The Role of Indicators in Strategic Environmental Assessment

Experience from Chinese Practice

Gao, Jingjing

Publication date:
2013

Document Version
Early version, also known as pre-print

The Role of Indicators in Strategic Environmental Assessment

Experience from Chinese practice

Jingjing Gao

The Role of Indicators in Strategic Environmental Assessment

Experience from Chinese practice

Jingjing Gao

ISBN 978-87-91404-41-2

THE ROLE OF INDICATORS IN STRATEGIC ENVIRONMENTAL ASSESSMENT

EXPERIENCE FROM CHINESE PRACTICE

Jingjing Gao

AALBORG UNIVERSITY
DENMARK

Doctoral Thesis
January 2013

Jingjing Gao

The Role of Indicators in Strategic Environmental Assessment
Experience from Chinese Practice

The Danish Centre for Environmental Assessment
Department of Development and Planning
Aalborg University
Skibbroggade 5, 1
Aalborg 9000, Denmark

ISBN 978-87-91404-41-2
Cover Painting: Maria Marseen Vejlby
Cover Design: Jingjing Gao
Printed in Denmark by Uniprint, Aalborg University

Preface

Marshall McLuhan's words perfectly describe how this PhD research topic has been initialised. He said "*Begin with theory, you begin with the answer; begin with observation, you begin with questions*". After being involved in numbers of SEA and EIA projects in China, an interesting experience is that those projects really varied a lot in terms of their quality and effectiveness. I felt a need to further explore what makes a difference. Carrying my experiences with me, I started the PhD research in The Danish Centre for Environmental Assessment (DCEA), at the Department of Development and Planning at Aalborg University. This PhD research opened for me a window towards the academic community of environmental assessment. Doing research in DCEA offered me a much broader stage to learn, to experience and to contribute to this field. This research was conducted under the supervision of Professor Lone Kørnøv and Professor Per Christensen, who led me go through all the steps to become a researcher. My sincere gratitude goes to them for all their brilliant guiding, remarkable engagement and valuable discussion. At each crossroad during this research, it was their encouragement and support that have facilitated me to go further with me research.

Besides those in Denmark, this research was also supported by many SEA practitioners and researchers, either in China or internationally, during my interviews and the online survey. I would like to acknowledge those interviewees from the Ministry of Environment Protection (MEP), the Appraisal Center for Environment & Engineering (ACEE) of China and several local environmental research institutes in China for providing this research valuable resources and brilliant inspirations, and also those who have contributed to the survey, most of whom are anonymous, for sharing their ideas, thoughts and opinions with me, which has significantly improved the empirical work of this study.

Coming to Denmark from the Far East, challenges do not only exist in research, but also in the personal life. Many of my colleagues from the Department of Development and Planning, especially those from DCEA have learned me how to enjoy a different life in Denmark. Therefore, I would like to express my gratitude to them for being so supportive with both academic and practical input during these years. I would also like to specially thank all my Chinese friends in Aalborg. Thank you for all your warm support when we are far away from our country. For his kind caring I would like to give my most special thanks to Martin Jensen.

Although it has been years, I still remember how my parents encouraged me to take environmental studies when I started in the university. I have enjoyed being involved in this field. Now when finishing this PhD research, I really want to thank my parents and my sister, who have always encouraged me to be positive, active and having dreams, for their understanding, support and love.

Jingjing Gao
Aalborg, January 2013

CONTENTS

SUMMARY

The application of indicators in Strategic Environmental Assessment (SEA) is assumed to help actors attain the knowledge to support communication and the inclusion of environmental concerns in planning and decision-making. This thesis examines the connection between the Chinese indicator system and the SEA. Although the system is built upon the assumption that the indicators will support SEA effectiveness, this assumption is not always justified. Based on research in China, the project examines the application of indicators in SEA from a science-policy perspective, and from a more practical perspective investigating how indicators in SEA can make a difference to the assessment process.

Indicators have been applied in Environmental Impact Assessment (EIA) and are considered to be a useful tool in providing precise and simpler information in the technical-based EIA. However, whether indicators as a typical quantitative and calculation-based tool should be applied in the same way in SEA as in EIA is one of the concerns that initiated this project. After decades of development, SEA is now taking on a global turning from being a technically-based activity to being a more deliberative and value-included political tool. At this turning point, the project looks into the on-going changes and implementation of the Chinese indicator system.

The changes consisted of the revised national guidelines being more sector specific than they were previously, and operating with a higher aggregation levels of indicators.

Taking the point of departure in these new versions of guidelines, this project aims to investigate the implementation of indicators in the Chinese SEA system, and to explore the indicator's role in SEA. In this research, this aim is divided into four perspectives and raises the questions of:

- How and why did the SEA indicators system change?
- How do the SEA guidelines and the practice address and mediate science-policy interaction in the use of indicators?
- How do indicators influence communication in SEA?
- What is indicators' role in influencing planning/decision-making during SEA?

Two main theories were applied in this research: implementation theory and planning/decision-making theory. Implementation theory is adopted to analyse SEA as an implementation process, in order to investigate how the new indicator system and guidelines for SEA in China are implemented, and to reflect on how this implementation is addressed from the perspective of the scientific-political interface of indicators. Planning/decision making theory is applied to analyse the communication occurring in the interaction in SEA and in the planning/decision making process, as well as to examine how using indicators influence SEA's impact on planning and decision-making.

This research is based on three aspects of empirical work: the documentary study of guidelines, reports and research publications; interviews with administrators, experts, researchers, SEA practitioners and planner; and an online survey with administrators, experts, researchers and SEA practitioners.

