. For instance, the results point to the need to increase, retrieve and make knowledge on green qualities operable. Focus may then be placed on discussing strategic options to gain knowledge on the supply and demand for green qualities in the region. Valuating green qualities (Slootweg and van Beukering 2008; Chan et al. 2012; de Groot et al. 2012; Norton et al. 2012), mapping green qualities (Raymond et al. 2009; Sherrouse et al. 2011; Burkhard et al. 2013) and using landscape analyses (Mörtberg 2007; Gontier et al. 2006; Zetterberg et al. 2010; González del Campo 2012) may facilitate obtaining knowledge on the supply and demand for green qualities. Using these tools may also enable dialogue to make this knowledge operable and driving planning through the formulation of aims and strategies in terms of required habitat types and their qualities in terms of connectivity, location and levels of wear and tear.

Monitoring of green qualities and ecological compensation measures are other issues that could enable increasing knowledge on green qualities, and for which aims and strategies could be formulated. Collected practitioner perspectives indicate that effective monitoring could enable political awareness on green quality issues, it enables to detect, understand and evaluate changes related to green qualities, and contributes to address knowledge gaps and uncertainties (Azcárate et al. 2013). As well, practitioners mention that monitoring green qualities could facilitate identifying ecological compensation measures, and mention that as with monitoring, these should be discussed at strategic planning levels, which is in line with other research on the matter (e.g. Rega 2013).

Additional key issues that are put forth by practitioners, and for which aims and strategies may be formulated at a strategic planning level, are accessibility to green qualities and green area design. Accessibility to green qualities in urban areas is considered to be crucial for and increasingly sought after by urban dwellers (De Groot et al. 2005; Tzoulas et al. 2007; Gómez-Baggethun et al. 2013). In terms of cultural ecosystems services, residents' accessibility to green areas provides additional value and increases the quality of green areas (Azcárate et al. forthcoming). Moreover, minimizing transport needs and promoting walking, biking and public transport are basic for compacting cities (Jenks et al. 1996; Burton 2000; de Roo 2000; Nabielek 2012). This aim could be combined with green areas by planning for walking and biking possibilities within green areas to contribute to increase city accessibilities.

Accordingly, proposing aims and strategies for the design of green areas is also of importance, as practitioners consider that green areas should be creatively designed to provide multiple qualities instead of simply applying standardized green area designs, e.g. the use of lawns (Ignatieva and Ahrné 2013), that lead to a limited provision of green quality types.

5.2.2. Assessment and monitoring for green qualities

The second step of the green qualities SEA framework concerns assessment and monitoring of green qualities. In this step green qualities are made part of the assessment framework that can be used to shape, assess and monitor strategic actions, i.e. urban plans and programs. The aim is to create appropriate conditions to have discussions for development and assessment of strategic actions in light of the aims and strategies for green qualities that are formulated in the previous step at the regional level. Since strategic actions in Sweden are formulated and implemented at the municipal level, municipal authorities should be in charge of applying the assessment and monitoring for green qualities step of the proposed SEA framework.

The assessment and monitoring step for green qualities consists of three activities. The first activity focuses on engaging key actors and green qualities based on the context of the assessed strategic action, i.e. plan, program or project. This activity entails

mapping green qualities and identifying the potential beneficiaries of these green qualities. Moreover, it entails identifying pressures on green areas that are covered by the planning action, measuring the ability of green areas to provide green qualities, and valuating green qualities. A combination of quantitative and qualitative spatial valuation analyses for green qualities provision-pressures relations may contribute to set the conditions to address these issues at this point of the green qualities SEA process (Azcárate et al. forthcoming). In addition, the activity entails prioritizing green qualities based on actor dialogues and by studying the nature of the strategic action. The idea is to identify a specific set of green qualities that should be used to shape and assess the evaluated strategic action.

Once the context for green qualities is in place, in terms of key actor and prioritized green qualities, the second activity in the assessment and monitoring for green qualities step would be to shape and assess strategic actions. Prioritized green qualities could serve as a dialogue base from which key actors can engage in discussions and collaboration to shape and assess strategic actions. According to the research with practitioners, prioritized green qualities could shape strategic actions by highlighting associations between the prioritized green qualities, human well-being in green economy (enhancement of recreation, sports, art, culture and commerce) and social terms (reduction in costs by addressing the needs of children, the elderly, the disabled and gender and intergenerational issues). From these dialogues and collaboration several strategic action options may emerge which consider green qualities in different degrees.

The last activity in the assessment and monitoring of green qualities step would be to formulate green quality monitoring and compensation strategies in relation to the context of the assessed strategic action. These strategies should, however, be linked to the overall green quality monitoring and compensation measures that are formulated in the strategic analysis for green qualities step. Moreover, more than focusing on monitoring conformance to and the performance of the implemented strategic action, the monitoring strategies should focus on addressing gaps of knowledge and uncertainties (Partidário and Fischer 2004), as well as managing observed changes in the supply and demand of green qualities (UNEP 2014). For this, the monitoring strategies should link to and aim at improving existing environmental observation systems (Azcárate et al. 2013). In addition, based on the research with practitioners, actor involvement in setting and implementing monitoring and compensation strategies should take place as these will deal with green quality trade offs that may concern some of the actors (Morrison-Saunders and Pope 2013).

Applying the proposed green qualities SEA framework could foster strategic dialogue on green qualities at regional and municipal planning levels in the compacting Stockholm region.

At the regional planning level, strategic dialogues on green qualities may lead to the formulation of a vision, aims and strategies for green qualities. At the municipal planning level, the strategic dialogues may enhance shaping and assessing city compaction strategic actions using green qualities and their associations to human-well being.

The application of the proposed green qualities SEA framework may be limited by practitioner preconceptions on the limits of formal and generic types of SEA focusing on impact assessment. However, being contextualized to regional and municipal planning and focusing on green qualities might enhance the proposed framework's possibilities to be applied in the Stockholm region.

Moreover, the research that was carried out with practitioner perspectives on challenges and measures for green qualities in the compacting Stockholm region provides a base on which to develop a full-fletched green qualities SEA process. However, more research will be needed before or in parallel

to the application of such an SEA framework for green qualities.

6. Conclusions

Due to their importance for the attractive and sustainable city, green areas and green qualities should be recognized as key values on par with economic and technical values in urban planning. However, green area and green qualities tend to be overlooked when compacting cities and city regions. To address this issue, practitioner perspectives on challenges and measures for green quality inclusion in the compacting Stockholm region were collected and analyzed. Several data pattern elements and categories were identified and from these key issues were inferred.

The key issues pointed to the need to set a strategic direction for green areas and green qualities in the urban planning of the compacting Stockholm region. Moreover, the key issues highlighted the need to better understanding local contexts, to make knowledge on green qualities operable, and to structure a comprehensive collaboration amongst a plurality of actors to stimulate dialogue on green areas and green qualities.

It was considered that addressing these key issues could enhance the inclusion of green areas and green qualities at different urban planning scales in the Stockholm region. However, it was acknowledged that these and other issues should be further discussed and identified.

For this purpose, a green qualities SEA framework was proposed. At the regional urban planning level the framework should focus on establishing a strategic context analysis for green qualities. This could be done by furthering dialogue and collaboration on conflicts and measures for green qualities, and by setting visions, aims and strategies for green qualities. At the municipal urban planning level, the framework should focus on shaping and assessing strategic actions for city compaction based on green qualities and their associations to human-well being.

The collected practitioner perspectives on conflicts and measures for green qualities and the proposed green qualities SEA framework provide a base on which to develop strategic dialogues and collaboration for the inclusion of green qualities in urban planning. Additional research is however needed to enable the structuring of such dialogues and collaboration to contribute to make compacting cities and regions more attractive.

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IV

Reaching compact green cities – A study of the provision of and pressure on cultural ecosystem services in Stockholm

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ABSTRACT

High energy consumption, climate change inducing gas emissions and biodiversity loss need to be simultaneously addressed to reach sustainable cities. To meet this need city planning is increasingly focusing on compacting cities. However, when compacting cities attention is often paid to reach energy efficiency, while the preservation and enhancement of green infrastructure is frequently neglected, leading to green infrastructure quantity and quality losses. In compacting cities, remaining green infrastructure is essential for biodiversity and for the provision of various ecosystem services such as cultural ecosystem services (CES), which provide intangible benefits of importance for human well-being. For this reason, there is a need to have discussions on and include CES in city compaction agendas. This paper aims to study the urban planning dilemma of simultaneously striving to reach compact and green cities. Specifically, it studies the relation between city compaction pressures on green areas and their ability to provide CES. This is done by combining quantitative and qualitative analyses of various green areas in metropolitan Stockholm to estimate their CES provisions in monetary terms, and to measure city compaction pressures in terms of potential green area users within a one kilometre walking distance to the green areas. Quantifying green area CES provision-pressures in compacting cities can stimulate dialogue on desired types of CES, green area qualities, sizes, wear and tear levels, and compensation measures. Moreover, including green area CES provision-pressure analyses in planning support tools like strategic environmental assessment can stimulate further dialogue on strategies and measures for simultaneously compacting cities, reaching energy efficiency and including green infrastructure and CES at local, metropolitan and regional city planning scales.

Key words: Compacting cities; Energy efficient cities; Green infrastructure; Cultural ecosystem services; Strategic environmental assessment; Urban planning

1. INTRODUCTION

Ongoing and rapidly increasing global urbanization poses major challenges for the planning of sustainable cities (Grimm et al. 2008; Seto et al. 2013). To make cities sustainable, a pressing challenge is to simultaneously address raising high energy consumption, climate change inducing gas emissions and biodiversity loss (Alberti 2005; Niemelä et al. 2011; Elmqvist et al. 2013). To meet this challenge urban planning is increasingly focusing on compacting cities, which aims to reach compact, intensely used cities with a minimum of transport, as well as attractive and liveable cities that preserve valuable green areas (Hillam 1996; Breheny 1997; Jenks 2000; Williams 2000; Cities Alliance 2007). However, when compacting cities focus is placed on reducing transport levels and reaching energy efficiency (Jenks et al. 1996; Burton 2000; de Roo 2000; Nabielek 2012), while green area protection and enhancement are largely neglected (Breheny 1996; Lin and Yang 2006; Hofstad 2012). It is argued that city compaction is leading to a continuous loss of green areas and their ecosystems in cities (Bolund and Hunhammar 1999; Tratalos et al. 2007; Borgström 2011; Kabisch et al. 2015) and to a considerable wear and tear of remaining ecosystems (Jim 2004; Lehvävirta 1999, 2004), affecting the provision of ecosystem services (ES) that benefit urban dwellers (Masnavi 2000; Williams et al. 2000). Hence, the compatibility between striving to reach compact, intensely used and energy efficient cities at the same time as shaping them to become green, attractive and liveable seems to be an urban planning dilemma that needs to be addressed.

Green infrastructure is a planning concept that seeks to group and place the elements of ecosystems in equal terms with built infrastructures in city planning (Sandström 2002; Pauleit et al. 2011). Green infrastructure can be defined as the interconnected network of green areas, all natural, semi-natural and artificial multifunctional ecosystems within, around and between urban areas at all spatial scales (Tzoulas et al. 2007). It formally includes natural reserves, parks, green hearts, greenbelts, green wedges and greenways, which have been used in city planning as instruments to limit urban sprawl, connect urban areas with their suburbs and rural areas, and enhance recreation and other ES (Sandström 2002; Colding 2011; Shahani 2012). However, green infrastructure can also include informal green elements such as brown sites (Kabisch and Haase 2013), productive or abandoned agricultural land (Li et al. 2005; La Greca et al. 2011; Yokohari and Bolthouse 2011), and artificially created green areas (Jim 2004; Tian et al. 2012), which together with its formal green elements are basic for the provision of a variety of ES in urban contexts (Niemelä et al. 2010; Pauleit and Breuste 2011).

ES are the essential goods and benefits provided by ecosystems to humans, and they are usually categorized as supporting, provisioning, regulating and cultural ES (MA 2005). All ES and their interconnections are important for human well-being and life quality in cities (Bolund and Hunhammar 1999; Li et al. 2005; Niemelä et al. 2010; Beatley and Newman 2013; Marcus et al. 2013). However, in cities the availability of and access to regulating and cultural ES (CES) can be seen as particularly crucial (Gómez-Baggethun et al. 2013). The availability of regulating ES such as air quality, climate and water regulation is fundamental to manage and provide good living environments in urban areas (McDonald and Marcotullio 2011). Moreover, access to CES is basic for the quality of life in cities and is increasingly being sought by urban dwellers (De Groot et al. 2005; Tzoulas et al. 2007; Palomo et al. 2013; Montes et al. 2014). CES are ecosystems´ contributions to the non-material benefits that arise from human-ecosystem interactions (Chan et al. 2012). CES are usually categorized as recreational, educational, cultural and historical, artistic and spiritual CES (Chiesura and de Groot

2003). However, these CES categories are context depend as are their provided benefits (Chan et al. 2012), which can range from mental health and cognitive benefits to inspiration and spiritual benefits (Chiesura and de Groot 2003; Milcu et al. 2013). A common characteristic of the benefits provided by CES is their intangible or non-market nature (Chiesura and de Groot 2003; Chan el al. 2012; Milcu et al. 2013). This aspect of CES may have led to their poor appraisal (MEA 2005) and to their peripheral treatment in scientific research (Milcu et al. 2013). Moreover, the intangibility of CES has limited their quantification and valuation, leading to their low prioritization in or exclusion from decision making (de Groot et al. 2005).

Despite this, several approaches and methods for the quantification and valuation of CES have been proposed. Some approaches focus on quantifying and assigning monetary values to CES using a combination of economical valuation methods (Costanza et al. 1997; de Groot et al. 2012). These approaches have been developed in an effort to place CES, and ES in general, in decision making as most decisions are usually based upon cost-benefit analyses using monetary values (Chiesura and de Groot 2003). However, monetary valuation of CES is controversial and contested, as it leaves out a plurality of important values in the valuation of CES (Vejre et al. 2010; Chan et al. 2012). For instance, the recreational, ecotourism, cultural heritage and educational values of CES are more easily and frequently monetized than the spiritual and inspirational values of CES (Milcu et al. 2013).

In order to capture the marginalized values of CES, quantitative mapping methods as well as qualitative approaches for CES analysis are increasingly being used. In general ES mapping approaches serve to provide spatial information on ES stocks, demands and flows (Burkhard et al. 2013), and they have been applied to map CES and their associated social values (Raymond et al. 2009; Sherrouse et al. 2011; Palomo et al. 2013; Montes et al. 2014). Moreover, as CES valuation strongly depends on the perceptions of both personal and social driving forces (Kumar and Kumar 2008; Gee and Burkhard 2010; Vejre et al. 2010; Daniel et al 2011), qualitative methods based on deliberation are proposed to complement and combine with CES monetary and quantitative CES mapping approaches to make the intangible and incommensurable values of CES more visible in decision making (Chan et al. 2012; Norton et al. 2012).

However, in spite of the existence of various and complementary approaches to valuate CES, and despite that CES, and ES in general, are increasingly gaining societal support (De Ridder et al. 2004), are being taken up in policy discourses (Wilkinson 2012), and serve to articulate knowledge of the benefits provided by green infrastructure (James et al. 2009; Reed et al. 2013), their integration in spatial and city planning is still limited (Geneletti 2011; Wilkinson 2012; Haase et al. 2014). This poses a significant challenge especially when advocating compact city planning (Sandström 2002), as the quantity and quality of green infrastructure, which are both essential to support CES and other ES (Niemelä et al. 2010; Pauleit and Breuste 2011), are usually overlooked in urban planning and tend to decrease when compacting cities (Jim 2004; Tratalos et al. 2007).

In compacting cities that aim to make multiple urban functions accessible for their citizens, there is therefore a need to discuss how to promote the capacity of green infrastructure to provide CES and how these can be made equitably accessible (Niemelä et al. 2011). As the capacity of green infrastructure to provide CES and other ES depends on various aspects of biodiversity (Niemelä et al. 2010), the spatial configuration of habitat including size, location and connectivity between green areas as well as with residential areas, and

habitat quality including structure and composition of green areas (Colding 2011, James et al. 2009, Mörtberg 2009), specific discussions on these issues need to be taken up when compacting cities. For instance, in compacting cities, issues that need to be explored and discussed are that of green area size, habitat composition and potential provision of CES within reach to urban dwellers. CES can be seen as one of the multiple urban functions that should be possible to reach with minimum transport needs in a compact city, preferably within walking distance. Moreover, the issue of pressure, expressed in terms of the amount of users that may share the benefits of the CES provided by green areas also needs further exploration and discussion.

A planning support instrument that can potentially facilitate dialogue on these issues and mainstream information on green infrastructure and the provision of CES in compacting city contexts is strategic environmental assessment (SEA). SEA offers a legal basis in many countries, e.g. in Europe, through the SEA EU directive (OJEC 2001); a growing international application (Sadler 2011); and scenario based assessment approaches (Thérivel 2004; Geneletti 2011). Furthermore, various guidelines for including ES in SEA have recently been developed (Slootweg and van Beukering 2008; OECD 2010; Slootweg et al. 2010; Landsberg 2011), as have several methodological frameworks (Geneletti 2011; Helming et al. 2013; Partidário and Gomes 2013). However, various limitations of including ES in SEA have been identified (Baker et al. 2013), and there are still few practical examples that explicitly deal with this integration (Honrado et al. 2013). In order to address these issues and contribute to place biodiversity and ES, particularly CES, on par with economic and technical issues early on and throughout urban planning processes, there is a need to enable discussions on both the provision of and pressure on CES within SEA.