The results of the analysis show, firstly, that the implementation of new guidelines and indicators system are a clear top-down process with the strong intention of putting more specific guidelines in place to guide the practice. However, an indirect bottom-up effect of the new guidelines is also identified, reflected by a higher information aggregation and a more complex structure of indicators, which grants and requires more room for the practitioner's discretion. Secondly, it is a strong tradition to use indicators in assessing strategic plans in China. However, the application of indicators is very much scientifically and technically based, and explicit recognition of the political and value-laden elements of using indicators is still generally quite weak in Chinese SEA practice. Thirdly, indicators are used mainly in internal communication within the SEA team rather than externally with stakeholders, and they are used more in one-way communication for providing information than in two-way communication for involvement or participation. Finally, it has been found that using indicators has more influence on the planning and decision making through the structure of SEA in improving the procedure of SEA than through the actors of SEA in engaging publics and politicians.

RESUMÉ

Anvendelsen af indikatorer i strategisk miljøvurdering (SMV) anses som en hjælp til aktører mod at opnå viden til at understøtte kommunikation og inddragelse af miljøperspektiver i planlægning og beslutningstagning. Denne afhandling undersøger sammenhængen mellem det kinesiske indikatorsystem og strategisk miljøvurdering. Selvom systemer bygger på en antagelse om, at indikatorerne øger effektiviteten i strategisk miljøvurdering, kan denne antagelse ikke retfærdiggøres i alle tilfælde. Med udgangspunkt i kinesisk forskning undersøger denne afhandling anvendelsen af indikatorer i strategisk miljøvurdering ud fra et videnskabeligt-politisk perspektiv og fra et mere praktisk perspektiv ved at belyse hvordan indikatorer i strategisk miljøvurdering påvirker vurderingsprocessen.

Indikatorer er anvendt for vurdering af virkninger på miljøet (VVM) og anses som et nyttigt værktøj til at give præcis og simpel information i den teknisk baserede VVM redegørelse. Om indikatorer som et typisk kvantitativt og beregningsbaseret værktøj bør anvendes på samme måde i SMV som i VVM, er et af de spørgsmål, som danner grundlag for dette projekt. Efter årtiers udvikling er strategisk miljøvurdering ved at ændre retning fra at være teknisk baseret til at være et mere bevidst og et værdiinkluderende politisk værktøj. Ved dette retningsskifte belyser dette projekt de igangværende ændringer og implementeringen af det kinesiske indikatorsystem. Ændringerne betyder, at de nationale retningslinjer er blevet mere sektorspecifikke, og at de opererer med højere aggregeringsniveauer i indikatorerne.

Med udgangspunkt i retningslinjernes nye versioner er formålet med dette projekt at undersøge implementeringen af det kinesiske strategisk miljøvurderingssystem og belyse indikatorernes rolle i strategisk miljøvurdering. I projektet er dette formål inddelt i fire perspektiver, hvilket rejser følgende spørgsmål:

1. Hvordan og hvorfor ændredes indikatorsystemet i strategisk miljøvurdering?
2. Hvordan håndterer og formidle retningslinierne for strategisk miljøvurdering og dens anvendelse den videnskabelige-politiske interaktion ved anvendelse af indikatorer?
3. Hvordan påvirker indikatorer kommunikationen i strategisk miljøvurdering?
4. Hvordan påvirker indikatorer planlægning/beslutningstagning i strategisk miljøvurdering?

I dette projekt anvendes de to hovedteorier implementeringsteori og planlægning/beslutningstagningsteori. Implementeringsteorien anvendes for at kunne analysere strategisk miljøvurdering som en implementeringsproces og for at undersøge, hvordan det nye indikatorsystem og de nye retningslinjer for strategisk miljøvurdering i Kina er implementeret. Endvidere anvendes implementeringsteorien for at kunne reflektere over, hvordan implementeringen håndteres af indikatorernes videnskabelige-politiske grænseflade. Planlægnings- og beslutningstagningsteori anvendes for at analysere kommunikationen i interaktionerne i strategisk miljøvurdering og planlægnings- og beslutningstagningsprocessen samt for at vise, hvordan anvendelsen af indikatorer påvirker strategisk miljøvurderings indflydelse på planlægnings- og beslutningstagningen.

Denne forskning er baseret på tre aspekter af empirisk arbejde: Studie af retningslinjerne, rapporter og videnskabelige publikationer; interviews med administratorer, eksperter, forskere, brugere og planlæggere af strategisk miljøvurdering og et online spørgeskema med administratorer, eksperter, forskere og brugere af strategisk miljøvurdering.

For det første viser analysen at implementeringen af de nye retningslinjer og indikatorsystemet er en klar top-down proces med et stærkt ønske om at styre anvendelsen af strategisk miljøvurdering med mere specifikke retningslinjer. Dog ses også en indirekte bottom-up effekt af de nye retningslinjer gennem højere aggregering af information, og kompleksitetsniveauer i indikatorerne giver større rum til brugernes fortolkning af retningslinjerne. For det andet er der en stærk tradition for brug af indikatorer, når strategiske planer skal vurderes i Kina. Dog er anvendelsen af indikatorer meget baseret på videnskab og teknik, mens direkte anderkendelse af de politiske og værdiorienterede elementer ved brugen af indikatorer er svag i kinesisk strategisk miljøvurdering. For det tredje anvendes indikatorer fortrinsvist til intern kommunikation i SMV gruppen og ikke til ekstern kommunikation med interessenter. Desuden anvendes indikatorerne hovedsageligt som envejs kommunikation til at viderebringe information, og ikke som tovejs kommunikation der kan involvere eller inddrage andre. Slutteligt viser forskningen at forbedring af fremgangsmåden i strategisk miljøvurdering gennem anvendelsen af indikatorer er mere påvirket af indikatorernes indflydelse på strukturen i strategisk miljøvurdering end af indikatorernes indflydelse på aktørernes evne til at engagere offentligheden og politikerne.