This paper aims to study the urban planning dilemma of simultaneously striving to reach compact, intensely used, low transport, energy efficient cities, as well as green cities that preserve and enhance the capabilities of green infrastructure to provide CES. By combining quantitative and qualitative analyses of green areas in the study area of metropolitan Stockholm, focus is placed on exploring the relationship between the potential ability of the green areas to provide CES, and city compaction pressures on these green areas, expressed in terms of potential visitors within a walking distance to them. These issues are in turn related to on-going city compaction planning processes in four case studies in metropolitan Stockholm. Placed within a holistic and participative planning approach made operable by SEA, the CES provision-pressure analyses of the green areas intend to encourage and further discussions on strategies and measures for simultaneously compacting cities and including green infrastructure and CES in planning processes at local, metropolitan and regional scales.

2. STUDY AREA

The study area embraces a large part of metropolitan Stockholm, the capital of Sweden, which is located within Stockholm County, one of Sweden's densest and fastest growing counties with an approximate total population of two million people (Statistics Sweden 2012) (Figure 1). To handle current and projected population increase and to avoid urban sprawl, metropolitan Stockholm is planned to be intensively compacted (Office of Regional Planning and Urban Transportation 2010). The study area includes the central parts of Stockholm city, many of its suburbs as well as parts of its green and blue infrastructure, including the whole or the larger part of five municipalities (Stockholm, Lidingö, Sundbyberg, Solna and Danderyd) and smaller parts of many of the surrounding municipalities. Out of the study area's green infrastructure, 44 green areas were chosen to be studied. The selection was based on their location in an urban compaction gradient

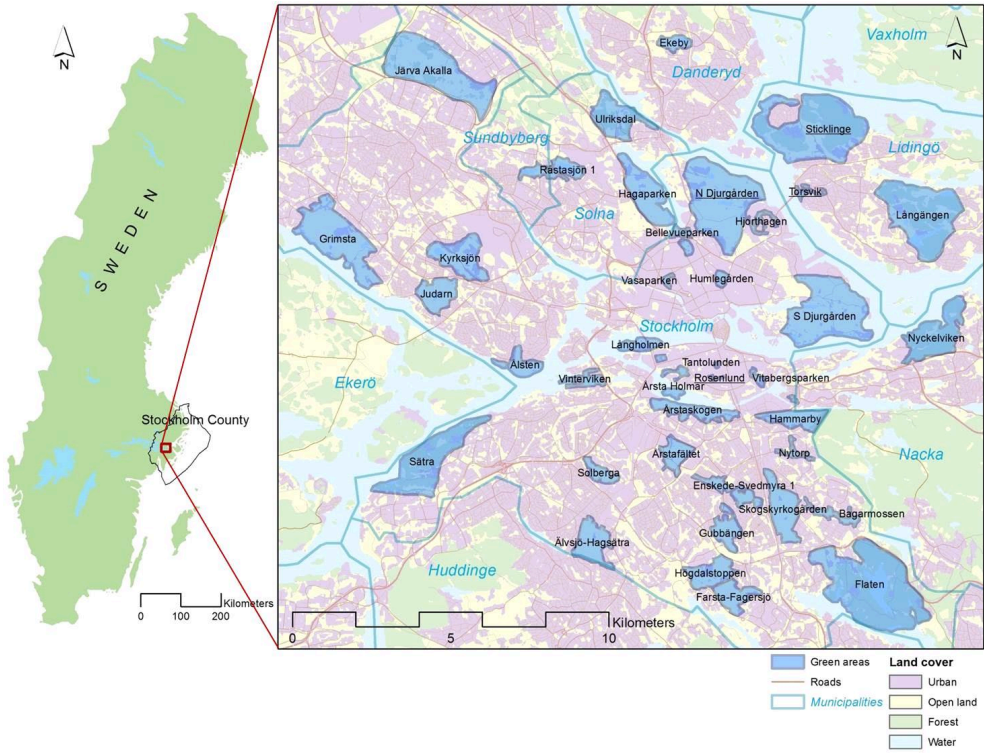

Fig. 1 The study area of metropolitan Stockholm showing the 44 green areas

that extends from the inner city to the suburbs, as well as on planned urban compaction developments that could affect them (Figure 1). The areas are mostly used for local recreational purposes and consist of parks, remnants of natural and semi-natural vegetation, or a mix of these, including main habitat types such as forests, grasslands, parks with and without tree cover, wetlands, lakes and watercourses.

3. METHODOLOGY

the selected green areas to provide CES as well as the potential pressure on these green areas and their CES. A spatial CES provision-pressure analysis was carried out using a Geographic Information System (GIS), in an effort to quantify i) the potential provision of CES by each green area in monetary terms, based on their size and habitat types, and ii) the potential pressure on the green areas and their CES in terms of the amount of potential visitors living within an assumed walking distance of one kilometre to the selected green areas. Based on the quantitative analysis and on a review of planned city compaction developments that could potentially affect the green areas, four case studies were selected for further qualitative analysis.

3.1 Quantitative analysis

A direct spatial approach to CES mapping was applied in order to get a brief overview of the urban planning dilemma. The spatial analysis was performed so as to quantify the relationship between provision of and pressure on CES for 44 green areas in metropolitan Stockholm. For this purpose, topographic data (Lantmäteriet 2013a), landcover data (Lantmäteriet 2013b), habitat

type data (Swedish Environmental Protection Agency, SEPA, 2004) and population data from Statistics Sweden (2010a) was used. For the spatial analysis we used ArcGIS 10.2 (ESRI 2009).

In order to try to quantify the CES provided by each green area, their size was estimated, since an assumption could be that a larger area of a certain habitat type should generally have a higher potential to provide CES. Furthermore, different habitat types could be expected to be of different importance when it comes to the provision of CES.

One way of quantifying this difference and to get a single and comparable unit for the CES values is to use an already existing monetary evaluation. Therefore, based on the size of the habitat types within the green areas, the total economic value of the CES provided by each of the 44 studied green areas was calculated in 2007 International dollars per hectare and year, according to the global ES valuation scheme of de Groot et al. (2012). These authors derived the values from case studies within the Ecosystem Service Value Database (ESVD). To allow value aggregation and comparison, they performed a standardization process, taking values from local currency units per area and year and converting them to 2007 International dollars per hectare and year. This made it possible for them to calculate the total mean value per bundled ES for several habitat types (Van der Ploeg et al. 2010, de Groot et al. 2012). The final standardized monetary values that in this way are available for CES (as well as for other ES), were used to obtain an estimate of the total economic value of the CES provided by the studied green areas in metropolitan Stockholm.

When using the ESVD values, four habitat types were considered for the studied green areas (Table 1). Each green area yielded a unique composition mix of the habitat types, which was determined according to land cover data (Lantmäteriet 2012), except for the land cover class "urban park", where the habitat type data from SEPA (2004) was used to separate tree-covered areas, that was treated as forest in the calculations, from grasslands. The proportions of the habitat type composition mix in each green area were multiplied with the ESVD potential economic values for CES, and the results were then added to obtain an estimate of the economic value of the total CES provision for each green area. Of the five different CES that were evaluated in the ESVD (de Groot et al. 2012); aesthetic information; opportunities for recreation and tourism; inspiration for culture, art and design; spiritual experience; and cognitive information including education and science; only the two former (aesthetic and recreation values) had more than one case study concerning the habitat types within the green areas of Stockholm. Thus they were selected for the analysis. Since the economic values of the ESVD database comes with a high degree of uncertainty, the variability within the database was taken into account. This was done through using not only the mean economic value, but also minimum and maximum values, proportionally to what was reported by de Groot et al. (2012), see Table 1.

Table 1 Monetary values of CES according to the ESVD database (de Groot et al. 2012), along with their variation and the number of relevant case studies, for the habitat types constituting the studied green areas.

Habitat types	Total economic value		
	Mean (2007 Int.$/ha/year)	Variation of values within the ESVD database	Number of case studies in the ESVD database
Forests and tree-covered parks	989	0.1-1014 %	25
Grasslands	193	1.6-337 %	9
Wetlands	3503	0.1-625 %	16
Lakes and watercourses	2166	63.7-155 %	3

An indication of the potential pressure on the green areas was estimated by summarising the total population of citizens

living within an assumed walking distance of one kilometre to each studied green area. In the first step, this number was calculated by disaggregating population values from Statistics Sweden (2010a) over all postal codes into ten square meter raster cells and adding the values contained in the cells. In the next step, a one kilometre distance buffer from the boundaries of the studied green areas was used to account for the number of citizens that could potentially reach the green areas by walking. This walking distance zone was adjusted so that residential areas behind barriers like large water bodies were excluded. The total number of citizens within the walking distance zone of each green area was calculated as well as the number of potential visitors per hectare of each green area.

3.2 Qualitative analysis

Four case studies were chosen for further qualitative analysis based on the spatial CES provision-pressure analysis and planned city compaction developments. The chosen case studies were: Norra Djurgården (Albano resilient campus), Torsvik, Rosenlundsparken, and Sticklinge (the underlined names in Figure 1). The qualitative analysis focused on identifying possible changes in provision of and pressure on CES for the selected green areas, caused by the planned city compaction developments. The analysis was carried out by reviewing planning documents related to each of the four selected green areas and by carrying out interviews with urban planners from the municipalities of Stockholm and Lidingö. Focus was placed on analysing planned increases of building and population densities, planned intensification of a diversity of urban activities, and proposals for green infrastructure protection and enhancement. These planning intentions were compared with the overview derived through the spatial CES provision-pressure analysis and then discussed.

4. Results and Discussion

4.1 Provision of and pressure on CES in the green areas

4.1.1 Provision of CES

The 44 outlined green areas in metropolitan Stockholm showed a high variability in their potential provision of CES. They varied in size from 2.3 to 633 hectares and were composed of forest and tree-covered parks (49.5%), grasslands (28.3%), water (5.9%) and wetlands (0.7%). The remaining areas were intermixed parcels of urban land and infrastructure (13.0%), fields (2.4%) and other open land (0.2%).

In the direct spatial approach to CES mapping, the CES monetary value per hectare and habitat type will be the same in any location, but the total value provided by a green area will differ with size and habitat type composition. The green area with lowest mean total provision of CES was also the smallest, Fatbursparken (2.3 ha), which accounted for 109 (2-366) Int.$/year, while the largest green area, Flaten (633 ha) accounted for the highest total provision of CES, 638,500 (122,990-4,730,810) Int.$/year. A majority of the green areas were of the size 15-200 hectares and showed mean CES provision values ranging between around 2,000 and 100,000 Int.$/year. Several large green areas were in size over 200 hectares, such as Flaten, Norra and Södra Djurgården, Sticklinge, Långängen, Grimsta, Sätra, and Nyckelviken, and showed high mean CES provision values ranging from around 100,000 to almost 650,000 Int.$/year. By contrast, green areas of 15 hectares and smaller, such as Fatbursparken, Rosenlundsparken, Vasaparken, Sickla Udde, Högalidsparken, Vitabergsparken, Vanadislunden, Tantolunden and Torsvik showed mean CES provision values of around 5,000 Int.$/year and below. There were, however, several cases where green areas of the same size showed either considerably higher or lower CES provision values. This variability was due to habitat type differences, as green

areas containing larger amounts of wetlands and water bodies in their habitat composition showed higher CES provision values than those containing only forest and grassland.

However, the results of the spatial monetary evaluation were highly uncertain, taking the uncertainties within the ESVD database into account in the form of mean, minimum and maximum values (de Groot et al. 2012), as illustrated by Figure 2. This is to be expected, since even if the monetary values of CES from the ESVD database were standardised from an economic perspective, and derived with a defined set of methods, they were still from different parts of the world, derived with different (but selected) methods and within different contexts. As pointed out by e.g. Gee and Burkhard (2010) and Sukhdev et al. (2014), CES values tend to be context dependent and temporal, and in order to capture them it may be necessary to study interactions between CES values and their users in specific social contexts. In addition, monetary valuation of CES provision likely excludes a multiplicity of fundamental values, as several types of CES can be considered to be more or less updated and with an improved access to regionally relevant studies, improved precision of monetary evaluation could be expected.

4.1.2 Habitat quantity, connectivity and quality

For the direct spatial approach to CES mapping, other shortcomings related to spatial and temporal dynamics of ecosystems remain. Intrinsic to the direct spatial approach to mapping of CES provision is the assumption that a larger area of a certain habitat type has a higher capacity to provide CES. This assumption can be seen as reasonable when it comes to the dependence of CES on ecological processes and biodiversity (e.g. Niemelä et al. 2010), since habitat size is an important aspect for e.g. hydrological processes and for species persistence in a landscape by lowering extinction risks (e.g. Forman 1995).

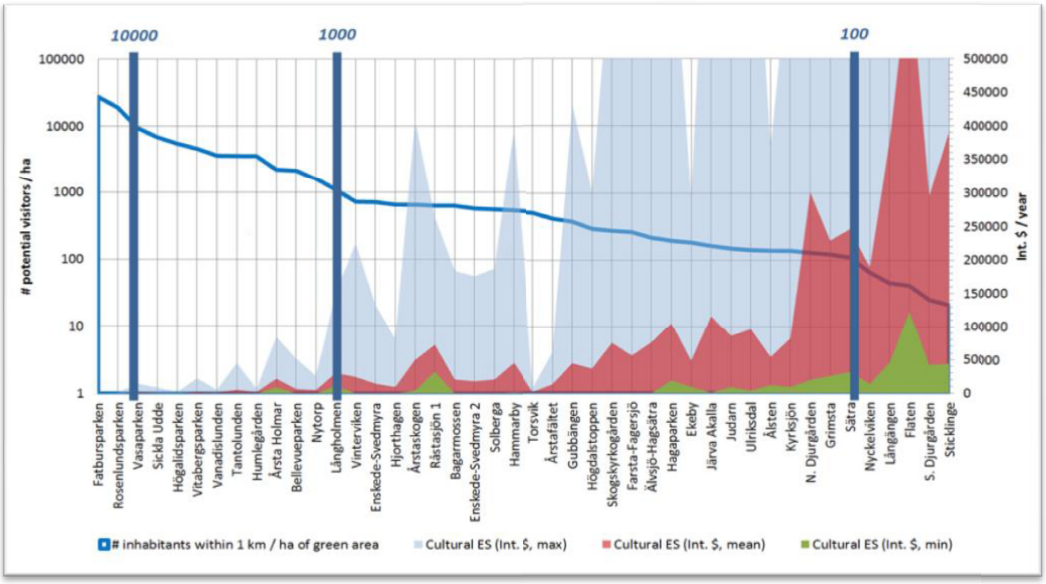

Fig. 2 The number of potential visitors per hectare for the 44 green areas, together with an estimate of the potential provision of CES in monetary terms from the direct spatial mapping. The break values for 100, 1,000 and 10,000 potential visitors per hectare are highlighted with vertical blue bars.

Other main aspects are though left out in this approach, such as habitat connectivity, location and quality. Habitat connectivity is related to ecological processes such as water flows, affecting water quantity and quality and downstream habitats. It is also related to movement and dispersal of different species, and is therefore also crucial to biodiversity. Location of habitat in adjacency to other habitat types may strengthen their ecological functions, while location in adjacency to urban land use may increase disturbances (e.g. Forman, op cit.).

The capacity of the green areas to provide CES depends also on habitat quality, which does not only vary between habitat types, which is accounted for in the direct spatial approach to CES mapping, but also within habitat types (Colding 2011, James et al. 2009, Mörtberg 2009). Important factors that may differ are for example age of trees, whether the species area mainly native or non-native, and hydrological regimes. Habitat quality and related potential for CES provision are also affected by disturbances, which in an urban area could consist of for instance noise, pollution, increased levels of domestic predators and human visitors, etc. (e.g. Mörtberg 2009).

From a recreation perspective, habitat size is also an important aspect that has been pointed out in studies on human perception and use of green areas in urban landscapes (e.g. de Jong et al. 2012, Grahn 1991, Grahn and Stigsdotter 2010). Also for human use of CES, the aspect of habitat connectivity is important, for instance between green areas, allowing for longer routes of walking and biking. Location is important since the adjacency to e.g. sea and lakes may increase CES values, while the adjacency to e.g. roads with heavy traffic may decrease CES values. For human use of CES, connectivity between green areas and residential areas is also important for easy and equal access to CES, while spatial mismatches between ES supply and demand are not uncommon (Burkhard et al. 2012a).

In addition, habitat quality aspects are important, since they can add e.g. aesthetic values, cultural history, ecological identity, sense of place, and other CES (e.g. Kumar and Kumar 2008, McCunn and Gifford 2014, Stewart et al. 2004). It has been pointed out that habitat size aspects could not be successfully traded for habitat quality aspects when it comes to certain recreation values, which are related to habitat size (e.g. Grahn and Stigsdotter 2010). Therefore, there is a need to further disentangle the different types of CES, for instance different types of aesthetic and recreation values provided by small and large green areas, in order to enable proper evaluation and integration of CES in urban planning.

In the current study, a set of green areas was outlined, which left out smaller and more informal parts of the green infrastructure, such as single trees along streets, which are also important for CES provision. In addition, since relatively coarse data on habitat were used, certain habitat types were misjudged. For instance, when the tree layer was too sparse, such as in Rosenlundsparken, the green area was classified as grassland. This particular type of error can be avoided by using higher resolution data (Hedblom and Mörtberg 2011, Lakes and Kim 2012), but will always occur to some extent.

4.1.3 Using of the direct spatial approach to CES mapping

Uncertainties in the calculations were thus introduced in several steps, not only in the monetary evaluation of CES but by the simplistic representation of ecosystems, e.g. leaving out important spatial and temporal dynamics and qualities, as well as lack of knowledge on detailed types of CES that the ecosystems provide and related parameters and thresholds. Since the monetary evaluation adds layers of uncertainties to the analysis, other mapping methods would be possible (e.g. Burkhard et al 2012a), and a multitude of approaches to address many other of the mentioned shortcomings are under development (e.g. Burkhard et al.

2012b, Schägner et al. 2013, Malinga et al. 2015).