PART 1

CHAPTER 1

INTRODUCTION

This research project looks into the role of indicators and the opportunities and limitations associated with using indicators in Strategic Environmental Assessment (SEA) in China to support the effectiveness of SEA. Effectiveness is here viewed in relation to:

- How the use of indicators supports communication and participation by stakeholders in SEA
- How the use of indicators in SEA influences planning and decision-making

This chapter provides a brief background and a point of departure for this research (Section 1.1). Further, it presents the state of the art of the research field in Section 1.2, while Section 1.3 describes the research aim and questions. Finally, Section 1.4 provides a reading guide for the whole thesis.

1.1 Point of departure

Conflict between socioeconomic development and environmental protection has been an important barrier to sustainable development, especially in developing regions. As a useful tool and key step towards achieving sustainable development, SEA is a systematic process for evaluating the environmental consequences of a proposed policy, plan or program (PPP) in order to ensure they are fully included and appropriately addressed at the earliest stage of decision-making with economic and social considerations (Lee and Walsh, 1992; Sadler and Verheem, 1996). The primary aim of carrying out SEA is to provide a high level of

environmental protection and to integrate environmental considerations into the planning and decision-making process (Donnelly et al., 2007). However, after decades of development, globally, by moving the focus from "assessment" to "strategies" (Bina, 2007), SEA is taking an understanding turning from being a primarily technical-based activity to being a more political and value-included tool (Diamantini and Geneletti, 2003; Fischer, 2003; Partidário, 2000; Vicente and Partidário, 2006; Wallington et al., 2007). At this turning point, what is information and knowledge's role in environmental assessment? One way of supporting both the technical and the communicational sides of SEA is by adopting indicators.

In order to support the communication and understanding of environmental impacts, traditionally indicators can be useful to measure and present the complex impacts and relationships arising from a given PPP in a simpler way. The term "indicator" in this research encompasses a variable used in environmental assessment to describe the baseline, measure the trend of the proposed impact of PPPs, monitor environmental changes and facilitate the communication among and between practitioners and stakeholders. By being intensively applied in Environmental Impact Assessment (EIA), indicators have proven to be a helpful tool for providing precise information in technical-based assessments. However, at this turning point in SEA's role, developing and designing indicators raises questions about the participation of experts, stakeholders, the public and decision-makers (Donnelly et al., 2007; Cloquell-Ballester et al., 2006; Joumard and Gudmundsson, 2010), how inclusive the indicator system is in relation to environmental, economic and social indicators (Diamantini and Geneletti, 2003; Therivel, 2004; Walz, 2000), which aggregation level is appropriate (Cloquell-Ballester et al., 2006; Ramos, 2009; Walz, 2000), and how to use indicators to present information to decision-making (Geneletti, 2011). Thus, should indicators, as a typical quantitative and calculation-based tool, be applied in the same way in SEA as they are in EIA? Alternatively, as one of the traditional ways of carrying information in environmental assessment, do indicators still provide the desired information in an appropriate manner to practitioners and planners/decision-makers?

Analysing the use of indicators in the Chinese context further develops the above concerns. In the Chinese SEA system and practice, indicators have been widely used as a tool for measuring and quantifying the impact of PPPs in environmental assessment. The Technical Guideline for Planning EIA (PEIA hereafter) (2003) provides a recommended procedure to guide SEA practitioners in identifying indicators. This guide also informs SEA practitioners about the environmental objectives for plans at different levels and in different sectors. Based on these objectives, a list of recommended indicators is presented. After six years, the Technical Guideline for PEIA (2003) called for reflection on and improvement to keep pace with SEA development in China. In 2007, the former State Environmental Protection Administration in China launched a committee board to revise the Technical Guidelines (2003). In 2009, the Ministry of Environmental Protection (MEP) in China issued the draft revised version of the guidelines to call for a hearing, and these are still under construction. Instead of recommending a guideline for SEA in all sectors, the Technical Guidelines for PEIA (revised version, 2009), in addition to providing a general guideline, consist of a series of guidelines focusing on the following five sectoral plans: Coal Industry Mining Area Plan, Urban Master Plan, Forestry

Planning, Land Use Plan, and Onshore Oil and Natural Gas Field General Exploitation and Development Plan. For each of these sectoral plans, the SEA guideline provides 28–50 indicators at different aggregation levels for use in the assessment.

With input from practitioners and scientists, the above-mentioned indicator sets have been developed to assist the undertaking of SEA. The application of indicators is assumed to help actors with knowledge support the communication and inclusion of environmental concern into planning and decision-making. After more than two decades of practice, the application of SEA in China has been facing the challenge of updating and renewing knowledge in the field. Along with this improved understanding, SEA's implementation in China is also reaching a crucial crossroads for its future development. Updated general knowledge on SEA, the changing of assessment scopes and focuses and the replacement of the indicator system for sectoral SEA further lead this research to a central concern: what is the indicators' role in the Chinese SEA system? Further, it raises more concerns, such as does using indicators influence the communication in SEA in a post-modernist communicative SEA process. Moreover, what is the indicators' role in influencing planning or decision-making? How do indicators in SEA make a difference in the assessment process? Against this backdrop, searching for answers to these questions about the indicators' role in SEA becomes even more urgent.

1.2 State of the art

After decades of research and activities in the field of indicators and impact assessment, there is a current knowledge base upon which this thesis builds. In this section, an overview of current research on different perspectives on indicators is presented. Based upon the initial interest of how indicators play a role in Chinese SEA, this review focuses on the following aspects: indicators and communication, implementing indicators in policymaking/decision-making and Chinese experiences of using indicators in SEA.