In any case, it has been stressed by several authors (e.g. de Groot et al. 2012, Sukhdev et al. 2014) that the monetary estimates are conservative and cannot be seen as the full monetary values of ecosystem services. Likewise, the smallest green areas in the current study of metropolitan Stockholm yielded very low CES values in monetary terms, which most probably was very much an underestimation. While some of the potential recreation values may be low due to their small size, the aesthetical values and more social parts of the recreation values may still be high (Grahn and Stigsdotter 2010, Tzoulas and Green 2011; Gruehn 2013. An interpretation is therefore, that the monetary values in the current study should be seen as a lower boundary, while the accuracy of ES valuations based on land-cover and ecosystem unit values has been recognized to be higher on broad scales (Schägner et al. 2013). In this sense, it can serve as a means to communicate and take account of CES that are otherwise poorly recognized in urban planning.

The use of global land-cover classes and a standardized set of monetary evaluation have the advantage of giving coarse estimates of the order of magnitude of the value of some types of CES, which makes it useful for comparative studies in order to relate to other cities in the region or globally. At the same time, the approach can be used to relate single green areas and associated plans for urban compaction to the metropolitan scale, in order to explore the spatial planning dilemma of reaching compact green cities in a systematic way.

4.1.4 Pressure on the green areas and their CES

The pressure on the green areas in the form of potential visitors, i.e. number of citizens within one kilometer per hectare of the green area, varied widely so that a few green areas had over 10,000 potential visitors/ha, the highest being Fatbursparken with about 27,500 visitors/ha; yet a few had less than 100 visitors/ha, the lowest being Sticklinge with around 21 visitors/ha; while most green areas were in between (see Figure 2).

Green area size was correlated with the pressure on them ($p < 0.001$, $R^2 = 0.88$). Several central green areas such as Fatbursparken, Rosenlundsparken and Vasaparken, with about 10,000 potential visitors/ha or more, are small (2.3-8.1 ha) and with the direct spatial approach to CES mapping therefore yielded low mean CES provision values, below 2,500 Int.$/year. By contrast, some of the largest green areas (205-633 ha) had below 100 potential visitors/ha, and showed high mean CES provision values over 180,000 up to almost 640,000 Int.$/year. In between were a set of green areas with a pressure of 1,000-10,000 potential visitors/ha, ranging in size between 3.9-44.4 ha and between around 700-30,000 Int. $/year, as well as a set of green areas with a pressure of 100-1,000 potential visitors/ha, ranging in size between 23,1-445 ha and between under 2,000 to over 300,000 Int. $/year.

The pressure from potential users of CES, which inherently increase with city compaction, will increase the risk of affecting habitat quality and thereby the ability of the green areas to provide CES. The number of visitors will affect CES for instance by causing wear and tear (e.g. Lehvävirta 1999, 2004) and by mere presence, as there are obvious limits to how crowded an area can get and still provide the same CES.

The current analysis was coarse and could only give an indication on the potential pressure from users of CES, not the actual number and frequency of visits, or if there would be certain parts of the green areas that were more used than others, or if there would be several green areas within reach for some visitors. In addition, more knowledge is needed on how visitors will affect the ability of green areas to provide different types of CES, and how to mitigate such effects. Still, it could be demonstrated that the variation in pressure is very high, which will create widely disparate conditions

for the green areas when it comes to how their provision of CES is affected. More knowledge is though needed on the relation between CES provision and pressure, i.e. how much can the possible number of users per area unit increase before CES provision starts to degrade, related thresholds and possibilities for benefit-sharing.

When analysing the total number of potential visitors per green area (not per hectare), a different pattern however emerged where no significant correlation could be found. In many cases, the smallest green areas had the highest number of potential visitors, but there were also cases where small green areas had relatively low numbers of potential visitors (see Figure 3).

Likewise, there were large green areas with high potential provision of CES with both low and high total number of potential visitors. This means that on a metropolitan scale, green areas could have very different conditions when it comes to size, potential provision of CES, pressure in the form of potential visitors per hectare, and total potential visitors for the whole green area. Since these parameters are highly sensitive to the implementation of urban plans for compaction and other initiatives, impacts on these parameters should be carefully examined. On a strategic level, it would be fruitful to develop goals for different types of CES provision, taking potential users and pressure into account.

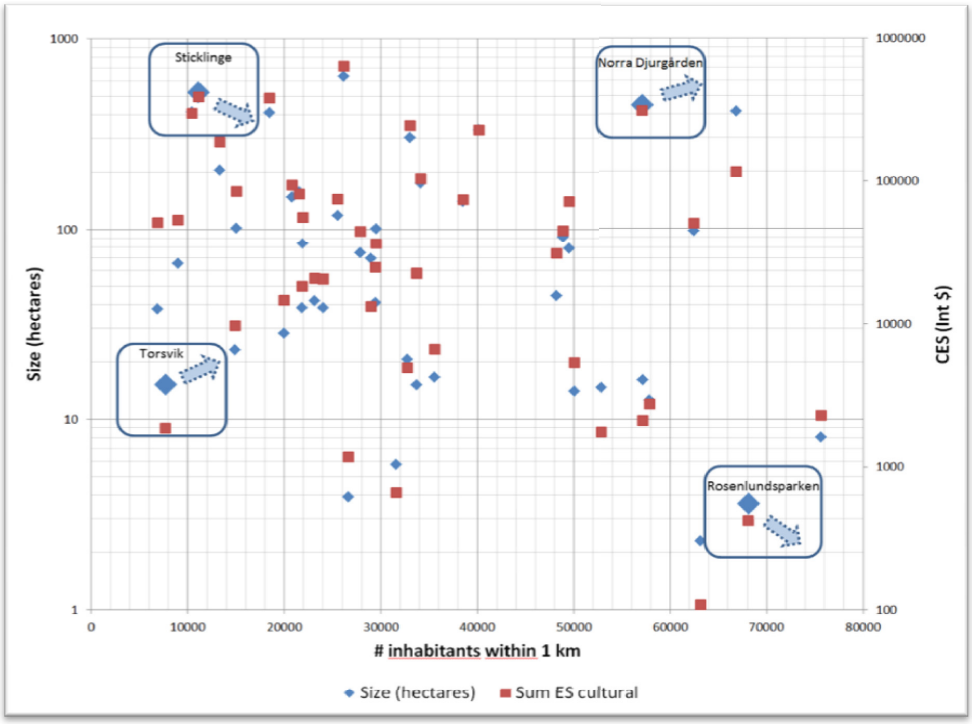

Fig. 3 Green area size, CES monetary values and number of potential users combined. The encircled green areas were further investigated as case studies and the arrows show the intended direction of change as expressed by the planning documents.

4.2 Case studies

To further illustrate how the analysed CES provision-pressure factors can be considered in metropolitan Stockholm's on-going planning processes for city compaction, complementary qualitative analyses were carried out for the four green areas of Norra Djurgården, Torsvik, Rosenlundsparken and Sticklinge. These green areas were selected due to their contrasting CES provision values and total number of potential visitors (Figure 3).

Considering the compacting city aim to simultaneously reach compact, intensely used, low transport, energy efficient as well as attractive and green cities, the planning processes for compaction in metropolitan Stockholm affecting these green areas should ideally aim to increase the total number of urban dwellers benefiting from CES, and at the same time promote or at least protect current CES provision. In terms of the spatial analysis, this would mean that the studied cases should involve planning for increasing both CES provision and total number of potential visitors, changing the conditions for the green areas as illustrated by the arrows in Figure 3.

Rosenlundsparken is an inner city green area located in Stockholm municipality (Figure 1). According to the spatial analysis, the size of the outlined green area is 3.6 ha, of which 2.2 ha are grasslands with scattered trees and the remaining area consists of intermixed urban land cover and infrastructure. It has a total of 68,100 inhabitants within one kilometer; around 18,870 potential users/ha; and its total CES provision according to the spatial analysis would be 422 (7-1,424) Int.$/year. Rosenlundsparken contains open and sparsely tree-covered areas and several playground, sport and school facilities, according to the planning document covering a total size of 5 ha, and it is well connected to major bus, train and metro networks as well as to green corridors that enhance walking and biking to the green area (Stockholms Stad 2013a). Due to its attractive location, and following regional compaction strategies (Office of Regional Planning and Urban Transportation 2010), the Stockholm city planning office is proposing a plan to develop the area (Stockholms Stad 2013b). The plan intends to enhance the area's urban character by compacting and diversifying its uses through the building of 200 additional households, a local street with several stores, and a two lane bus street crossing the green area from north to south. At the same time, the plan intends to compensate for the shrinkage of the green area by restoring the quality of its western area, creating additional green areas, and connecting these to increased recreation possibilities (op. cit).

Due to the plan's apparent conflicting goals, pressures on Rosenlundsparkens ability to provide CES will depend on the preference that is given to each of the plan's goals and on how these will be handled. However, if the planned compaction activities are implemented, Rosenlundsparken most likely be reduced in size, and at the same time, the pressure from an increased amount of potential visitors can cause significant wear and tear. In addition, the internal connectivity of Rosenlundsparken can be assumed to be negatively affected if the two lane bus street and the new houses are built. For these reasons, the CES provision value for Rosenlundsparken can be expected to decrease, while the pressure would increase, after the plan's implementation (Figure 3).

Torsvik is part of the municipality of Lidingö, which is located in the northeast of the study area (Figure 1). According to the spatial analysis, the size of the outlined green area is 15.2 ha, of which 0.3 ha are forest or tree-covered park and 8.1 ha grassland. The remaining area consists of intermixed urban land cover and infrastructure. It has around 7,710 inhabitants within one kilometer; around 507 potential users/ha, and the total CES provision according to the spatial analysis would be 1,865 (24-8,382) Int.$/year. The area included in the planning of Torsvik is larger, around 60 hectares, out of which approximately 24 hectares correspond to parks and open areas. The natural habitat in Torsvik is however

dominated and fragmented by human activities (Lidingö Stad 2011). This is so because Torsvik serves as Lidingö's main connecting point with Stockholm city, and because it is where most local administrative, commercial and cultural activities take place. Due to its importance, local authorities are designing a plan that aims to strengthen the urban character of the area, improve its public transport and housing possibilities, and increase the quality, quantity and accessibility to valuable green areas, all of which should contribute to make Lidingö an attractive, healthy and high quality living option (Lidingö Stad 2013).

In this case study, the availability of green infrastructure and the provision of CES can surface as design and trade-off decisions. This is so because planning proposals for the creation of new green areas, such as the over-decking of a major road that cuts through Torsvik, depend on the building of new housing on existing green areas. Hence, design and trade-off decisions will have a bearing on the current CES provision and pressure values in the area. However, if the road is over-decked, new green areas are created and houses are built, it can be expected that the overall CES provision value for Torsvik will increase, as would the pressure on the green area since the number of people benefiting from these services at a walking distance will increase (Figure 3).

Norra Djurgården is located in the north of Stockholm municipality (Figure 1). According to the spatial analysis, the size of the outlined green area is 445 hectares, of which 209.7 ha are forest or tree-covered park, 135.9 ha grassland, 10.8 ha wetland and 13.8 ha water. The remaining area consists of intermixed urban land cover, infrastructure and fields. It has 57,100 inhabitants within one kilometer; around 128 potential users/ha, and the total CES provision according to the spatial analysis would be 301,276 (19,614-2,473,978) Int.$/year. Despite its closeness to the city centre, the majority of this large green area consists of forests and parks, and it is part of the even larger National Urban Park of Stockholm. Besides this, Norra Djurgården contains a diversity of houses and infrastructure, and many sites inside as well as in the vicinity of the green area that are attractive for development. One such area is a 16 ha strategically located site between the higher educational facilities of Stockholm University and KTH Royal Institute of Technology, and between the green areas of Norra Djurgården and Bellvueparken, on which the Stockholm City planning office is planning to develop the Albano resilient campus. The Albano resilient campus is meant to play a central role in developing Stockholm as a knowledge city (Stockholms Stad 2012). The specific aims of the Albano resilient campus development are to: supply the city with educational spaces and student housing; link the area to inner city dynamics; and strengthen the area's natural and cultural values (op. cit).

Due to its strategic location, the Albano resilient campus offers possibilities to simultaneously improve Stockholm's transport system and increase the amount of green areas by overdecking a highway that disconnects the Albano site and Norra Djurgården from neighbouring green areas. Apart from potentially creating and reconnecting green areas, the Albano site offers possibilities to enhance the accessibility to Norra Djurgården and its neighbouring green areas by building a new metro station and tramway line, and improving biking and walking to, from and in the area (Barthel et al. 2010). These proposed activities in the Albano site together with the building of educational spaces, student housing and retail spaces will likely increase the number of potential visitors to Norra Djurgården. For these reasons both the CES provision and pressure values for Norra Djurgarden could be expected to increase after the implementation of the Albano resilient campus plan (Figure 3). However, to gain a more comprehensive view on the changes to Norra Djurgården's green area size and its CES provision values it would be necessary

to consider the cumulative pressures exerted by other city compacting activities taking place around the green area.

Sticklinge is located in the northwest of Lidingö municipality (Figure 1). According to the spatial analysis, the size of the outlined green area is 524 hectares, of which 305.9 ha are forest or tree-covered park, 97.4 ha grassland, 0.4 ha wetland and 31.6 ha water. The remaining area consists of intermixed urban land cover, infrastructure and other open land. It has 11,100 inhabitants within one kilometer; around 21 potential users/ha, and the total CES provision according to the spatial analysis would be 391,348 (44,242-3,246,466) Int.$/year. A large part of this green area is dominated by forests and cultural landscapes having direct access to the coast line. This makes Sticklinge an attractive area for outdoor recreation activities such as golf, boating, bathing, walking and hiking.

Moreover, Sticklinge has become an attractive housing location. For example, in the north of the area, summer homes have been replaced by permanently inhabited detached housing, which has led to a population increase in this part of the area from 227 inhabitants in 1960 to 2,943 in 2010 (Statistics Sweden 2005; 2010b). The urban development that has taken place in this part of Sticklinge has been planned for in several detailed plans. Regardless of the plans' existence, and that urban development has slowed down in the area (Statistics Sweden 2010b), detached houses continue to be built. Except for the planned actions to improve boat connections to Sticklinge, there is no specific information on planned activities for the area's development in Lidingö's current comprehensive plan (Lidingö Stad 2012). It is therefore probable that, until comprehensive strategies are formulated for Sticklinge, the area's development could continue to respond to what seems to be incremental planning of detached housing. If this takes place, the size of the green area will be reduced and more inhabitants will have access to use the green area. For these reasons, the CES provision values for Sticklinge could be expected to decrease, while the pressure would increase (Figure 3).

4.3 CES provision-pressure analysis and SEA in urban planning for compaction

The four case studies represent four different conditions for green areas in the metropolitan Stockholm area in terms of size, habitat composition, CES provision-pressure values and number of potential visitors (Figure 3). Rosenlundsparken is small, dominated by grassland, and showed low CES provision and high pressure values, while potentially benefiting a high number of citizens on the metropolitan scale; Torsvik is relatively small, dominated by grassland, and showed low values for both CES provision and pressure, while benefiting a relatively small number of citizens; Norra Djurgården is large, contains forest and tree-covered parks, grasslands, wetlands and water areas, and showed high values for CES provision and relatively low pressure due to its large area, while benefiting a high number of citizens; while Sticklinge is large, contains forest, grasslands, wetlands and water areas, and showed high CES provision and low pressure values, benefiting a relatively small number of citizens.

These different conditions for the green areas constitute a baseline situation that needs to be recognized in urban planning when deciding upon and implementing urban compaction plans. If such green area baselines are recognized, an opportunity may arise to discuss ambitions for green area CES provision in relation to the pressure caused by urban compaction activities. In turn, these discussions could lead to assessment of the impacts of proposed compaction plans in these terms, and to formulation of goals and strategies for green areas and CES provision, all of which could lead to seriously taking this resource into account in urban planning and decision making.

Among the green area case studies all four involved plans for urban compaction. However, each of the plans' ambitions for CES varied considerably. For instance, two of the compaction plans expressed ambitions to increase green area sizes by over-decking roads, while one plan proposed compensating for reductions in green area size by enhancing the quality of the green area. Moreover, the plans brought forth different issues, such as conflicting goals, design trade-offs, cumulative impacts, and incremental planning.

Identifying and analysing differences in planning ambitions and issues allows to increase and/or decrease the CES provision-pressure values for each green area, as well as the number of potential local users (Figure 3). By illustrating how compaction plans might change these green area baseline conditions, discussions could take place to improve the plans. The desired direction and magnitude of CES provision and pressure changes could be addressed, as could, for instance, proposals for compensation measures aimed at preserving or even improving green area CES provision levels.

With regards to green area compensation measures, it could be interesting to discuss if decreases in green area sizes could be compensated with proposed improvements in green area quality. However, as designing and achieving equitable ecological compensation seems to be quite challenging (Hayes and Morrison-Saunders 2007; Brownlie et al. 2013; Villaroya el al. 2014), there might be a need to discuss these issues at strategic metropolitan planning levels (Rega 2013).

4.3.1 A metropolitan perspective

Incorporating qualitative information on urban compaction ambitions into the CES provision-pressure analyses can contribute to zoom in discussions on green area planning at the individual green area scale, and potentially improve planning decisions at this level. Additionally, for large green areas, such as Norra Djurgården and Sticklinge, the CES provision-pressure analyses could provide an overview of the cumulative pressures caused by various compaction projects taking place in or near the green areas.

Moreover, the CES provision-pressure analyses could provide a general overview of green area CES provision and pressure values and the effects of urban compaction development at the metropolitan city scale (Figure 3). At this strategic level of urban planning, the analyses could serve as a discussion base to formulate city wide compaction and green area strategies. For instance, careful consideration should be given to planned increases in compaction levels on green areas that are smaller than 15 hectares and that are located where there are many current potential visitors or where they could potentially increase. From the CES provision-pressure analyses, it was shown that these green areas have relatively low CES provision values while there may be high demands on their CES. If compaction is to take place in and near these green areas, consideration should be given to green area habitat type composition and quality, as certain types of habitats can provide higher CES.