1.2.1Communication in SEA and planning

As an instrument for integrating environmental considerations into decision-making, SEA has been intensively discussed in the EA community as part of a number of fundamental debates, regarding whether the traditional EIA-based SEA, which is "marked by instrumental rationality" (Fischer, 2003, p.156), can reflect a reality that cannot be pre-defined, and whether this traditional mode remains effective in influencing decision making (Fischer, 2003; Kørnøv and Thissen, 2000; Nilsson and Dalkmann, 2001; Partidário, 2000; Stoeglehner et al., 2009; Vicente and Partidário, 2006). From this perspective, a turning in planning research provides a foundation to understand the emphasis of the communication in SEA. Due to the fact that the traditional representative democracy hardly handles the complicated societal problems alone (Fischer, 2003; Healey, 1992, 1997; Innes, 1995), and the planners are not often able "to deliver unbiased, professional advice and analysis to elected officials and the public" who make

decisions, and instead spend a lot of time communicating with various stakeholders and actors (Innes, 1998), communicative planning was developed as an alternative to rational planning by providing an arena of engagement and participation, by building a consensus in open air (Habermas, 1981) and making power relationships transparent (Flyvbjerg, 1998). In communicative planning, a plan is the result of "various discourses and how different ideas have come together through language to create a particular view or plan" (Allmendinger, 2002, p.198). Also, an agreed "storyline" means more than how the storyline is developed and the scientific knowledge it is based on (Allmendinger, 2002, p.202). Along with the popularity of this alternative, discussions arise regarding the role of knowledge and information, along with participation and deliberation in planning; e.g. how to sort out the jumble of the massive information during the discussion (Healey, 1996), or based on the assumption that judgement relies more on potential than on instrumental calculation, and whether "profession" as expert knowledge still exists in planning besides the different opinions (Allmendinger, 2002, p.206).

The rise of interpreting communicative planning has been observed in environmental assessment processes, with the shift from analysis/evaluation to communication (Janssen, 2001), as well as in PPPs' implementation of multiple stakeholders involvement, and communication (Joumard and Gudmundsson, 2010). Based on but beyond the traditional EIA-based SEA, an argument for a more communicative SEA has been delivered intensively over the last decade (Hilden et al., 2004; Partidário, 2000; Vicente and Partidário, 2006). Differing from the EIA-based SEA, which originates in rational planning, communication-based SEA calls for more participation and communication from stakeholders within a more flexible procedure (Fischer, 2003; Partidário, 2000; Vicente and Partidário, 2006). However, depending on the tiers of decision-making being used, the need for the extent of communication differs (Fischer, 2003). The communication-based SEA model has also been criticised as highlighting too much of the process other than effective outcomes (Fischer, 2003), especially considering whether the free of power could be achieved in reality (Tewdwr-Jones and Allmendinger, 1998), the effectiveness of communication-based SEA in decision making was criticised. Therefore, the question of how to balance the technical foundation and a more communicative process of a SEA deserves further research.

1.2.2 Indicators and communication

In addition to providing technical measurement, the communicational function of indicators has been recognised in the literature (Cloquell-Ballester et al., 2006; Dale and Beyeler, 2001; Joumard and Gudmundsson, 2010). By improving information aggregation (Hammond et al., 1995; Ramos et al., 2007; Ramos, 2009; Walz, 2000), indicators reduce complexity and promote a common understanding in order to improve the efficiency of communication (Morrone and Hawley, 1998). Indicators are applied by providing a general overview rather than detailed information to provide comprehensibility as the communication background (Walz, 2000). They provide the "underlying concept of reality" and "make this world's view explicit to a specific audience, e.g. decision-makers" (Joumard and Gudmundsson, 2010, p.

38). Indicators can also "facilitate communication with [the] general public and promote accountability" by playing a communicational role (Saisana and Tarantola, 2002, p. 72). A survey of indicators' selection and usage (Joumard and Gudmundsson, 2010) showed that one of the reasons for using indicators in environmental and sustainable evaluation is because "it is easy to communicate the indicator to the public and decision-makers" (p. 95). Lyytimäki and Roenström (2008) argued that developing indicators together could facilitate communication with the public and decision-makers.

1.2.3 Indicator implementation

Scholars have analysed the implementation of sustainability indicators and found the factors that influence their effective utilisation in planning and policymaking (Hezri, 2004; Hezri and Dovers, 2006; Krank et al., 2010; McAlpine and Birnie, 2005; Velazquez et al., 2008). The literature shows that governance and leadership is important for the successful implementation of indicators (Krank et al., 2010). Six factors have been identified as influencing their development/implementation, namely hardware (indicator system and technical setting), software (factors concerning users), orgware (institutional setting), finware (financial factors), ecoware (local knowledge) and polware (political support) (Nijkamp and Pepping, 1998).

Krank et al. (2010) studied the implementation of sustainability indicators in five Asian cities and found several constraints to implementation, such as unperceptive, passive and fearful users, focus on short-term projects, corruption, a lack of will and pressure from society and structural issues such as complexity, speed of functioning and budget issues. In another piece of research, Hezri (2004) summarised the four institutional constraints that limit the implementation of sustainability indicators: meta-policy issues, technical capacities, communication concerns and theoretical limitations. For meta-policy issues, factors such as policymaking culture, the rules of the game, economic rationality, inter-agency rivalry and lack of trust were identified. For technical capacities, budgetary and human resource capacity, data-storing and network system, lack of local knowledge and non-continuity of information recording were mentioned. For communication issues, accessible database, consensus building and restriction on data sharing and the vague definition of information users were the main concerns. Finally, as theoretical limitations, the knowledge gap in information's role in policymaking, unbalanced understanding of indicators in the science–policy interface, overemphasis on the rational way of using indicators by decision-makers and independence were discussed.