Moreover, consideration should be given to current and increased pressures caused by planned compaction developments. For instance, in metropolitan Stockholm the widely disparate conditions for green areas with 100, 1,000 or 10,000 potential visitors per hectare provide indications as to where increases in potential visitors could take place without compromising the ability of green areas to provide CES. Baseline conditions in terms of number of visitors per hectare, as well as goals for their increase need to be included and discussed in on-going city compaction plans at the metropolitan scale. Such information may contribute to manage compaction levels in relation to desired CES provision outcome values. Moreover, it may indicate what pressure values could be tolerable based on analyses of green area wear and tear levels, and the amount of users that may share the

green areas' provided CES. In short, considering CES provision-pressure relations, may contribute in the planning of attractive and sustainable compact green cities.

4.3.2 Planning for compact green cities

The spatial CES provision-pressure analyses that have been developed for metropolitan Stockholm, as well as other initiatives such as the Cities Biodiversity Index (SCBD 2012) and the Green Area Factor (Becker and Mohren 1990), and other (e.g. Mörtberg et al. 2012, 2013), aim to contribute to the enhancement of compact green city planning by generating knowledge on biodiversity and ES. This knowledge should however be considered at an early stage to move from compact green city planning at the project level to strategies at the urban landscape level, which is a big challenge (Pauleit et al. 2011), and to address planning conflicts between urban development and green areas, as this is an important part of including and maximizing biodiversity and ES in urban development (Hostetler et al. 2011).

Since SEA has the potential to enable an early inclusion of ES information in strategic planning (Geneletti, 2011), contribute to make multiple actor valuations of ES part of assessment frameworks (Partidário and Gomes 2013), and place valuation results in a societal context (Baker et al. 2013), it could be an appropriate planning support tool to frame the CES provision-pressure analyses and similar initiatives. Information on CES provision-pressure relations in an SEA framework for compact green city planning could enable setting multi-scaled goals and strategies for compaction activities as well as for CES. Goals and strategies could establish where city compaction activities could take place by considering information on CES and enhancing dialogue on this issue. Specific green area habitats and their qualities could also be planned for based on prioritizations of different types of CES as well as their provision levels. Moreover, the issue of accessibility to green areas and CES could be addressed through goal and strategy setting in such a framework. Walking could be placed in focus as in compact green cities the enjoyment of CES is supposed to be a daily activity that should not rely on the use of private vehicles.

The CES provision-pressure analyses used walking distance to green areas. However, it could be interesting to include other transport modes, such as biking and public transport, to provide information on how these could affect CES provision-pressure relations, and better plan accessibility to green areas and their ES. Moreover, the direct spatial approach to CES mapping needs improvements and deeper analyses, concerning monetary evaluation of different types of CES in regional and local contexts, consideration of spatial and temporal dynamics of ecosystems, ecosystem functions related to different types of CES, and more. Within the SEA framwork, one option in this direction could be to complement the monetary CES provision valuations with participatory based CES valuation approaches, as citizen participation can contribute to articulate underlying values in ES valuation (Chiesura and de Groot 2003).

The monetary estimates were not intended to be taken literally but to serve as an illustration in order to start a discussion on the actual benefits provided by CES in an urban landscape, in terms of city attractiveness, citizens' access to CES, recreational and health benefits, and other benefits that need to be highlighted and integrated into urban planning. Important parameters that define the condition of different green areas concern the potential provision of CES, the pressure on the green areas and the number of potential users of a single green area. Impacts on these parameters of plans for urban compactions need to be carefully assessed, and on a strategic level, goals are called for concerning desired levels of CES and related benefit-sharing.

5. CONCLUSIONS

Cities are being compacted to simultaneously reach energy efficiency and protect valuable green areas. However, when doing so the quantity and quality of green areas in cities are decreasing, compromising their ability to provide valuable CES for the benefit of urban citizens. A way to address this compacting city dilemma can be to value green area provision of CES and express compacting city pressure in terms of potential green area users within walking distance to green areas.

To achieve this, a spatial CES provision-pressure analysis was carried out for 44 green areas in metropolitan Stockholm, and complementary qualitative analyses were carried out with four green area case studies. The spatial CES provision-pressure analysis provided a general overview of green area CES provision-pressure values at the green area level as well as at the metropolitan city level. Both CES provision and potential green area user values varied considerably. Green area size was considered to be an important factor determining green area CES provision values. It was found that large green areas accounted for higher CES provision values while the reverse was true for small green areas. However, green area habitat types and their composition mixes were also seen to account for the CES provision differences. Moreover, high CES provision values were observed for green areas with low user per hectare values, while the inverse was observed for green areas with high user per hectare values. However, when the total number of potential visitors for each green area was considered at a metropolitan scale, a weak correlation was found between these numbers and CES provision levels. Hence, from the spatial CES provision-pressure analysis it can be said that green area size, habitat types and composition mixes as well as potential green area users per hectare are key factors affecting CES provision values. However, it was discussed that the CES provision-pressure analysis carried high uncertainties, and leaves out important issues such as habitat quality in terms of connectivity, location and levels of wear and tear, which should be considered to making the analysis more robust.

Qualitative analyses for four case study green areas complemented and expanded the results of the quantitative analysis. By studying compaction plans for the four green areas, planning ambitions and specific issues such as cumulative impacts, design trade-offs, conflicting goals and incremental planning were identified, This allowed to analyse how the different planned ambitions and issues could influence the green areas' baseline conditions and their CES provision-pressure values. Moreover, SEA was suggested as an appropriate framework to incorporate the spatial CES provision-pressure analysis. Establishing an SEA framework could enhance improving and validating the accuracy of the CES provision-pressure as well as generating strategic dialogues on these and related issues early on and throughout compacting city planning processes at local, metropolitan and regional scales. Results of these strategic dialogues could be anchored goals for green areas and CES, and strategies to attractive and sustainable compact green cities.

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V

Impacts of urban development on biodiversity and ecosystem services

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1. INTRODUCTION

Urbanization has increased rapidly worldwide and this development is expected to continue. In the beginning of the 20th century, around ten percent of the human population lived in urban areas, while today it is estimated that more than half of the world's population lives in cities (Grimm et al 2008), an estimate that is expected to increase to nearly 70 percent in 2050 if current urbanization trends continue (Seto et al. 2013). Hence, sustainable development challenges will be increasingly concentrated in cities which call for implemented policies that can lead the way towards sustainable societies (UN2014).

While urban areas only constitute around three percent of the global terrestrial area (McGranahan et al. 2007) they contain the majority of the human population and are centres of human action. These actions lead to emissions and consumptions of natural resources which generate global impacts, for instance urban activities were already a decade ago estimated to account for 78% of carbon emissions, 60% of residential water use, and 76% of wood used for industrial purposes (Brown 2001). Thus, to meet the demands of urban populations, cities rely on external commodities and shape land-use decisions and environmental change, over not only local but regional and global scales.

The urban domination of resource flow and the general localisation pattern of cities have significant consequences. A majority of the world's cities are situated along coastlines and major river systems, in areas with highly productive ecosystems and abundant natural resources, which are also strategic from a transportation point of view (Luck 2007). Not only at the global level, but also at regional and municipal levels, there is a general orientation of urbanising areas towards highly productive ecosystems, in proximity to rivers and coasts, reliable water sources and high-fertility soils, which are ecosystems that support high levels of biodiversity and ecosystem services (Falkenmark and Chapman, 1989; Ricketts and Imhoff, 2003) (Figure 1). Hence, urbanization contributes to the loss of biodiversity and due to the continuing urbanization trend the impact on biodiversity is likely to continue.

The spatial correlation between urban development and highly productive ecosystems with high biodiversity, together with the complex response to urbanisation, opens for planning as an enabler for sustainable urban development. This calls for approaches to planning and impact assessment that take the scale of ecological processes into account, across administrative borders. For this purpose, a landscape approach can be useful, which addresses scales of e.g. watersheds, animal movements and human perceptions and actions. A landscape approach includes natural, semi-natural and artificial multifunctional ecosystems in urban environments, often called green areas (Tzoulas et al. 2007), which have functions that can be studied in a landscape perspective. So, tools have been developed to inte-

Figure 1: Railway bridge in urban green area in Stockholm (photo: Mörtberg)

grate biodiversity and ecosystem services in planning and impact assessment of urban development options, promoting a sustainable urban development.

This chapter addresses impacts of urbanization on biodiversity and urban green areas' capacity in providing ecosystem services. A brief description of the role of biodiversity and ecosystem services in urbanizing areas give a framework for a landscape approach in biodiversity assessments and for the practical examples from the Stockholm region which are presented. Related to the assessment, tools for predicting and assessing biodiversity impacts at a landscape level are discussed as well as planning and management of urban green areas. The chapter concludes with lessons learned and key recommendations for best practice.

2. IMPACTS OF URBANIZATION ON BIODIVERSITY

Urbanization is a dominant agent of loss, fragmentation and degradation of habitats with significant impacts on biodiversity (Marzluff and Ewing, 2001, Ricketts and Imhoff, 2003, Müller et al. 2013). In central urban areas, habitat is continuously lost and fragmented due to urban compaction, while in peri-urban areas, urban sprawl not only converts land into new built-up areas and infrastructure, but also changes land-use in the surroundings. As rural land becomes peri-urban, it is increasingly supporting the city with industries, waste dumps, building materials and water supply as well as recreation areas. These changes on local to regional scales can have both positive and negative impacts on biodiversity, with rich opportunities for planning to influence the direction of change (Forman 2008).

The overall loss of natural and semi-natural habitats and shrinkage of habitat patches is a main driver of biodiversity decline, since habitat size is related to the probability of extinction of local populations. In addition, fragmentation increases the distance between habitat patches, which together with barrier effects of urban land cover decreases habitat connectivity in the landscape, with lower possibilities for colonization as a consequence. Habitat size and connectivity together are main predictors of species abundance, diversity and genetic exchange, and influence the probability of species persistence in the landscape (Hanski and Ovaskainen 2003; Holderegger and Di Giulio 2010).

With fragmentation, the proportion of edges between habitat and non-habitat will increase on the expense of core habitat. Conditions near edge habitat will differ from that of core habitat, in that edge habitat for example have a different micro-climate with, in the case of forest habitat edges, higher temperature and wind speed compared to core habitat, and disturbances from the surroundings will be higher. Certain edge effects, such as micro-climate, may impact in a range of tenths of meters, while other can

be more long-ranging. Consequently, habitat near edges will change and can provide a high diversity on local level, while species tied to core habitat will be negatively affected and the result on a regional level may still be detrimental (Di Giulio et al. 2009). Furthermore, habitat that becomes incorporated into urban settlements or are affected by urban sprawl will change, even if they are protected, as a result of urban disturbances and pressures (McDonald et al. 2009). These can consist of for instance pollution to air and water, noise, vibration and artificial light disturbances, changes in microclimate and hydrology, as well as impacts of urban predators and recreation pressure (Forman 2008; Mörtberg 2009; Lehvävirta et al. 2014).

A consequence of urbanization is an expanding network of transportation infrastructure which reduces habitat connectivity as roads and railways constitute movement barriers, cause habitat degradation through noise and pollution, and also cause road mortality. Simultaneously, with construction of transport infrastructure new habitat is created that can have positive impacts on some species. However, several studies have found an overall declining diversity and abundance of birds and mammals with increasing proximity to transport infrastructure (Bissonette and Rosa, 2009; Eigenbrod et al., 2009; Avon et al., 2010; Benítez-López et al., 2010). Impacts of transport infrastructure on biodiversity are further elaborated in (Forman et al., 2003; Fahrig and Rytwinski, 2009; Holderegger and Di Giulio, 2010; Karlson et al., 2014).

Another effect of urbanization is the increase in number and extent of non-native invasive species (e.g., McDonald and Urban 2006). Moreover, there is a suite of skilled generalist species that can be called "urban adaptors", that are present in most cities around the world. Meanwhile, urbanization often leads to the loss of "sensitive" species dependent on larger areas of more natural habitat. The net result is sometimes termed "biotic homogenization" (McKinney 2006).

The general pattern of urbanization impacts on biodiversity is complicated, and differs depending on scale, properties of biomes, habitat and species as well as with site history (Müller et al. 2013). However, the overall trend is considered to be a global decline of biodiversity and a homogenization due to urbanization (Hobbs et al. 2006; Müller et al. 2013). The changing density of species in cities can best be explained by anthropogenic features such as landcover and city age, rather than by non-anthropogenic factors such as geography, climate and topography. Despite this, cities still retain a high diversity of native species (Aronson et al. 2014), thus providing opportunities for planning and management that would be significant for biodiversity on all levels, also regional and global (Balfors et al. 2005).

3. A LANDSCAPE APPROACH TO BIODIVERSITY ASSESSMENT

Planning decisions, which lead to changes in the composition and pattern of the landscape, impact ecological processes and thus biodiversity and ecosystem services. The impacts may occur on site, just affecting the area of development, but often they occur also offsite, since ecological processes like species persistence and dispersal often work at large scales. Therefore, a site-based approach is not sufficient for the consideration of biodiversity and ecosystem services in impact assessment. Instead, it is necessary to consider the quality, quantity, and spatial cohesion of ecosystems and the persistence requirements of species and communities in the entire landscape.

A landscape approach calls for methods for assessing the impacts of human actions on biodiversity at a landscape level. Such methods should allow an analysis of cumulative impacts of many single planning decisions, which may lead to substantial alterations including the loss, isolation, and disturbance of natural habitats. Many of the processes involved have a temporal and spatial dimension and are possible to quantify, analyse, and visualize with geographical

information systems (GIS) combined with spatial ecological models. This allows for localisation and quantification of predicted effects of urbanisation on biodiversity components over landscape and regional scales. Also, the long-term effects of planning scenarios can be addressed.

3.1. Spatial ecological models

There is a multitude of GIS-based spatial ecological models that are designed to address ecological processes and biodiversity in relation to land use change, such as urbanization and related infrastructure, which can be used for impact assessment (e.g. Gontier et al. 2006; Mörtberg et al. 2007; Zetterberg et al. 2010; Segan et al. 2011; González del Campo 2012). Such spatial models address ecosystem processes on different levels; focusing on e.g. i) ecosystems distribution, fragmentation, rarity, etc. (Geneletti 2004, Cushman et al. 2008), ii) species and community distribution, diversity, abundance, rarity, habitat suitability and connectivity, etc. (Mörtberg et al. 2007, Phillips and Miroslav 2008, Gontier et al. 2010, Bacaro et al. 2012), or iii) both (Gontier et al. 2006; Alkemade et al. 2009; Di Minin and Moilanen 2012).

Data to support such assessments are increasingly available through national and international sources, concerning classified datasets on urban development as well as other land cover and land use (e.g. Hedblom and Mörtberg 2011). However, such ecological knowledge may not be readily available, for instance concerning detailed habitat types that would require new classifications from remote sensing data. More detailed information on habitat types will facilitate the assessment of the relative amount of habitat, which can provide a better understanding on the rarity of habitat in an area (e.g. Geneletti 2004).

Habitat amount and connectivity can be assessed using landscape metrics, such as mean habitat patch size, number of patches and edge/area ratios (McGarigal et al. 2012), from which indices useful for impact assessment can be selected (Cushman et al. 2008). Such indices were for instance used by Karlson et al. (2015) to find vulnerable habitat types in relation to impacts of transport infrastructure.

Addressing the levels of biodiversity components such as species, communities and spatial distribution would potentially relate to both the spatial and non-spatial properties of a project or plan. In order to find spatial distribution data for a baseline situation, field inventories can be conducted, which offers several advantages in terms of data accuracy. However, if this is not feasible, the spatial distribution of a biodiversity component, as well as anticipated changes due to urban development alternatives, can be predicted in different ways.

When occurrence data on a biodiversity component is available, their spatial distribution can be predicted through their correlation with independent variables, describing their habitat in the baseline situation and for scenarios. These could be based on habitat quality, quantity and connectivity (Mörtberg et al. 2007; Drielsma and Ferrier 2009; Gontier et al. 2010; Bacaro et al. 2012), while also urban disturbances and pressures can be included in such models (e.g. Mörtberg 2009). If empirical data on the distribution of a biodiversity component is not available, a predicted spatial distribution could be estimated through expert knowledge, based on resource requirements and movement capacity (Gontier et al. 2006).

One type of spatial ecological models that have potential to be used as decision support is based on graph theory, so called ecological network models (Saura and Pascual Hortal 2007, Saura and Rubio 2010, Saura et al. 2011). In such models questions concerning suitable habitat and available habitat can be addressed, taking both habitat amount and connectivity into account simultaneously. Ecological network models have been developed and applied to decision support problems, in urban settings (e.g. Zetterberg et al. 2010, Mörtberg et al. 2013, Bergsten and Zetterberg 2014) and could be very suitable for impact assessment.

Another approach that could be advantageous in a planning context is to model the predicted spatial distribution for prioritised groups of species characterised by their ecological profiles (Vos et al. 2001; Angelstam et al. 2004; Mörtberg et al. 2012). An ecological profile is a representation of several biodiversity components that share important attributes, such as resource requirements and dispersal capacity. This could for instance be a functional group of species that all depend on coniferous forest of a certain age and composition and that move similar distances within the landscape. This approach can help both setting priorities and to overcoming data scarcity, and have been applied in several case studies addressing urban development (Mörtberg et al. 2007, 2012) and transport infrastructure (Karlson et al. 2015), and can be linked to an environmental assessment process.

3.2. Integrating multiple criteria in decision support tools

For integrated assessment of urbanization scenarios, multiple and sometimes conflicting criteria need to be handled together and evaluated in decision-making. For this purpose, multi-criteria analysis (MCA) methods have been widely used for handling complex issues (e.g. Segan et al. 2011; Coutinho-Rodrigues et al. 2011; González del Campo 2012). Compared with single criteria approaches, MCA is designed to take complex factors into consideration and to perform an integrated analysis. A multitude of tools have been developed to carry out MCA analysis both in spatial (e.g. Bagli et al. 2011; Geneletti 2010, Orsi and Geneletti 2010) and non-spatial (e.g. González et al. 2013) approaches.