The literature shows that although community participation in designing sustainability indicators has been emphasised (Krank et al., 2010; McAlpine and Birnie, 2005), it is not always possible to involve them at such an early stage in practice (McAlpine and Birnie, 2005). Theoretically, encouraging more stakeholders to participate in designing sustainability indicators will ensure more views are covered; however, challenges such as time and financial limitations and the ability to generate public interest have been mentioned (McAlpine and

Birnie, 2005). Top-down and bottom-up are two sharply opposite approaches to planning and decision-making in the context of indicator design. These focus on whether they purely rely on "trained experts" or also involve local communities (Fraser et al., 2006; McAlpine and Birnie, 2005). The top-down approach to designing indicators has been criticised as lacking local knowledge (Fraser et al., 2006), while the bottom-up method has been challenged as missing the whole picture of sustainability, overly focusing on local values (Brugman, 1997) and failing to engage the local community prior to designing indicators (McAlpine and Birnie, 2005). Therefore, a synthesis of the top-down and bottom-up approaches combining expert knowledge and local community involvement is thought to be necessary for effectively designing and implementing indicators. In some cases, indicators can be firstly proposed by "experts" in a top-down way and when the preliminary indicators have been initialised, a bottom-up approach can be employed to incrementally generate the local community's interest in order to express, contribute and integrate their concerns.

1.2.4 Indicators in SEA and decision-making

Indicators can aid decision-makers in both direct and indirect ways with information embodied in them in an attractive form. The European Environment Agency (EEA) summarised three major purposes of the indicators used in the decision-making process: 1) to supply information on environmental problems in order to enable policymakers to value their seriousness; 2) to support policy development and priority setting by identifying key factors that cause pressure on the environment; and 3) to monitor the effects of policy responses (EEA, 1999, p. 5). In addition to technical purposes, indicators' ability to aid communication is considered by the EEA to be the most important function (EEA, 2005). Hammond et al. (1995) pointed out that indicators improve information communication about progress towards goals. In the process of communicating information to decision-makers and the public, indicators provide information in a more quantitative form than words or pictures alone. They are also a simpler and more readily understood form than complex statistics or scientific data, making their significance more readily apparent and simplifying information about complex phenomena so that communication can be improved**.**

In environmental fields, sustainability indicators have been thought of as providing support for planning and decision-making (Higgins and Venning, 2001). The need for policymaking to be rational and scientific (Innes, 1998) facilitates indicator development (King et al., 2000). Hezri (2004) analysed the utilisation of indicators and proposed four levels of utilisation in policymaking. The lowest level of using indicators is "onset", which means information reaches policymakers. The next level is "influence" by which information changes policymakers' perceptions of the world. The third level is "acceptance", which means information contributes to decision-making and influences outcomes. The highest level is "impact/institutionalisation", when information positively informs the process and facilitates learning. Further, based on the rationality degree in the policy process, five purposes of using indicators have been classified: instrumental use, conceptual use, tactical use, symbolic use and

political use (Hezri and Dovers 2006). However, the literature also points out that indicators have largely been descriptive and not strongly linked to policy concerns (Atkinson and Hamilton, 1996) as well as only modestly used in policy cycles (Bell and Morse, 2001).

In the environmental field, indicators have become indispensable to policymakers with their wide use in reflecting trends in the state of the environment and society and for monitoring the progress made in implementing new policies, plans or programme targets, especially in spatial plan or land use plan sector (Geneletti, 2012; Geneletti et al., 2007). Kørnøv and Hvidtfeldt (2003, p. 33) pointed out that "indicators are being used in an increasing number of instances as tools to maintain an updated understanding of the condition of the environment and therefore provide the possibility of better political steering". The use of indicators has also been shown to lead to improvements in SEA, such as the smoother implementation and easier creation of an overview of the often-complex impacts of PPPs (Kørnøv and Hvidtfeldt, 2003; Thérivel, 2004). Guidance on incorporating indicators effectively into the assessment process has been argued to have improved SEA in contributing to sustainability (Noble, 2002).

The relevance of Braat's (1991) classification of explicit target groups for indicators has also been recognised within the SEA community (Thérivel, 1996). The communicative function of indicators is essential in the interaction between both decision-makers and the public due to the quantitative and aggregated nature of the presented information. Therefore, when determining the level of aggregation appropriate for an indicator and the communication involved, decision-makers and stakeholders should be taken into account. Donnelly et al. (2006) argued that SEA practitioners should be encouraged to develop or compose their own indicator sets that are specific to the proposed PPPs by concentrating on relevant and significant issues targeted in the scoping phase of SEA. Selecting indicators at an aggregation level appropriately for SEA can be a step forward in ensuring the effective application of SEA and integrating its results into decision-making. Geneletti (2011) pointed out that indicators using is one of the main challenges for integrating SEA and spatial planning. Developing and designing an indicator system is thought to be only one step in the process of qualifying SEA through simplification. The next step is the communication and use of indicators in SEA and in planning and decision-making; these steps also point to the implementation process. Providing an appropriate basis for practitioners, stakeholders, the public and decision makers to use indicators in the SEA process can be crucial for ensuring its effectiveness and objectivity. However, studies of the implementation and effectiveness of SEA in general provide little understanding of how indicators influence the output of SEA as well as planning and decision-making.

1.2.5 Indicator application in Chinese SEA

Most research on SEA in China has focused on the concepts and theory (Che et al., 2002), legal requirements and key elements and procedures (Zhu et al., 2005). After reviewing recent research in Chinese SEA, Lam et al. (2009) summarised the different emphases of Chinese SEA research by academics. One main research focus is the Chinese SEA system as a process,

from the perspective of political theory and policymaking experiences, which focuses on SEA's influence on planning, while the other main study regards SEA as an end, based on the application of SEA to policies, major legislation and macroeconomic and government decisions. Looking closer at Chinese SEA issues, Bina (2008) also called for broader thinking about SEA in terms of deliberate changes in context, the wider society and the way we act and think in order that societal experiments can be made, experiences gained and lessons learnt.

No specific study of the use of indicators in Chinese SEA has so far been published in English; however, studies of indicator's use exist in Chinese and as part of comprehensive research. Zhao et al. (2003) pointed out that current research on SEA focuses on "how to assess", while indicators are related to the question of "what should be assessed". The Centre of SEA for China at the Chinese University of Hong Kong surveyed the "Effectiveness criteria for PEIA in China" in 2009–2010 (CSEAC, 2010). According to its findings published in 2010, one of the best practice criteria for improving the effectiveness of SEA in China is selecting assessment indicators for the key issues or objectives identified during scoping when setting up the SEA framework. Similarly, Wang et al. (2009) reviewed five SEA cases carried out by the provincial environmental protection administration and identified one of five main issues existing in local level SEA to be with indicators: "The established indicator systems for various PPPs should be much different owing that each industry or PPP has its specific characteristics with socioeconomic development and environmental impacts. Thus, this renders it highly challenging to develop a indicator system congruent with different PPPs or industries" (p. 418). In a review of the integration of land use planning and SEA in China, Tang et al. (2007) concluded that a SEA report must include "an illustration of the selected assessment indicators of SEA" (p. 256). In the same study, a critical perspective of the Technical Guidelines (2003) was also provided: "The TG [Technical Guidelines] are actually an extremely general process and lack a detailed procedure to instruct the PEIA … of certain planning. This is necessary to complement the initial TG by sectoral guidelines that have been partly compiled by planning authorities" (p. 255). Guo et al. (2003) also pointed out that most indicator studies in SEA have been limited by using a general framework without much guidance for practices in China.

Methodologically, Bao and Lu (2001) discussed the principles for classifying and selecting indicators for SEA. With a case study on an energy plan SEA, the authors proposed a method for selecting and weighting indicators and recommended an indicator list for Chinese energy strategies. Xu (2009) discussed how to establish and use the comprehensive index system in China's SEA by proposing a model with an integrated index that consists of several lower aggregation indicators. Guo et al. (2003) in their case study of a regional plan suggested the DPSIR (Drivers–Pressures–State–Impacts–Responses) model as a useful tool for simplifying the complex relationship between human society and the environment and thus provided a basic framework for indicator use. By contrast, Fan and Zhou (2008) claimed that the DPSIR framework is imperfect because it oversimplifies cause and effect chains. Instead, they suggested that indicators based on the DPSIR model should be adjusted according to the context of SEA in order to better reflect the complex reality of the situation and to improve the effectiveness of the indicators. All the above reviews of the indicators used in Chinese SEA

imply a strong technical/scientific focus in either research by scholars or practice by practitioners.

1.2.6 Summary and contributions of this research

The present study suggests that the scientific/technical functions and applications of indicators have been studied and practiced, either in general or in the environmental assessment field. In Chinese environmental assessment experiences, the scientific/technical use of indicators is even stronger. On the other side, the political/communicational role of indicators in general has also been more and more recognised. However, although few works touch upon the science–policy interface of indicator use, the topic has been rarely discussed or analysed in the SEA field, especially based on Chinese SEA practice. However, along with the turning point of SEA from being primarily a technical process to being a more political and value-included process, indicator use at the interface of science–politics is a very interesting and necessary topic that deserves careful research.

Further, current SEA practice in China implies that the application of indicators is assumed to help actors with knowledge that supports the inclusion of environmental concerns in planning and decision-making, although this assumption that indicators when used will support SEA effectiveness is not always justified. Based on the previous study of implementing indicators in policymaking, planning and decision-making, another concern is also sketched as how indicators should/could be used in SEA under this communicative turning point of SEA at the moment.

Of these two concerns, by looking into the latest revision of Chinese SEA technical guidelines, this research aims to contribute to the following perspectives. Firstly, departing from the latest Chinese SEA guideline development, it looks into how the implementation of indicator use has been addressed; secondly, it examines the application of indicators in SEA from a science–policy interface perspective; and finally from a more practical perspective, it investigates how SEA makes a difference, by using indicators, in the assessment process and in planning/decision-making later. To explore these concerns, the relevant theories, frameworks, methodological designs and empirical resources are explained in Chapter 4 and Chapter 5.

1.3 Research aim and questions

Based on the initial concern of this research and the state of the art summarised above, this project focuses on the opportunities and limitations of indicators being applied in SEA processes and this leads to the overall research aim as:

Investigating the role of indicators in SEA in Chinese practice

By setting the above research aim, this research explores the use of indicators as a means to influencing the SEA and planning and decision-making from the following perspectives, which themselves serve as sub-research questions:

1. How and why did the SEA indicator system change?
2. How do the SEA guidelines and the practice address and mediate the science–policy interaction in the use of indicators?
3. How do indicators influence communication in SEA?
4. What is indicators' role in influencing planning/decision-making during SEA?