An elaboration of these approaches is to translate all indicators into one "currency", as in cost-benefit analysis. Economic valuation of biodiversity and ecosystem services has been seen as a promising approach to improve sustainable management and decision-making (Helm and Hepburn 2012; Laurans et al. 2013; Gomez-Baggethun and Barton 2013).

4. URBAN GREEN AREAS AND THEIR ECOSYSTEM SERVICES

Urban green areas include natural reserves, parks, green infrastructure, green hearts, greenbelts, green wedges and greenways, which have been used in city planning to connect urban areas with their suburbs and rural areas, and enhance recreation and other ecosystem services (Sandström 2002; Colding 2011). Urban green areas can also include areas such as brown sites (Kabisch and Haase 2013), productive or abandoned agricultural land (Li et al. 2005; La Greca et al. 2011; Yokohari and Bolthouse 2011), and artificially created green areas (Jim 2004; Tian et al. 2012).

Urban green areas are increasingly being considered an integral part of city development and a key issue for city sustainability (Pickett et al. 2011). They are also more often seen as vital city attractiveness factors (Douglas and Ravetz 2011), and as an issue to address, especially in spatially expanding cities and in cities experiencing population growth (James et al. 2009). Moreover, due to changes in lifestyles, regarding expectations on a higher quality of life, including good health, unpolluted environments and access to nearby recreation possibilities, there are claims and an increasing societal support for more green areas in and around cities (Sandström 2002; De Ridder et al. 2004; Li et al. 2005).

The urban ecosystem services provided by urban green areas deliver an ample range of benefits for cities and its inhabitants. In essence, all these urban ecosystem services and their interconnections are important for and benefit human well-being and life quality in cities (Niemelä et al. 2010; Colding 2011; Beatley and Newman 2013; Marcus et al. 2013). In particular, the availability of and access to regulating and cultural ecosystems services can be seen as important (Gómez-Baggethun et al. 2013). Regulating ecosystem services, such as air quality, climate and water regulation, are fundamental to manage and provide safe, healthy and good living environments in urban areas (McDonald and

Marcotullio 2011). Cultural ecosystem services, which are ecosystems' contributions to the non-material benefits that arise from human-ecosystem interactions (Chan et al. 2012), are basic for the quality of life in cities and is increasingly being sought by urban dwellers (De Groot et al. 2005; Tzoulas et al. 2007). Cultural ecosystem services are usually categorized as recreational, educational, cultural and historical, artistic and spiritual (Chiesura and de Groot 2003). These categories, together with other categories of urban ecosystem services, are however context dependent, as are their provided benefits (Chan et al. 2012; Gómez-Baggethun et al. 2013).

In general, cities can benefit from urban green areas and their ecosystem services in economic, health and quality of life, and ecological terms (Jansson 2014). Cities can benefit economically from urban ecosystem services by increasing city attractiveness, property prices, consumption, employment, food production, as well as cost savings in health care, disaster prevention and infrastructure and service maintenance. The availability of and accessibility to urban ecosystem services can define city characters and also have several positive economic effects (Dunn and Henegham 2011). For instance, green cities can attract technology and knowledge creation (James et al. 2009), provide status (Pauleit and Breuste 2011), and lead to higher property prices (Ståhle 2008), in some cases between 5 to 20 percent depending on the green area and the neighbourhood (SCBD, 2012).

In cities, the regulating ecosystem services provided by green areas deliver various types of ecological benefits, e.g. air filtration, microclimate regulation, noise reduction, water purification and supply, storm water regulation and flood control, sewage water treatment, soil erosion control, and biodiversity maintenance (Douglas and Ravetz 2011). For example, urban and peri-urban green areas have the capacity to maintain water supply security in cities (Beatley and Newman 2013), providing city inhabitants with fresh water for drinking and for many other activities, and influencing the amount and quality of the supplied water (McDonald et al. 2013). Moreover, vegetated areas in cities can contribute to mitigate climate change by acting as carbon storages and by minimizing the urban heat island effect through evapotranspiration and solar energy absorption (SCBD 2012).

Cultural ecosystem services contribute to health and improve well-being and quality of life for people in cities. Urban nature provides a regenerative function, lowering stress and providing relaxation from daily routines, which is extremely important especially in urbanizing contexts (Chiesura and de Groot 2003). Contact with urban green areas has also been seen as helping to restore attention capacity and emotion regulation, countering depression and anxiety (Tzoulas and Greening 2011). People that live in proximity to urban green areas tend to spend more time outdoors and are more physically active, taking part in walking, biking and sporting activities, and viewing and appreciating nature (Beatley and Newman 2013).

Contact with urban nature is also important for urban dwellers to develop and strengthen social relationships and community bonds (Tzoulas et al 2007). For instance, weaving community gardens in the urban fabric is considered important to promote community cohesion and rebuild productive urban landscapes (Yokohari and Bolthouse 2011). Gardening can also increase longevity of the elderly and contribute to cognitive development of children, to whom green areas are vital for learning (Tzoulas and Greening 2011).

4.1. Planning and management of urban green areas

One key message from Cities and Biodiversity Outlook (SCBD 2012) is that ecosystem services must be integrated in urban policy and planning. This integration requires an in-depth understanding of how ecosystem services are manifested in urban contexts and how they are affected by urban development. In cities, the tasks of struc-

turing and designing urban green areas should focus on maximizing the multiple services and benefits that these areas can provide (Douglas and Ravetz 2011). Urban green areas could for instance be planned and managed to simultaneously motivate human physical activity and promote biodiversity.

However, green areas in city contexts are typically fragmented and disconnected, conflicting with the urban green area planning and management goal of maximizing multiple ecosystem services and benefits (James et al. 2009). There is also a lack of knowledge around the quality of different ecosystems from both a biodiversity and an ecosystem services perspective, as of how to manage them to increase their performance. Other challenges for urban green area planning and management are: how to identify and balance ecosystem service and benefit trade-offs (Grimm et al. 2008), how to assess and manage urban green areas' perceived ecosystem disservices such as increased fear, feelings of insecurity, and spread of diseases associated to urban green areas (Tzoulas et al 2007, Lyytimäki and Sipilä 2009); and how to develop urban green areas that are shaped by human actions and are subject to socio-demographic and environmental change (Chiesura and de Groot 2003; James et al. 2009; Niemelä et al 2010).

An understanding of how the biophysical and human processes in urban settings interact with each other across multiple spatial and temporal scales can contribute to address the above mentioned challenges (Pickett et al. 2011; SCBD 2012). Moreover, gaining a wider understanding on how society values urban ecosystem functions and services can affect how pressures or impacts on urban green areas are viewed, and what actions can be designed to manage these pressures (Niemelä et al 2010). For instance, including information on ecosystem services in city development assessments and decision making can be used to identify both where human action has adversely impacted a service and where intervention might give rise to additional benefits (Azcarate et al. 2015). In urban planning, consideration of green areas in an early stage could lead to a move from planning at the project level to strategies at the urban landscape level (Pauleit et al. 2011), and to address conflicts between urban ment and green areas, which is an important part of including and maximizing biodiversity and ecosystem services in urban development (Hostetler et al. 2011).

5. APPLICATIONS IN THE STOCKHOLM REGION

The Stockholm County consists of 678,500 hectares of land and water, extending 180 kilometers from north to south, and representing around two percent of Sweden's total land. The County includes 26 municipalities and embraces varying landscapes such as large forested areas, open agricultural areas, and built up areas that respecttively account for 50, 20 and 14 percent of the land area (Statistics Sweden 2012). Within the Regional Development Plan for the County, green areas in the form of ten Green Wedges were identified that stretch from the region's rural-urban fringe to the center of Stockholm City, the capital of Sweden (Office of Regional Planning and Urban Transportation, ORPUT, 2010). The Green Wedges are remnants of formerly connected natural and semi-natural habitats having high ecological, recreational and cultural significance (Elmqvist et al 2004, Colding 2013), which are built up by core areas, with high biodiversity and recreational values, and connecting dispersal links. Apart from having Green Wedges at a close distance, urban residents in the Stockholm region have access to other types of green areas, such as nature reserves, city parks and natural shore-lines, as well as a large number of golf courses, private gardens and allotment gardens that also provide opportunities for biodiversity and ecosystem services in the urban region (Barthel et al. 2005; Colding el al 2006). From a European perspective, the Stockholm region and its urban

areas can be considered to provide a high coverage in green areas (Elmqvist et al 2004; Colding 2013). However, these green areas are affected by continuous and rapid urbanization (Bolund and Hunhammar 1999; Mörtberg 2009; Borgström 2011; Colding 2013).

The Stockholm region is a fast growing and dynamic region, which attracts companies and new residents. It has been estimated that the migration into Stockholm County will be as much as 250 000 – 400 000 more households by the year 2030 (ORPUT 2010), which is expected to significantly increase the region's total population of approximately 2 million people (Statistics Sweden 2012). With an increase in population, the demand for and pressure on urban resources, from housing to public transport and recreational possibilities increase, and additional capacity will be required to support the current pace of urbanization in the region. To handle these increases, and to avoid urban sprawl, which can for instance affect the Green Wedges, certain urban areas or urban nodes in the Stockholm region are planned to be densified and strengthened with additional transport infrastructure (ORPUT 2010).

In these urban nodes, densification activities aim at increasing housing possibilities and a variety of urban functionalities, but there is a

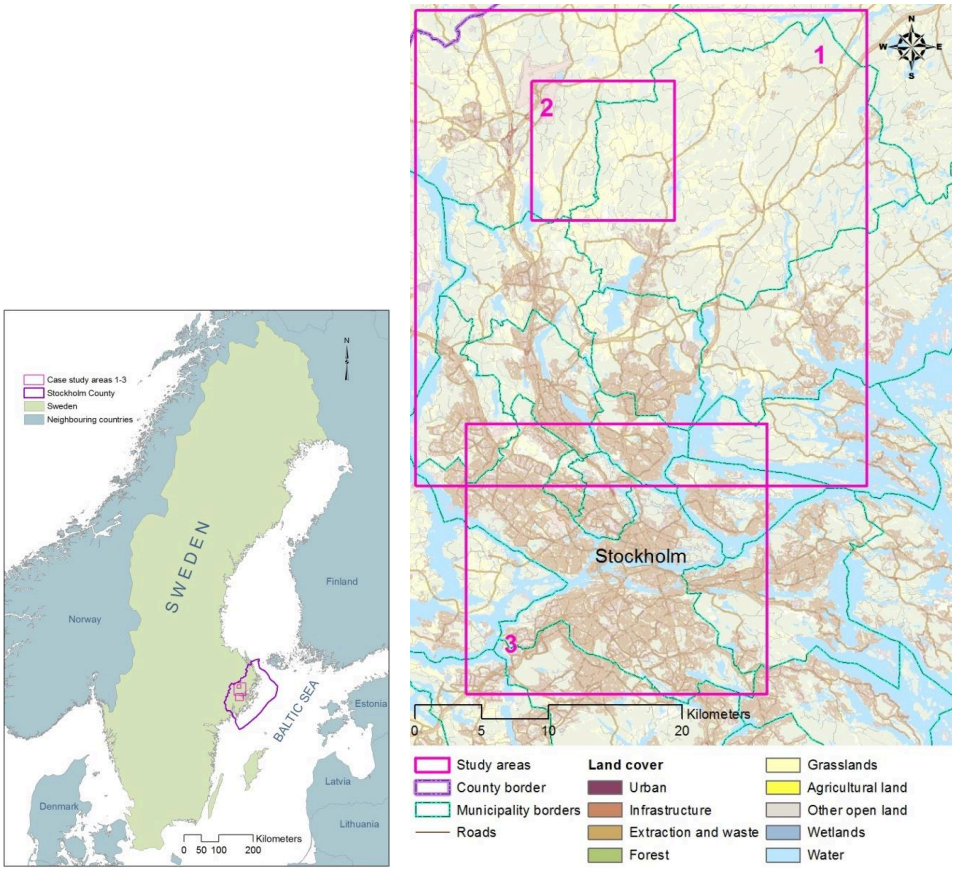

Figure 2. Location of Stockholm County and the three case study areas 1-3, © Lantmäteriet 2012 [i2012/920].

risk that these activities might cause undesired effects on the green areas located within the intervened areas. Moreover, since the Stockholm region is increasingly connecting to the much larger region of Mälardalen, involving several counties, fast trains and other transport modes could mean that valuable green areas in the region, within and outside of its Green Wedges, could become increasingly fragmented and decrease in size, which can negatively affect biodiversity and ecosystem services on a regional scale.

In the context of the Stockholm region three case studies are selected to illustrate different landscape approaches to integrate urbanization impacts on biodiversity and ecosystem services in urban planning (Figure 2). The first case study addresses the formulation of regional landscape strategies using a landscape approach in a study area covering the larger part of six municipalities situated north of Stockholm City. The second case study concerns the construction of a new railway connecting the important urban development nodes of Arninge and Arlanda. The case study involves development of methods using spatial ecological and geological models to infer about important ecological characteristics that may be affected by the planned construction. Alternative corridors for the railway are tested by the spatial ecological and geological models. The third case study introduces combined quantitative and qualitative analyses to estimate the potential provision of cultural ecosystem services of various green areas as well as the pressures that these green areas could face with the implementation of city densification in metropolitan Stockholm. In this way the impacts of single planning projects can be linked to the overall status and needs on the metropolitan level.

5.1. Regional landscape strategies

The conservation of biodiversity is the main concern of one of the Swedish national environmental quality objectives called A rich and varied plant and animal life (Govern. bill 2004/05:150). Within this objective, a target is to develop regional landscape strategies for the consideration of biodiversity on a landscape scale. For this purpose, the Swedish Government commissioned seven county councils to develop methods in different pilot projects. One of these pilot projects was carried out in a rapidly urbanising area north of Stockholm City (Figure 2). The study area embraced six municipalities in sub-urban and peri-urban settings with a mosaic of built-up areas, transport infrastructure, forest, agricultural land and lakes, with high values from biodiversity and ecosystem services perspectives. The aim of the project was to develop methods for creating regional landscape strategies for this area, with the target to create a joint policy document for the landscape. The strategies should provide an umbrella for a wide array of planning and conservation measures, for example within biodiversity conservation, conservation of historical landscapes, the programme for the countryside, regional and municipal planning and urban development.

The regional landscape strategies were formulated using a landscape approach, integrating biodiversity objectives together with cultural history and recreation values. For the objectives, operational targets and indicators were formulated, the latter in the form of ecological profiles, historical landscapes and recreation values and availability. Spatial ecological and landscape models were applied to study the baseline situation for the selected indicators. An integrated assessment was performed of the baseline situation compared to the targets and was followed by a formulation of strategies for the landscape to reach those targets.

The project approach allowed a broad participation of stakeholders through several meetings and workshops involving different competences from the Stockholm County Administrative Board, together with the Stockholm County Council, regional representatives of the Swedish Forest Agency, the Swedish National Road Administration, the Swedish National Heritage Board, planners and ecologists from six municipalities, the

Federation of Swedish Farmers and several NGO's. The stakeholders were engaged in the formulation of suitable planning objectives and targets, provision of local ecological knowledge and final integration of results into a spatially visualisation of strategies.

The targets related to biodiversity that were selected in the participative process were the conservation of three main nature types and the potential for sensitive species tied to these nature types to persist in the landscape. The nature types consisted of coniferous forest with old pine trees, deciduous forest with old oaks and natural grasslands. The ecological profiles were groups of species tied to these nature types with low or intermediate dispersal or movement capacity.

The results of the spatial ecological modelling were habitat networks for each ecological profile representing resource- and/or dispersal limited species of targeted nature types in the region. These were integrated with information of remnants of historical landscapes and recreation values and availability, which resulted in a final map with core areas and connecting links for these values. In this way, synergetic effects of several different values could be outlined. Examples of this were the outlined core areas with historical landscapes and natural grasslands, a large forest area with high recreation values, shorelines and castles with assemblages of old oak trees and green areas in suburban areas with high recreation values and availability. The latter correlated to a large extent with the Green Wedges in the Regional Development Plan (ORPUT 2010). However, the core areas differed in certain locations between the regional landscape strategies and the Green Wedges, which would be expected since the scope of the current study was substantially broader and a result of a broad stakeholder engagement.

The strategies formulated in the resulting policy document (Stockholm County Administrative Board 2007) concerned e.g.:

- *Strengthen the status of the landscape in urban planning*: Important landscape structures and the peri-urban landscape functions should have a clearer role in urban, regional and infrastructure planning. Develop a holistic and integrated view over administrative borders and set up harmonised databases on landscape values. Disturbing activities such as industries and waste dumps need to be planned from a regional perspective.
- *Conserve and develop good habitat for people and for biodiversity*: There is a need to develop baseline data on important cultural and ecological structures in the landscape, concerning both biodiversity, recreation and health. Likewise, there is a need to plan for measures to mitigate barrier effects both concerning biodiversity components and recreation. Further, there is a need to plan forestry for multiple goals including economic, biodiversity, recreation, cultural and aesthetical values. This concerns for example, the oak stands and natural grasslands that need long time management plans, and nature close to residential areas with high recreation values, which are of key importance and need plans for people's movements in their urban or suburban landscape.

The broad participative process benefited a more unified view on the landscape values and enhanced the cooperation of different sectors responsible in different ways. Further, it was important for gathering local ecological knowledge and knowledge on recreation values and barriers in the landscape. The process also enhanced strategic thinking among responsible stakeholders, development of visions and identification of synergies concerning landscape values. Finally, the regional landscape strategies have the potential to be a valuable tool for planning, since through the presentation of core areas and connecting links over administrative boundaries, the municipalities' areas and values can be seen in a broader perspective, i.e. in a landscape and regional perspective.

5.2. Arninge-Arlanda railway

Within the Regional Development Plan for Stockholm County (ORPUT 2010), a selection of urban nodes, which are already important centres of urban activities, were proposed to be further developed. Two such urban nodes situated north of Stockholm City are Arninge and Arlanda Airport, both of which are important commercial centres, while the latter is the largest international airport in Sweden. In an effort to meet future demands on public transport between these urban nodes, a feasibility study for new public transportation links, either a railway connection or a new bus line between the two nodes was initiated by Stockholm Public Transport, directed by Stockholm County Council. Within the study, three alternative railway corridors were proposed (Håkansson et al. 2012) (Figure 3). Since all the three alternatives for the proposed connection crossed an area with high biodiversity, cultural and recreational values, trade-offs could be anticipated between economic development, the climate smart solution of supplying public transport, and biodiversity objectives.

Comparing with other planning efforts concerning biodiversity and ecosystem services, all three railway corridors crossed straight through a broad dispersal link outlined in the Green Wedges (ORPUT 2010). In addition, the northernmost corridor crossed an area of national interest for cultural history (…). Furthermore, the same corridor passed through one of the core areas formulated by the regional landscape strategies described in Case Study 1. At an early planning stage, the plan with the three pro railway corridors were subjected to a public exhibition, which generated a high interest from the public and NGOs. Following the exhibition, the northern corridor, that was fragmenting the area of national interest for cultural history, was removed, and the remaining corridors adjusted to further avoid this area (Håkansson et al. 2012).

A similar planning problem was addressed in another research study on developing novel methods for planning and designing road corridors, aiming to integrate disparate sustainability issues such as resource efficiency, biodiversity and travel time, already at the design stage of planning transport infrastructure corridors (Karlson et al. 2015). Resource efficiency was addressed by integrating spatial models of geological suitability and mass balance into the design, to find the corridor with least resource load. Biodiversity was addressed by integrating spatial ecological models of habitat networks for prioritised groups of species, i.e. ecological profiles related to coniferous forest, southern broadleaved forest, natural grasslands and wetlands. The habitat networks consisted of habitat patches and dispersal links, and the road corridor with least impacts on these were found. An integration step between resource efficiency and biodiversity was performed using MCA and by applying different weights which gave different results. When resource efficiency was given a high rank, together with travel time, a northern alternative was chosen. By contrast, when biodiversity was given a high rank, together with travel time, the northern parts were avoided, see Figure 3a.

Thus, effects of habitat loss and fragmentation on the habitat networks of prioritised groups of species can be quantified and used in the design of transport corridors (Karlson et al. 2015). More detailed information on the overall performance of the habitat networks and the impacts of removing certain patches and links can also be integrated (e.g. Zetterberg et al. 2010). However, a limitation of the use of habitat networks in corridor design is that thresholds for when significant impacts on biodiversity components occur are still largely missing. Another related problem is that since all proposed railway corridors will cross outlined dispersal links, either in the current method development study, as outlined in the Green Wedges or in the regional landscape strategies (Case Study 1), threshold values for habitat networks would be needed in order to address the overall impacts on species persistence in the studied landscapes.

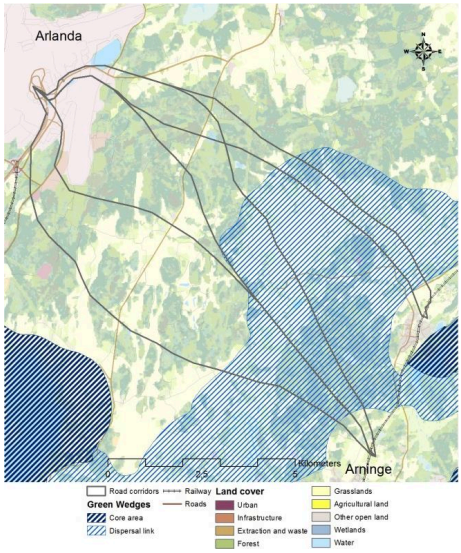

Figure 3a. The three proposed railway corridors between Arninge and Arlanda crossed through a dispersal link of the Green Wedges (ORPUT 2010).

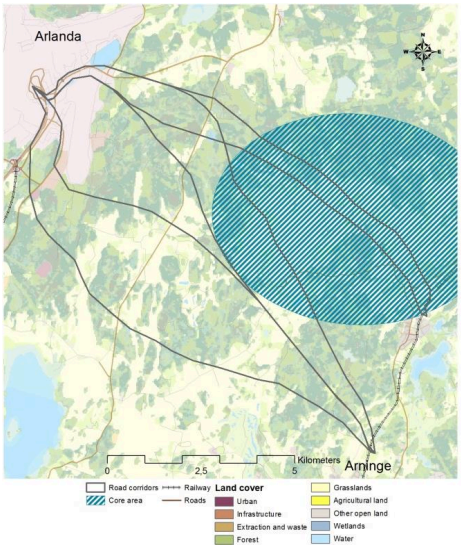

Figure 3b. The northern corridor crossed a core area of the regional landscape strategies (Case 1), where also an area of national interest for cultural values is situated. Also the middle corridor was impacting on the area.

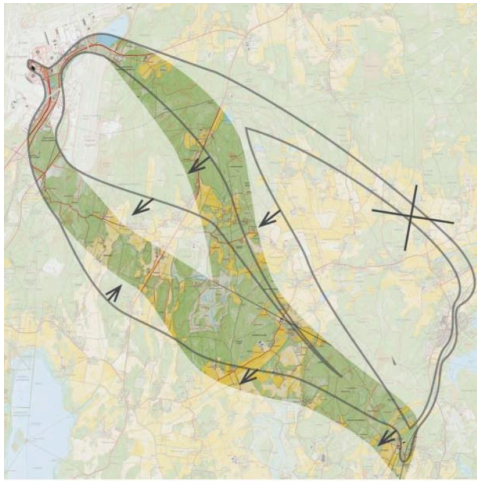

Figure 3c. During the feasibility study, after public hearing, the northern corridor was removed and the middle corridor adjusted to avoid the sensitive area (Håkansson et al. 2012).

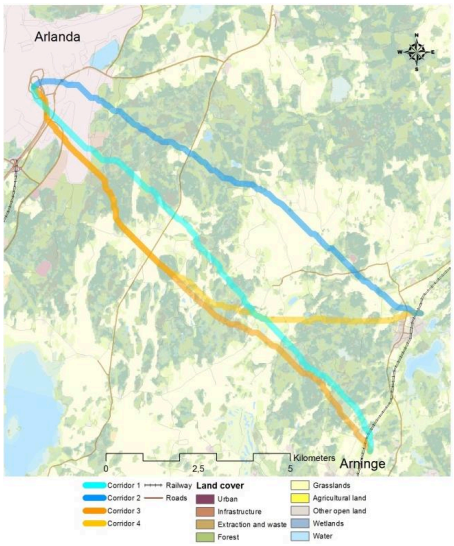

Figure 3d. Using SMCA and least cost path for designing road corridors. When weighting the geological criteria high, the blue alternatives resulted, while when weighing the ecological criteria high, the orange alternatives, the northern area was avoided.

From landscape and regional perspectives, all the proposed alternatives may be unsustainable and the optional transportation mode in the form of a new bus line on existing and already planned roads may be a better alternative. To sum up, the methodology has great potential to integrate biodiversity considerations in designing planning alternatives and to localise critical areas for mitigation measures, supporting sustainable urban development.

5.3. Densification of Stockholm metropolitan

One of the urban nodes where urban development is particularly emphasized in the Regional Development Plan (ORPUT 2010) embraces the central parts of the Stockholm region. In this node Stockholm City and surrounding municipalities have initiated different urban development projects in areas close to the inner city of Stockholm to meet the urgent need for new housing in the region. These projects result in a densification of the central node which is in line with the intentions of the Regional Development Plan. Moreover, densification provides preconditions for sustainable mobility as expressed in 'The Walkable City – Stockholm City Plan' which was adopted in 2010. Due to these developments, which primarily takes place within existing residential areas and on brown sites close to the inner city, several green areas will be affected by ecosystem loss and fragmentation, and/or by increasing numbers citizens living in adjacent areas. This means that ecosystem services provided by the green areas will be affected and that the pressure on the green areas will increase.

The provision of cultural ecosystem services (CES) is not well integrated in the planning process for individual development projects. Hence, incremental planning and decision making does not provide information for an overall assessment of the impacts of ongoing densification projects on CES at local and regional levels.

In order to relate single planning projects to a landscape perspective, the potential CES provision of each green area needs to be quantified. In a research project, a set of 44 green areas in the central and suburban parts of metropolitan Stockholm have been studied, for which the potential provision of and pressure on CES was estimated (Azcárate et al. 2015). While the capacity of green areas to provide CES is related to their size, the habitat type will also matter. Furthermore, there may be a limit to how many people may use a green area before the pressure will start degrading the CES. The potential economic value of the CES was estimated using the global ecosystem service valuation scheme of de Groot et al. (2012), with the unit 2007 International dollars per hectare and year. The values were applied to the size and habitat type composition for each green area. In addition, the potential pressure from users of CES, in the form of the human population living within 1 km from each green area, was also estimated. Based on the combined results and on-going city compaction plans, planning cases related to four of the green areas were selected for extended qualitative analysis. The selection represents four different types of urban green areas; two with low CES values and two with high CES-values, two with a high number of inhabitants within 1 km and two with a low number of inhabitants within 1 km (Figure 4).

The green areas varied in size from 2.3 to 633 hectares, and the number of citizens within 1 km varied from over 10,000 potential users per hectare to less than 100 users per hectare. The CES monetary value per hectare and habitat type was the same in any location, but the total value differed with size and habitat type composition. The values of CES that were provided by the green areas varied between 557 (50-3035) Int.$/year and 669,700 (108,144-2,929,100) Int.$/year (Azcárate et al. 2015). The results of the monetary evaluation are highly uncertain, taking into account the uncertainties within the database reported by de Groot et al. (2012). However, these estimates give an indication and facilitate a discussion on the actual benefits provided by CES in an urban

landscape, in terms of city attractiveness, recreational and health benefits, and other benefits which can provide an input in urban planning.

A comparison of the provision of CES by the four cases is presented in Figure 4b, showing that the two large green areas provide high total CES values, while they differ strongly in pressure. Likewise, the two small areas provide low total CES values, while they also differ widely in pressure. Based on a review of planning documents and interviews with urban planners, the planned increases of housing, urban population and other urban activities were summarised for each of these cases, as well as related changes of green area size and management. All four cases would imply an increase of the number of potential visitors, while the change in size of the green areas differs widely. While in two cases the green area would shrink, the green area would be indifferent in one case and even increase in one case, due to a planned over-decking of a major road that would be transformed into a park.

The provision-pressure analysis illustrates the challenge of compacting cities, to provide both room for an increasing number of citizens as well as for CES, on limited space. This challenge raises questions on whether increasing habitat quality can compensate for shrinkage of green areas, how much pressure is possible before CES starts degrading, and how to plan for sufficient levels and benefit-sharing of CES.

The landscape approach to identifying potential provision and pressure concerning CES can serve to initiate an active engagement of concerned actors in strategic dialogues on complex issues surrounding green area and ecosystem service planning in compacting city contexts. However, to further such strategic dialogues, and to include green areas and ecosystem service issues early on and throughout the entire urban planning processes, the use of an ecosystem services based SEA approach could be useful.

Several ecosystem service based SEA guidelines (Slootweg and van Beukering 2008; OECD 2010; Slootweg et al. 2010; UNEP 2014) as well as various ecosystem service based SEA methodological frameworks (Geneletti 2011; Helming et al. 2013; Partidário and Gomes 2013) have been developed. Combining these guidelines with the CES provision-pressure analyses could

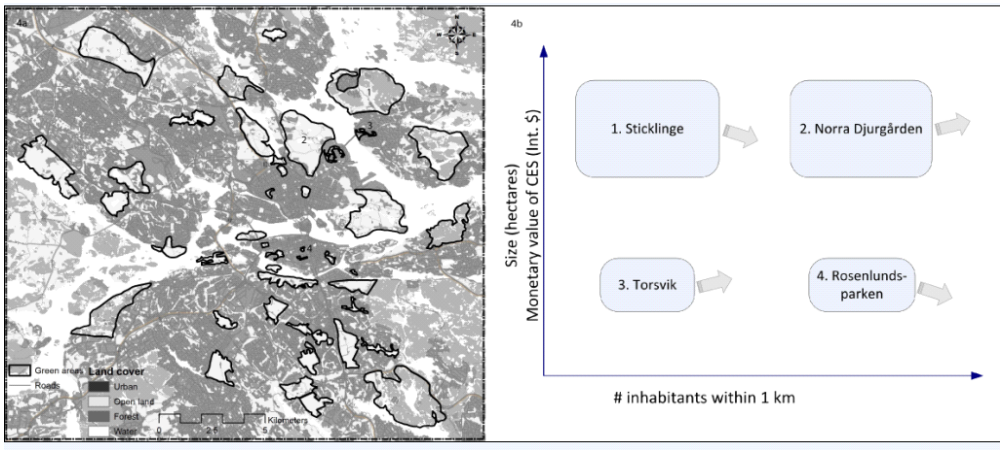

Figure 4a: The analysed green areas within metropolitan Stockholm. Figure 4b: From the analysis of the potential provision of CES for each green area, in hectares and in monetary terms, combined with the number of inhabitants living within 1 km distance of the green areas, four case studies were selected for further analysis of their planning situation.

frame the planning of city densification projects in the Stockholm metropolitan, and contribute to identify key measures concerning green area design, size, connectivity, composition, quality, uses and trade-offs. Moreover, the combination of the guidelines and the CES analyses would enable the formulation of strategies for including measures to secure the provision of CES at local and regional scales of urban planning.

6. LESSONS LEARNED AND KEY RECOMMENDATION FOR BEST PRACTICE

A consistent assessment of potential impacts can strengthen biodiversity considerations in the planning process and contribute to the preservation of biodiversity in the long term. This is also in line with international policy ambitions, which require protection of green areas so as to maintain biodiversity in urban regions. In addition, a more informed urban design can enhance new development projects that can save or increase ecosystem services' performance.

To support the impact assessment of human actions on biodiversity at a landscape level there is a need for methods that allow analysing cumulative impacts, e.g. GIS-based methods, such as spatial ecological models. In the case studies a number of advantages of spatial ecological models were identified i.e. (1) to model biodiversity components on a landscape level, (2) to study quantity, quality and connectivity of related habitat types in the landscape, (3) to put single sites into a landscape perspective, (4) to evaluate planning alternatives and to visualise and communicate the results. A challenge with these GIS-based methods is the strong visual capability and the inherent uncertainties that need to be communicated. Further, it is difficult to predict how viable populations of different species are developing over a time. However, it is possible to analyse where in the landscape the support for different functional groups of species is best. With this knowledge, it is possible to prioritise and provide decision support for planning measures on protection, restoration and management of biodiversity components and to analyse and evaluate planning alternatives.

In the case for ongoing city densification development projects in metropolitan Stockholm, a GIS-based method is applied to facilitate an ecosystem service provision-pressure analysis. The analysis provides a comprehensive understanding of how urban green areas can or cannot cope with increasing city densification. Moreover, specific issues such as recommended green area sizes, tolerable wear and tear levels, appropriate ecological compensation measures, required habitat compositions, and key ecosystems services that can be identified based on ecosystem service provision-pressure analyses. In addition, information on ecosystem service provision-pressure relations can be used to strengthen evaluation of development scenarios in strategic environmental assessments and support urban planning processes in metropolitan Stockholm in formulating strategies for urban densification.

In the case study of the Arninge-Arlanda railway, the analysis of the impacts of fragmentation on biodiversity supported the comparison of alternative rail infrastructure corridors. Enhanced knowledge on how transport infrastructure affects habitat networks and including this knowledge in environmental assessment processes can then improve the planning of infrastructure projects, strengthen biodiversity considerations in ongoing urbanisation processes and ensure the urban green areas' ability to provide ecosystems services. This is in accordance with the goals of EU requirements on environmental assessments, as well as with the Swedish environmental quality objective of maintaining and providing access to natural environments near and within urban areas that are valuable for outdoor recreation, cultural heritage and biodiversity.

Besides the assessment of impacts on green areas which improves the knowledge base in

urban planning, there is a need for dialogue on biodiversity and ecosystem services in urban development processes and increased collaboration between stakeholders at different planning levels to further coordinated actions for enhanced biodiversity and ecosystem services in urban planning. Experiences from the case study on regional landscape strategies showed that a broad participation process fostered the development of strategies, visions and synergies concerning landscape values. Moreover, the collection of local ecological knowledge benefited from an active stakeholder involvement. Also, the identification of core areas and connecting links over administrative borders, like municipal borders, were facilitated by the dialogue which resulted in a broader view on the landscape values – a regional landscape perspective.

The case studies from Stockholm show that a landscape approach provides opportunities to address different scales of ecological processes and hence strengthen important landscape structures and functions in urban, regional and infrastructure planning. Furthermore, a landscape approach can facilitate multi-scalar studies by providing a link between different planning actions at the local, regional and national level, which facilitates a long term sustainable management of biodiversity and ecosystems services in urban development.

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Article

Network strategic assessment approach for dialogue and capacity development in NGOs

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As platforms for dialogue non-governmental organizations play an important role in facilitating the inclusion of a diversity of views in the debates and decisions that shape society. However, to successfully influence societal development non-governmental organizations need to develop and mobilize their capacities. This paper argues that organizational capacities can be developed and mobilized with strategic dialogues, which can be enabled and fostered with network strategic assessment approaches. Through a case study, research was carried out to draw experiences from designing a network strategic assessment approach in the context of a network-based non-governmental organization that aims to strengthen the development of its members and communities. Even though conceptualizing the network strategic assessment approach was challenging, research results were participant engagement, process ownership and strategic dialogues. It is argued that by fostering strategic dialogues network strategic assessment approaches allow networks to synchronize and mainstream their strategic elements in the daily activities of their member organizations. Moreover, it is claimed that such approaches contribute to integrate aspects of capacity development with network planning and decision making, enhancing organizational understanding and performance.