1.4 Reading guide

This thesis consists of three parts. Part 1 is the introduction part, which consists of five chapters. Chapter 1 provides a brief background as the point of departure for this research, presents the state of the art of the research field, and the research aim and questions. Chapter 2 provides a background and context of how Chinese SEA has developed over the past decade. This chapter consists of three sections. Firstly, it describes the overall context that frames the Chinese SEA system in terms of society development and institutional setup. It also reviews SEA practical experience in the past 20 years in China and summarises some of the challenges Chinese SEA faces now. Finally, it presents the latest developments in Chinese SEA, based on which this research is mainly initialised and built. Chapter 3 reviews the existing knowledge of indicators. Firstly, it defines the concept of indicators and summarises the characterisation of indicator. Then, it looks into how indicators interact with SEA at different stages of the implementation process. Chapter 4 provides the theoretical bases for this study. It presents the use of the relevant parts of implementation theory, which inspires the overall approach for this project. It also summarises those parts of planning/decision-making theory that inspire designing detailed methodologies for the specific sub-research questions. At the end of Part 1, Chapter 5 explains how the research in this study is designed and structured and how the theories are applied and connected to each sub-research question. Firstly, it demonstrates the overall approach of the present work and the conceptual models designed for dealing with each sub-research question. Section 5.2 describes the methods adopted in this study and the materials and resources for collecting empirical data.

Thereafter, based on the collection of four articles, Part 2 summarises the analysis based on the empirical and conceptual input, which forms the basis of the research. This consists of two chapters. Chapter 6 firstly presents the results of the four articles to respond to each sub-research question, and then based on those results, as well as the material presented in the remaining part of this thesis, a summary of the overall finding is provided and discussed. Chapter 7 concludes the main finding and the contribution of the research then and finally some ideas on how future research could be addressed. Part 3 lists the four articles based on which this thesis is constructed.

Tables and figures are numbered according to the chapter and a consecutive numbering style.

CHAPTER 2

A DECADE OF DEVELOPING: SEA IN CHINA

This chapter provides an overview of Chinese SEA development in the past decade from three perspectives. First, it provides the context of the Chinese SEA system relating to the development of society in general and the institutional setup of SEA especially. Then, a review is provided of SEA practice as its experience has developed in the past 20 years in China. Taking this as a point of departure, the challenges that Chinese SEA faces now are presented as specific developments in SEA to highlight specific problems that relate to the use and character of indicators in Chinese SEA legislation. Finally, it presents the latest developments in Chinese SEA, which mainly initiated this research.

2.1 SEA in the Chinese context

2.1.1 The economic context

China has until recently been seen as a developing country with only limited funds. Mao and Hills (2002) studied the Chinese economic contextual influence on SEA and pointed out although China is in a transitional phase with economic, political and institutional reforms that emphasise power decentralisation, economic growth still has a higher priority than environmental quality. However, the increased acceptance of China as a stronger economy is pushing environmental protection slowly from the dilution of waste streams to precaution and proactiveness (Bina, 2008). Moreover, environmental considerations are also included in China's five-year plan in terms of limiting coal consumption, air pollution and so on. The 10th Five-Year National Development Plan (2001–2005) (National Development and Reform

Commission (NDRC), China, 2001) have opened up for strategic changes toward incorporating environmental considerations in policies, while the 11th Five-Year National Development Plan (2006–2010) (NDRC, China, 2006) aimed at the reduction of major pollutant emissions, energy savings and improvement in the efficiency of major resources. The latest Five-Year National Development Plan (2011–2015) (NDRC, China, 2011) also includes resource efficiency and circular economy. Low carbon economy, climate change adaption and sustainable development have been adopted as fundamental goals of environmental policy in China. However, as a developing country it is understandable that a lack of resources leads to weak enforcement (Mao and Hills, 2002).

Still today, the "putting economic development first" ethos is prevalent in many local administrations in China (Lam et al. 2009). But China is in a transitional that emphasise power decentralisation, ownership diversification and market mechanisms (Mao and Hills, 2002). As Lam et al. (2009) pointed out, "If the fundamental goal of SEA is to assure sustainable development, there is probably no other country in the world which is in greater need for SEA than China" (p. 370).

2.1.2 Institutional setting

Owing to the overwhelming size of the country, the administrative structure in China is rather convoluted with several layers of jurisdiction: central government, provinces and municipalities, autonomous regions and cities and sometimes their geographically administrative bodies. The institutional structure for environmental protection is under heavy pressure from diverging interests in Chinese society (Gu and Sheate, 2005). The institutional setup of environmental protection in China has a dual structure consisting of a vertical environmental authority competing with the horizontal structures of local governments. The central government, especially the ministries such as the MEP is weak (Gu and Sheate, 2005) and "lacks the authority to impose its policies and opinions on the Ministries and bureaucracies defining development" (Bina, 2008, p. 725). Other sectors with more power might even be a luxury for local environmental authorities that take the implementation of EIA seriously (Gu and Sheate, 2005). Environmental policy is seen as a sector in its own right and that unavoidably creates a barrier to weak environmental policy and weak instruments (be it administrative, economic or ideational) that cannot put sufficient pressure on decision-makers. Environmental authorities are thus in a weak position in the political hierarchy, having only doubtful commitment to the strict implementation of EIA (Mao and Hills, 2002). This makes the environmental assessment system ineffective, as many authorities can directly influence SEA implementation (Bina, 2008).