Key words: Non-governmental organizations (NGOs), networks, capacity development, dialogue, strategic environmental assessment.

INTRODUCTION

As part of civil society non-governmental organizations (NGOs) play a multiplicity of roles. They serve as government watch dogs, capacity brokers, private sector partners and government service providers (Mueller-Hirth, 2012). Moreover, NGOs act as fora for dialogue and as capacity building arenas for marginalized and vulnerable communities (Hilderbrand, 2002). A growing number of NGOs also promote development by committing themselves to human rights based approaches (Nelson and Dorsey, 2003), and are networking and internationalizing their operations to allow a variety of actors to access different arenas and influence international debates (Nelson, 2002). Through networks, NGOs encourage a free exchange of ideas, skills and experiences amongst a wide sector of society, and facilitate the inclusion of locally anchored perspectives on development in the planning and decision making processes that shape society (Gardner and Lewis, 1996).

However, the role of NGOs as fora, arenas and networks that enable dialogue, debate and capacity building is widely contested. According to Edwards and Hulme (1996), NGOs are criticized for failing to effectively develop participatory approaches for internal debate and decision making, and for not being able to achieve changes without becoming entangled in politics. Moreover, Jordan and Van Tuijl (2000) state that NGOs find it challenging to generate trust and effectively carry

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out actions in local and international decision making arenas to bridge organizational, cultural, professional and individual borders. In addition, it is claimed that NGOs are often perceived as institutions that consult from a distance, which leads to difficulties in coordination with partners, duplicity of projects and a lack of optimization in the use of resources (Bontenbal, 2009). Most importantly, it is argued that, even though assessing the capacities of NGOs is vital for an effective implementation of their programmes, NGOs give limited formal consideration to organizational capacity assessments (Schuh and Leviton, 2006).

As a way to tackle these challenges and increase the potential of NGOs becoming effective platforms for dialogue and change, Edwards and Hulme (1996) and Bontenbal (2009) suggest that NGOs should identify and develop their key capacities by engaging in a partnership approach where participation, learning, reciprocity and transparency are emphasized. This idea is shared by Banerjee (2006) who stresses that NGOs should develop certain capacities to reach their high-end goals of survival and effectiveness. However, Banerjee (2006) claims that understanding the correlations and causal relationships of complex capacities still remains an outstanding challenge for organizations.

Despite these challenges, a process-based concept that can enable NGOs to assess their organizational capacities and even include capacity development programmes in their organizational planning and decision making is the process of capacity development. Specifically, the United Nations Development Programme (UNDP) encourages the use of a five step capacity development process that focuses on actor engagement and capacity assessment, programme formulation, implementation and monitoring (UNDP, 2009). It is claimed that capacity development processes like the one proposed by the UNDP are processes that enhance the exchange of skills and knowledge at multiple organizational levels and facilitate multi-actor agreements to reach long term organizational transformations (UNDP, 2002; OECD, 2006).

However, it is argued that to effectively develop capacity development processes organizations need to understand and identify complex and key issues that are related to their capacity development processes, as well as they need to enable a large actor participation to reach empowerment and process ownership, all of which is challenging to achieve (OECD, 2006; UNDP, 2009).

Using planning and decision making support processes such as strategic environmental assessment (SEA) can be one way for organizations to overcome the above mentioned challenges and design capacity development processes. SEA is considered to be a tool that takes a strategic approach to improve planning and decision making (Partidário, 2000, 2007). SEA is also viewed as an instrument that has the potential to involve actors in strategic and complex decision making contexts (Sheate and Partidário, 2010), and that enhances collaborative learning (Jha-Thakur et al., 2009). However, as SEA practice has been largely dominated by its application as a technical, impact assessment based tool rather than a strategic planning enhancing tool (Jiliberto, 2007), there is a growing need for examples of SEA application as a strategic focused process that adapts to complex strategic planning and decision making contexts (Vicente and Partidário, 2006).

In light of the above, a research case study was designed and carried out in the context of a network-based NGO that works to develop the capacities of its member organizations and communities. The aim of the research case study was to examine how network-based NGOs can generate strategic dialogues to develop and mobilize their capacities and improve network planning and decision making. Specifically, the research case study explored if it was possible to design a strategic focused SEA approach based on the strategic elements of the network to effectively steer and frame dialogue, idea, skill and experience sharing within the network.

In this particular case study of strategic focused SEA design, the words “strategic” and “assessment” in SEA were highlighted to stress the strategic nature of the approach. Moreover, the word “environment” was left out and the word “network” was added to highlight the flexibility and adaptability of the approach to its context. These SEA lexicon changes resulted in the start of the conceptualization and development of a “network strategic assessment approach” in the context of the studied network-based NGO.

The purpose of this paper is to present the practical experiences that were gained by designing and developing a network strategic assessment approach in the studied network-based NGO. Focus is placed on providing organizations, particularly network based NGOs, with examples on how the strategic elements of networks can be synchronized and used in the daily activities of their members. Moreover, an account is given on how different aspects of capacity development can be integrated with network planning and decision making to develop and mobilize organizational capacities towards the attainment of their goals.

PROCESSES FOR ORGANISATIONAL DEVELOPMENT

Public and private organizations have the common purpose of transforming human, financial and physical resources into polices, regulations, knowledge, products or services to benefit society (UNDP, 2009). A way to reach this common purpose is for organizations to concurrently develop their capacities and focus on their strategic issues, for which capacity development processes and strategic focused SEA processes can be of use (OECD, 2006; Vicente and Partidário, 2006).

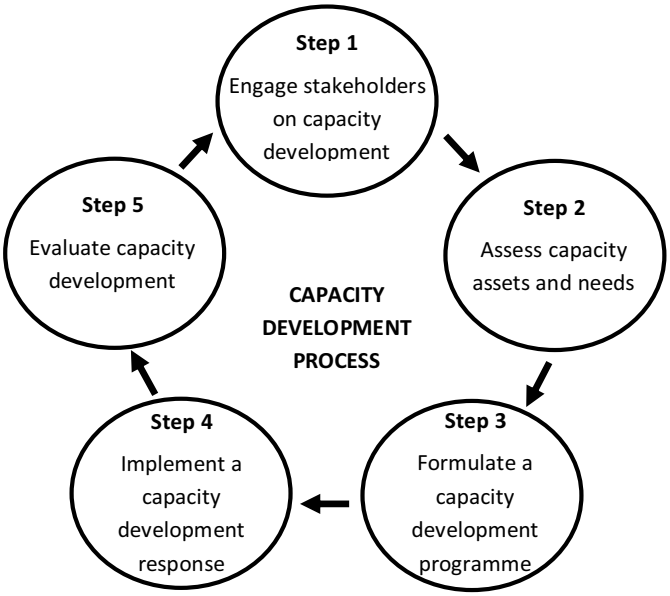

Figure 1. Steps in the UNDP Capacity Development Process (UNDP, 2009).

Capacity development

Capacity development is seen as a process that, based on the expressed needs of involved actors, enables the right conditions to design strategies for development (UNDP, 2006). Capacity development became of interest in the 1990s due to the limited success of technical cooperation in the development sector (Berg, 1993), and has gained increasing recognition among governments, the private sector, civil society and international development organizations (ECDPM, 2008).

For instance, governments consider the concept of capacity development to be fundamental to formulate policies and strategies for long term sustainability (UNDP, 2006). Moreover, in the private sector the concept is viewed as a basic determinant for companies to improve their performance and profit (UNDP, 2002), and in civil society public and private NGOs have linked their success to their readiness to develop their capacities (OECD, 2006). In addition, the United Nations Development Programme (UNDP) and the World Bank have adopted the concept (Bontenbal, 2009), and declared capacity development a critical factor to reach the Millennium Development Goals (OECD, 2006).

Furthermore, UNDP (2009) has designed a capacity development process consisting of five functional capacity steps (Figure 1). In this process, step 1 focuses on facilitating dialogue between actors and encouraging engagement; step 2 on assessing existing, desired and missing capacities to define development visions; step 3 on formulating programmes and strategies; step 4 on managing and implementing activities; and step 5 on evaluating and monitoring identified key issues.

Despite the fact that definitions for capacity development have caused confusion on its scope and meaning (ECDPM, 2008; Bontenbal, 2009; Kühl, 2009), what is important to understand is that capacity refers to the abilities or skills needed to achieve objectives, and capacity development to the means to use and develop these abilities or skills (UNDP, 2002).

In addition, while capacity building can be a one-time action, capacity development is considered to be a continuous and evolving process that focuses on local ownership and long term transformations (UNDP, 2009). The process is also considered to be endogenous, empower and strengthen local capacities, build on available human capital, stimulate self-esteem and respect local values (OECD, 2006; UNDP, 2006).

Another important aspect of capacity development is that it addresses different capacities at the individual, institutional and societal level (ECDPM, 2008). At the individual level personal skills, experiences and

knowledge are addressed, at the organizational level the capacities to connect individual skills to reach common goals are considered, and at the societal level the rules, laws, polices, power relations and societal norms influencing a specific context are analysed (UNDP, 2006; UNDP, 2009).

By using a multi-level approach, capacity development could be a way for organizations to engage with actors in various societal sectors and reach multi-actor agreements (OECD, 2006). Multi-actor agreements could be an opportunity for organizations to reach sustainable results through partnerships in projects that focus on developing existing capacities (Bontenbal, 2009). Moreover, multi-actor agreements could entail that organizations become engaged in networks, which can be a powerful tool providing members with a forum to access and exchange information, skills and methodologies (UNDP, 2002).

However, organizations that adopt a capacity development process can experience difficulties to measure its benefits (UNDP, 2009). This is so because comprehensive analyses are needed to understand complex multilevel relations and the non-linear evolving nature of capacity development processes, and because results with capacity development take time to be delivered (OECD, 2006). Moreover, for capacity development to contribute to measurable long lasting improvements, ownership, a large participation and local knowledge have to be reached, enabled and considered, all of which is challenging for organizations (UNDP, 2009).

To address these challenges and meet the pressing needs of organizations to efficiently use their resources (Degnbol-Martinussen, 2002) and continuously search for effective strategies to improve their learning abilities (Kühl, 2009), it seems essential for organizations to design supporting approaches to mainstream the capacity development concept in their planning and decision making processes.

Strategic focused strategic environmental assessment (SEA)

SEA is a process that promotes sustainable development by improving planning and decision making processes (Therivel and Partidário, 1996). SEA has its origins in the field of environmental impact assessment (EIA) of projects (Partidário, 2000), but focuses on the enhancement of strategic, higher level actions such as policies, plans and programmes (DEAT, 2000; ODPM, 2005; EC DG TREN, 2005).

SEA became well known through the European Union Directive on the Effects of Certain Plans and Programmes and the United Nations Economic Commission for Europe Protocol on SEA (OJEC, 2001; UNECE, 2003). After the enactment of the SEA Directive and Protocol, many developed countries embraced SEA in their legal systems (Fischer, 2007), and with the encouragement of organizations like the World Bank and Regional Development Banks, SEA was introduced in developing countries (Dalal-Clayton and Sadler, 2005).

In recent decades, different types of SEA approaches have been developed that vary in focus, in the level of public participation and in length (Verheem and Tonk, 2000; Therivel, 2004). These different approaches to SEA have caused confusion as to what SEA is to achieve and how it should perform (Verheem and Tonk, 2000; Vicente and Partidário, 2006). Moreover, EIA has limited SEA by perpetuating evaluation patterns that are not appropriate for assessing strategic decisions that usually present undefined, unclear and complicated planning and decision making contexts (Partidário, 2000; Álvarez-Arenas, 2006; Bina, 2007; Jiliberto, 2007). In these situations, involving individuals in SEA has been challenging (Rauschmayer and Risse, 2005; Sinclair et al., 2009), as has been involving the public at an early stage in the formulation of visions and the identification of key issues (Sheate and Partidário, 2010).

Despite this, it is argued that SEA contributes to sustainable development (Eggenberger and Partidário, 2000), as it places strategic issues and decision making in focus (Rossouw et al., 2000, Nilsson and Dalkmann, 2001; Vicente and Partidário, 2006; Jiliberto, 2007), enhances cooperation between institutions, and can potentially improve actor involvement in planning and decision-making, facilitating the inclusion of the perspectives of multiple actors in complex decision making situations (Hedo and Bina, 1999; Sheate et al., 2001; Nilsson et al., 2005; Bina, 2007). In fact, it is claimed that with SEA spaces have been opened for community groups that have normally not been involved in strategic planning issues (Sheate and Partidário, 2010), which improves transparency in decision making (Hedo and Bina, 1999; Xiuzhen et al., 2002; Therivel, 2004) and facilitates collaborative learning within organizations and with the wider society (Jha-Thakur et al., 2009).

Moreover, SEA application can be flexible and differ significantly (Dalal-Clayton and Sadler, 2005). For instance, SEA can exclusively focus on the environment (Fischer, 2003) or include social and economic issues when necessary (Verheem and Tonk, 2000). SEAs can also run in parallel to, be integrated with or replace planning and decision making processes when required (Sheate, 2010; CEA, 2006). Additionally, a variety of assessment techniques and tools, such as scenarios based on geographical information systems (GIS), life cycle assessment and environmental management systems, can be used and linked to SEA processes, adding considerable robustness to its application (Therivel, 2004; Sheate, 2010).

However, there seems to be consensus in that SEA should be even more flexible, adaptable and participative.

Hildén (1999) and Nitz and Brown (2001) argue that the role of SEA in planning needs to be developed so that SEA better adapts to different situations and conditions. Likewise, it is suggested that a new path for SEA would be for it to cross fertilize with other fields (Bina, 2007), to plan for suitable participatory and communicative practices (Doelle and Sinclair, 2006), and apply techniques to exchange and transfer knowledge (Sheate and Partidário, 2010). In addition, it is considered that the role of SEA needs to become more dynamic to better understand decision making processes and to address the strategic dimensions of planning (Partidário, 2000; Nilsson and Dalkmann, 2001; Vicente and Partidário, 2006; Jiliberto, 2007). Partidário (2007), for instance, claims that SEA should aim at becoming a strategic focused instrument that effectively influences planning and decision-making processes. To do so, Partidário (1996) argues that SEA should assess the strategic components, objectives or principles that shape the visions that are put forth in planning and decision making. Furthermore, Partidário (2000, 2007) stresses that for SEA to attain a stronger strategic focus, SEA should assess strategic actions in a sustainability impact assessment context and a lexicon for a "strategic" SEA should be developed. However, according to Vicente and Partidário (2006) in SEA practice there are many examples of technical EIA-based SEAs and a lack of SEAs that take a more strategic approach.

In this particular research of SEA design, the challenge of conceptualizing and developing a strategic focused SEA approach is taken. As a start, and as suggested by Partidário (2000, 2007), the words "strategic" and "assessment" in SEA are highlighted to stress the strategic nature of the approach. As well, to highlight the approach's flexibility and adaptability to the studied context, the word "environment" in SEA is left out and the word "network" is added, resulting in the beginning of the conceptualization and development of a "network strategic assessment approach".

METHODS

To explore how strategic focused SEA processes, in this case a network strategic assessment approach, can be conceptualized and developed to enhance capacity development and planning in network-based NGOs, a qualitative research strategy was undertaken with the use of a case study design and literature reviews and participant observation methodologies for data collection and analysis.

A case study design was chosen to gain an in depth understanding of the studied setting (Yin, 1984; Bryman, 2012), and literature reviews and participant observation methodology were chosen to gain an insider perspective of the studied context, set and reformulate research variables, and collect data to reinforce the scientific value of existing theories (Kurz, 1983; Black, 1983).

The case study design and the chosen methodologies were applied in the context of Samp Intercontinental Museum Network (Samp). In the case study design, four workshops were planned and implemented, allowing to make, analyse and link field observations with data collected from the literature reviews of the material concerning Samp and the concepts of capacity development and SEA.

CASE STUDY OF SAMP INTERCONTINENTAL MUSEUM NETWORK

Samp is a Swedish registered network-based NGO open to all museums from any country, having over 20 years of experience in connecting cultures (Samp, 2009a). The purpose of Samp is to facilitate the development of museums as fora for dialogue to promote human understanding and human rights together with the community, through responsible use of heritage, history and science (Samp, 2009b). To achieve its purpose, Samp connects member museums and their communities through joint projects, courses and meetings (Samp, 2009c), and uses its core values as guiding principles to facilitate and frame the exchange of skills, experiences and ideas within the network.

As the network has been largely financed by Sida (the Swedish International Development Cooperation Agency), a Sida policy (Sida, 2002) requires Samp to use EIA-based assessment approaches to account for the effects of Samp's activities on its member organizations and communities. However, to meet Sida's policy requirement and at the same time improve network planning and gain a better understanding of how Samp is perceived among its members and communities, the network decided to develop a strategic focused SEA approach or its network strategic assessment approach.

Samp's network strategic assessment approach

To provide Samp's network strategic assessment approach with a strategic character, four strategic themes, *Sharing*, *Cross-border*, *Dialogue* and *Respect*, were used in its design. The strategic themes were based on Samp's core values or guiding principles, which were established by the network to provide a value-based framework to link network activities with its vision, mission and overall purpose. For Samp *Sharing* means learning by sharing ideas and experiences; *Cross-border* means a precondition for mutual exchanges of ideas and experiences across different types of borders; *Dialogue* means willingness to create and use new ways of communication; and *Respect* means an equal right to be seen and listened to, and tolerance and openness to change. By using strategic themes to shape Samp's network strategic assessment approach, it was possible to link the approach to Samp's strategic elements.

After framing Samp's network strategic assessment with four strategic themes, a three step approach was designed (Figure 2). The first step was a participative screening step to assess the network's interest in developing such an approach, engage participants early

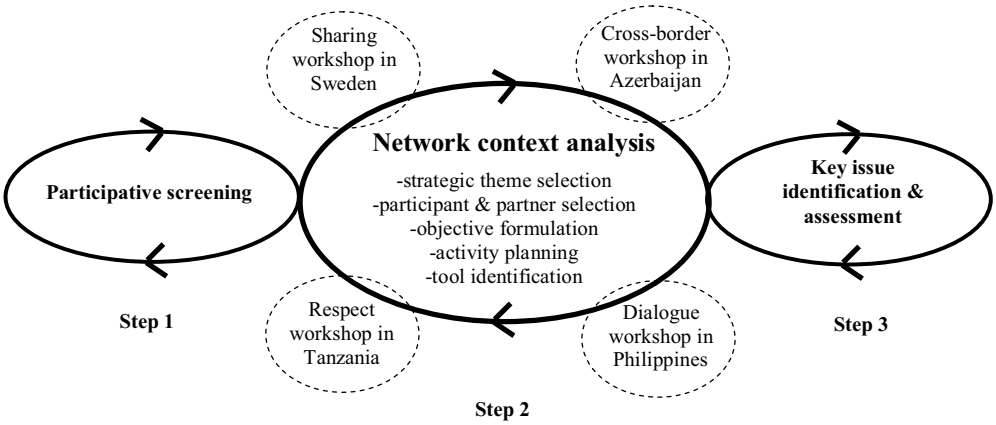

Figure 2. Samp's Network Strategic Assessment Approach.

on in the conceptualization of the approach, and establish a strategic assessment team responsible of driving all approach activities. After consultations, Samp's museum members showed interest in the approach and a decision was taken to go on with its development. The member museums showing interest in the approach were analysed with respect to their organizational diversity, cultural contexts and their abilities to contribute to the selected strategic themes. Based on these criteria, a network strategic assessment team was established. The team was represented by participants from three network member museums: the State Museum of Azerbaijan Musical Culture, Azerbaijan, the Museo Sang Bata sa Negros, Philippines, and the Museum and House of Culture, Tanzania.

The second step in Samp's network strategic assessment approach was a network context analysis where the network strategic assessment team started to develop the approach by designing and executing four workshops.[1] The first workshop took place at KTH Royal Institute of Technology in Sweden, the second workshop at the State Museum of Azerbaijan Musical Culture in Azerbaijan, the third workshop at the Museo Sang Bata sa Negros in the Philippines, and the forth workshop at the Museum and House of Culture in Tanzania. The strategic themes *Sharing*, *Cross-border*, *Dialogue* and *Respect* were used to conceptualize all workshops, and a specific strategic theme was emphasized per workshop. For instance, *Sharing* was specifically addressed in Sweden, *Cross-border* in Azerbaijan, *Dialogue* in the Philippines, and *Respect* in Tanzania.

In the workshops, the strategic themes were used to facilitate the selection of participants from the staff and communities of participating network member museums. Selected individuals from the staff of museums were directors, curators, technicians, receptionists and junior volunteer guides. Chosen individuals from the known communities of member museums were school students and teachers, friends of museums, artists, politicians and a journalist. Gender, age, skills, positions and professions, as well as willingness to share, capabilities to contribute, and potential to engage in dialogue in relation to the strategic themes were considered when selecting the individuals.

The strategic themes were also used to select the community partners with whom the participants of the network strategic assessment team should interact in the workshops. The selected community partners came from urban and rural settings, mainly from marginalized communities. The community partners included vulnerable community groups like fishermen, their wives and families, artists, carvers, and disabled musicians, in addition to the staff of a private firm and an NGO, and students and teachers of a public university. Community partners were chosen to expose the network strategic assessment team to less well known community groups in their societies, and to obtain a high diversity of views to shape Samp's network strategic assessment approach.

Additionally, the strategic themes were used by the network strategic assessment team to formulate workshop objectives, plan activities, and select network communication tools to facilitate interaction and exchanges of information in the workshops. The activities that were carried out by the team during the four workshops in Samp's network strategic assessment were characterized by an iterative exchange of skills, experiences, and ideas. This iterative exchange approach

[1] Reports per workshop and a final synthesis report can be found at www.samp.org/search/documents/reports

Table 1. Key Issues and Strategies for Samp's Strategic Themes.

Strategic themes	Key Issues	Strategies
Sharing	-Research -Communities -Organizations -Individuals -Environment	Multi-level inputs for profound sharing
Cross-border	-Reporting -Network communication -Location -Participant selection -Collaboration partner	Multi-actors and places for cross-border exchanges
Dialogue	-Empowering and engaging -Attentive proactive behaviour -Brewing conceptualization -Vital participation -Diverse methods fostering creativity -Crossing human, organizational, and spatial borders -Mutually benefiting all -Inclusion and encompassing	Empowering, engaging and including for active participation, and brewing a cross-border conceptualization for mutual benefits
Respect	-Process attitudes -Challenge preconceptions -Being marginalized -Increase self-esteem	Challenge preconceptions and process attitudes

became central to the network strategic assessment approach as it allowed for a Samp context analysis to take place.

In the third step of the approach, the key issue identification and assessment step, the data that was collected in the iterative dialogues that took place in the workshops was assessed to derive key issues and network based strategies to facilitate understanding Samp's core values and enhance planning to reach the network's purpose (Table 1). The assessment was carried out with the use of a mapping technique that is facilitated to visualize the links between collected data, key issues, strategies and Samp's core values.

In this step, the collected data was also used to assess how the network strategic assessment approach could be linked to the capacity development process proposed by the UNDP (UNDP, 2009). Focus was placed on studying how Samp's network strategic assessment approach engaged actors on capacity development, and how the approach facilitated the identification of network capacity assets and needs.

The overall result of Samp's network strategic assessment approach was the establishment of a strategic dialogue framework that served to encourage member museums, communities and partners to engage in iterative dialogues on the core values of the network. Based on workshop evaluations, participants mentioned that their perceptions on Samp's core values and in general of the network had been "synchronized". With a synchronized view of the network and its core values it was possible to start work to operationalize Samp's core values and to identify Samp's capacity assets and its capacity needs.

During the development of Samp's network strategic assessment approach the network did however emphasize that the approach and its four workshops were only an initial step towards future work with its strategic elements. In this sense, the design of Samp's network strategic assessment approach was a way for the network to begin consolidating its strategic work and more efficiently direct its actions towards the achievement of its purpose.

DISCUSSION

Participative screening to conceptualize network strategic assessment approaches

The initial consultations that took place with Samp's

member museums revealed that there was enough interest to justify the development of a network strategic assessment approach. These consultations were equivalent to the screening step in a standard SEA process where the relevance of applying SEA is determined (García-Montero et al., 2010). However, in Samp's screening step participating network member museums determined the type, scope and aims that Samp's network strategic assessment approach should have, hence making Samp's screening step participative in nature. In the participative screening step, Samp took the decision to develop a flexible, adaptable and network owned strategic assessment approach rather than importing a standard EIA-based approach to SEA. Moreover, in the participative screening step it was decided that Samp's network strategic assessment approach should measure the network's contributions to society and aim to enhance Samp's performance by improving its planning making processes. Based on this, it can be claimed that screening, which is currently viewed as an SEA orphan by various assessment practitioners and scholars[2], was fundamental to determine the relevance of Samp's network strategic assessment approach, to enhance an early and active involvement of network museum members in designing the approach, and to set the aims and type of approach that should be implemented. Furthermore, it can be argued that networks interested in designing network strategic assessment approaches can benefit from using iterative participative screenings to gain a wide acceptance for their approaches and to adequately conceptualize and tailor these to the particular needs and conditions of their organizations.

Enabling and fostering strategic dialogue in networks

As enabling and fostering dialogues on strategic issues is challenging (Dalkmann et al., 2004), a starting point could be for networks to establish a strategic dialogue framework based on various strategic themes. In Samp's network strategic assessment approach, the network's core values *Sharing, Cross-border, Dialogue* and *Respect* were used as strategic themes to drive an iterative network context analysis and engage participants in strategic focused dialogues. Even though enabling and fostering strategic dialogue in Samp was difficult to achieve, selecting participants and conceptualizing approach activities based on the identified strategic themes was essential.

Selecting network participants and partners using strategic themes

Interest to participate, willingness to share and potential contributions to identified strategic themes should be used as a basis for participant selection in network strategic assessment approaches. Using these criteria can help to establish a diverse group of participants, enable strategic dialogues, and link different points of view to the visions, goals and other strategic elements of networks. In Samp's network strategic assessment approach a diverse team was selected from the staff and communities of three network museum members, and the team was engaged in dialogue with various network partners using the network's strategic themes in four workshops. The selection of individual participants to each workshop, on average seventeen per workshop, was linked to workshop objectives and activity programmes and to Samp's identified strategic themes. These linkages allowed collecting varied understandings and perspectives on Samp's role as a network, and allowed to identify key issues and formulate strategies to start the operationalization of Samp's strategic themes (Table 1). However, it should be noted that using the network's strategic themes as participant selection filters and as a strategic dialogue generation framework was difficult and time consuming, mostly because continuous analyses on the potential contributions that each participant could have to the network's strategic elements were required.

Conceptualizing approach activities using strategic themes

To foster strategic dialogues, the activities and objectives of network strategic assessment approaches should be linked to network strategic themes and to the specific conditions of the network member organizations carrying out the activities. Each activity and objective should also be linked to a set of programmed sub-activities valid for the entire duration of the planned activity. Moreover, the scope of the sub-activity programmes should include the identification of suitable participants, work configurations and tools. For instance, each of the four workshops in Samp's network strategic assessment approach had a maximum of four objectives that were linked to the identified strategic themes and to the specific conditions and skills of the member organizations hosting the workshops. Moreover, sub-activity programmes of maximum three days, with clear starting and finishing times for each sub-activity were conceptualized for each workshop. The sub-activity programmes linked back to workshop objectives and to Samp's strategic themes and included instructions on how selected participants and partners should be grouped and work in each workshop. Additionally, tools with their instructions were identified to motivate workshop participants to engage in dialogue, and instructions were given on how participants should report their results when implementing the programmed activities.

Although workshops were carefully conceptualized to

[2] Jos Arts, Francois Retief, Bill Ross, Johan Nel, and Angus Morrison-Saunders at the session: "A visit to the orphanage of impact assessment" of the IAIA 2011 annual conference (www.iaia.org)

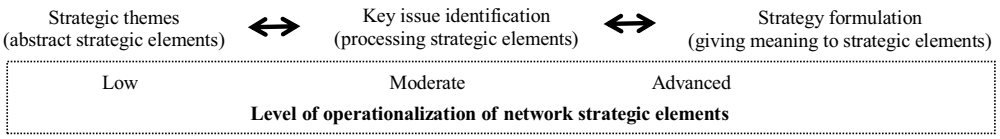

Figure 3. Operationalizing the Strategic Elements of Networks.

drive Samp's network strategic assessment approach, devising and implementing workshop activity programmes was demanding as linking the network's strategic themes with operable actions was complex. Network participants were, for instance, unaware of Samp's core values and had difficulties understanding their meaning, which led to complications when choosing appropriate discussion themes, activities, locations and other workshop participants. Moreover, maintaining participant motivation and engagement in workshops was hard to achieve as there were many programmed activities, participants had to confront many new impressions, and much travelling was required. At occasions, workshop programmes had to be changed on site due to unforeseen practical problems. Some programme changes meant that certain activities had to change completely or even be cancelled, which directly impacted the strategic dialogue generation that was aimed for in Samp's network strategic assessment approach. Nevertheless, it can be stated that having invested time and resources in constantly adapting Samp's network strategic assessment approach to changing conditions, allowed participants to engage in open dialogues on the strategic themes of the network, enabling Samp to gain a deeper understanding of its role as a network.

Operationalizing the strategic elements of networks

Network strategic assessment approaches can provide members in networks with an opportunity to come in direct contact with the strategic elements of their networks and facilitate their operationalization by deriving key issues and formulating strategies. In Samp's network strategic assessment approach twenty two key issues were identified for the network's *Sharing, Cross-border, Dialogue* and *Respect* strategic themes (Table 1). The key issues were linked to Samp's strategic themes and strategies for each strategic theme were formulated after having mapped and analysed the data that was collected from the generated strategic dialogues. This result can be considered a starting point for the operationalization of Samp's strategic elements (Figure 3). However, by further developing the approach, Samp members could gain a deeper understanding of the network's strategic elements, plan their daily activities in accordance to the network's strategic elements, and ultimately work in a synchronized manner to reach the network's overall purpose and vision.

Linking capacity development and network strategic assessment approaches

Samp's network strategic assessment approach facilitated the consideration in network planning of the first two steps proposed in the UNDP process for capacity development (Figure 1). The approach served as a framework to "*engage stakeholders on capacity development*", the first step of the UNDP capacity development process, by actively allowing and encouraging participants to shape Samp's strategic assessment approach. Engaging stakeholders from the beginning in the approach led to approach ownership, participant empowerment and creative dialogue generation, which served as a base to "*assess network capacity assets and needs*", the second step of the UNDP capacity development process. In this step, it was recognized that the network, at its individual, organizational and community levels, had ideas, skills and knowledge that should be mobilized to develop its member museums. It was also recognized that Samp's core values, organizational structures, and working approaches and tools, were network capacity assets that, if appropriately used, could guide its members to design and implement their activities in line with network objectives and strategies. Additionally, the generated strategic dialogues in Samp's network strategic assessment approach allowed identifying several capacity requirements. It was found that the network should become more aware of the contexts of its member organizations, of the network resources that are available at individual, museum and community levels, and of the inputs that its member museums have in their communities. Moreover, it was found that member museums need to improve their understanding and use of network core values to effectively synchronize the design and implementation of network activities in accordance to its vision and objectives. It was also observed that network member museums should develop activities to attract target communities, with special focus on marginalized communities, and that network museums should encourage the participation of their communities in museum activity planning and implementation (Table 2).

Table 2. UNDP Capacity Development Process and Samp's Network Strategic Assessment.

UNDP Capacity Development Process	Samp's Network Strategic Assessment Approach
Step 1: Engage stakeholders on capacity development	**Participative screening (step 1)**
	-Consulting stakeholders on their interest in a Samp network strategic assessment and establishing a strategic assessment team.
	Network context analysis (step 2)
	-Stakeholder involvement in mapping and identifying participants and network partners at individual, organizational and community levels for workshops.
	-Workshop conceptualization: stakeholder participation in objective formulation, activity programme set up and selection of network tools.
	-Strategic dialogues enabled and maintained, endogenous network issues addressed, and consolidation of process ownership by network stakeholders.
Step 2: Capacity assets and needs assessment	**Key issue identification and assessment (step 3)**
	Recognized capacity assets:
	-diversity of views, ideas, skills, knowledge and experiences at individual, organisational, and community network levels.
	-network strategic elements, organizational structures, and working approaches and tools.
	Recognized capacity needs:
	-Improve museum awareness of the contexts, conditions, capacities and needs of their communities.
	-Recognize and enhance museum inputs in communities.
	-Use network core values to guide the work of member museums.
	-Create awareness of network resources at individual, organizational and community levels and improve their use.
	-Reach and attract known target museum communities and identify unknown ones (focus on marginalized communities).
	-Better the involvement of museum communities in museum activity planning and implementation.
Step 3: Formulate a capacity development programme	-The results of Samp's network strategic assessment serve as a base to complete the remaining steps in UNDP's capacity development process. However, an application of a full scaled Samp network strategic assessment will further facilitate their completion.

Even though the initial scope of Samp's network strategic assessment approach focused on addressing steps one and two of the UNDP capacity development process, it can be stated that the data that was collected serves Samp to address the remaining steps (steps three to five) of the UNDP capacity development process. It is moreover argued that enabling participative and legitimate approaches in the initial steps of capacity development processes (steps one and two) is fundamental to continue with a successful formulation, implementation and assessment of capacity development programmes for network organizations. For this reason, it is suggested that Samp and other networks that aim to mainstream capacity development processes in their operations should develop flexible, adaptable and participative network strategic assessment approaches that accompany each of the steps of their capacity development processes.

CONCLUSIONS

It is fundamental for network-based NGOs such as Samp that aim to develop and mobilize their capacities and those of their member organizations to design approaches that enable and foster open, creative, and strategic dialogues. The case study presented in this paper demonstrates that network strategic assessment approaches that focus on the strategic elements of networks can be a way for networks to frame strategic dialogues for capacity development and mobilization.

In Samp's network strategic assessment approach

multilevel and cross border dialogues on the strategic elements of the network were generated. With these dialogues, it was possible to collect data, derive key issues and formulate accepted strategies for the network's core values, marking the start of their operationalization. Operationalizing the strategic elements of networks provides member organizations in networks with a tool to plan, synchronize and implement their activities in line with the visions and objectives of their networks, which can lead to an increased overall understanding of the network and even to improve network efficiency and performance.

In addition, it was learnt from the case study that network strategic assessment approaches can frame and accompany the formulation of organizational capacity development programmes. Samp's network strategic assessment approach showed that it was possible to address the steps of UNDP's proposed capacity development process by engaging network actors in strategic dialogues, identifying network capacity assets and needs, and establishing a base on which Samp can design, implement and evaluate its own comprehensive capacity development programme.

Furthermore, the Samp case study provides networks with valuable experiences on how to shape network strategic assessment approaches. It showed that participative screening is useful to gauge the interest and relevance of developing the approach, to determine the aims and the type of approach that should be developed, and to ensure an early and active participation of different actors in its design. Moreover, the case study showed that network strategic assessments can be designed using the strategic elements of networks. These elements can be used to map and select participants, choose methodologies, define activity programmes and their aims, and select tools and appropriate locations to develop programmed activities.

Finally, coinciding with Vicente and Partidário (2006), it is concluded that research examples on strategic focused SEA approaches like the one that was carried out in Samp are further needed. A relevant context for the study of this type of SEA can be its application in a transboundary context, where there is usually a need to address complex issues and conflicting and competing interests in a multiplicity of scales, and where main purposes could be to reach agreement on and assess different possible pathways to enhance sustainable development.

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