In China, on September 1st 2003, the EIA Law (The standing committee of the national people's congress, China, 2003) came into force. It is stated in Chapter 2 of the EIA Law that master plans on land use and regional/catchment/coastal zone development should take account of SEA and that a special chapter describing SEA results should be included in the draft plan submitted for approval (The standing committee of the national people's congress, China, 2003). No

specific SEA legislation had been established in China, instead, EIA Law is employed to explain the national requirements on SEA until the PEIA Regulation (The State Council of the People's Republic of China, 2009) came into force on October 1st 2009, and PEIA became a legally required process in China. Since then, PEIA has been the Chinese name for SEA in the starting phase. Together with the implementation of the EIA Law, the Technical Guidelines for PEIA (2003) was also issued (The State Environmental Protection Administration of China, 2003). The guideline was administered by the State Environment Protection Administration, now the MEP. After years of practice, based upon the practical experience gained, a revision of the Technical Guidelines for PEIA (2003) was initiated by the authorities in 2009. In addition to providing a general guideline, the proposed updated guidelines consist of a series of guidelines for plans within different sectors (MEP, 2009). The revision of the guidelines was still being undertaken when we visited China to collect data and interview participants in 2011. However, experiences point to the fact that the purpose of SEA legislation is vague and that focus on the process and dynamics of SEA is rather weak (Bina, 2008). Likewise, Zhu and Ru (2008) also identified the limited scope of the legislation for SEA in China as well as the ambiguous role of the environmental authorities as important weaknesses.

In the working procedure, SEA in China applies the same procedures of EIA at a strategic level (Wu et al., 2011). Bao et al. (2004) illustrated the working procedure of SEA in China as Figure 2.1 shows. According to them, after a plan or program has been drafted, a SEA report is normally initialled by the planning department who proposes new plans or programs and is responsible for organising and preparing the report as well as being obliged to submit it to the environmental authorities. After a SEA report has been initialled, SEA practitioners, either researchers or consultants, carry out the assessment, which is normally based on rational prediction. When the assessment has been finished and the report or statement submitted to the environmental authorities at the national, provincial or local level, the latter needs to hold an appraisal seminar to decide whether to approve the SEA report/statement. The appraisal seminar is chaired by the environmental authorities and an appraisal committee is set up to review and comment on the SEA report or statement. To avoid any conflicts of interest, an appraisal committee should be established as a third party. The final decision of the appraisal is seen as the legal document in deciding how to integrate the SEA results into planning or decision-making.

Figure 2.1 implies some interesting points. Firstly, SEA begins after the proposed plan has been drafted, which suggests that the opportunity of integrating environmental considerations into the plan making is limited. Secondly, planners' contributions stop when SEA begins so they are not engaged in the SEA process. Thirdly, the role of stakeholders from other relevant departments and politicians/decision-makers is rather vague, although in reality they can significantly influence the SEA outputs and planning or decision-making. Further, although NGOs and the public do appear in this procedure, their engagement is both too late and too limited by only participating in the so-called "check-up" stage. Therefore, as a rather common procedure of Chinese SEA, the above figure implies some negative experience in practice in China.

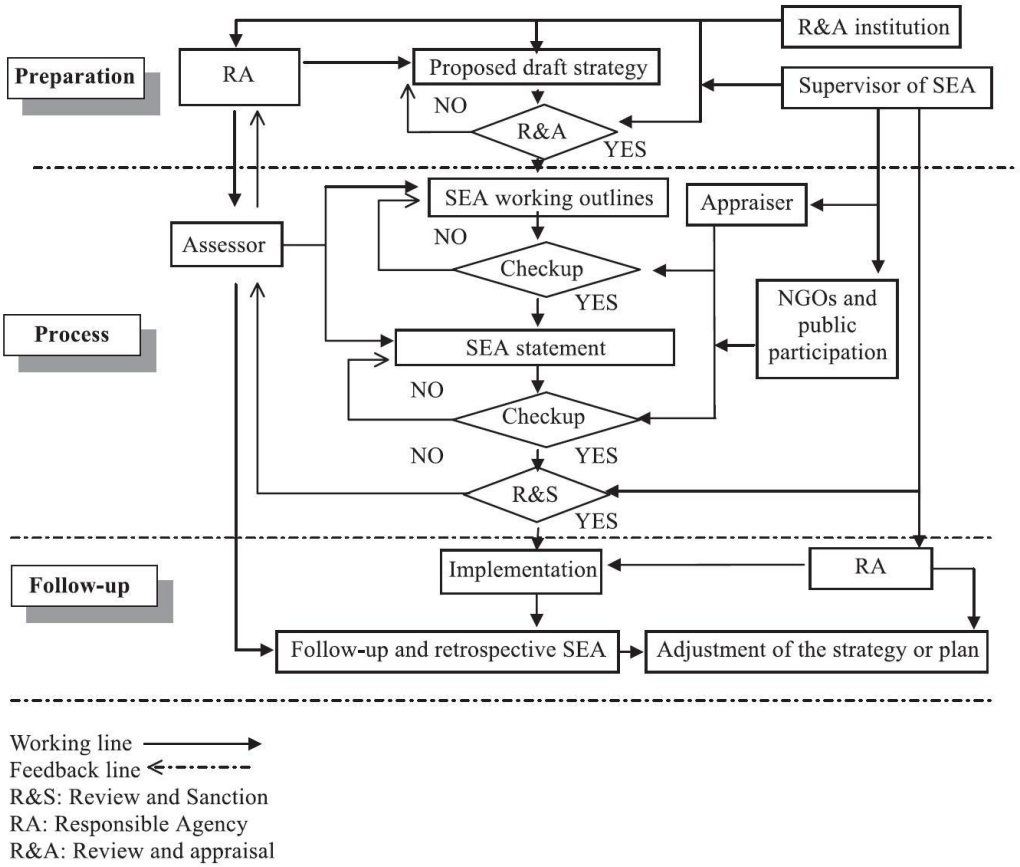

Fig. 2.1 The working procedure for SEA in China (Source: Bao et al., 2004, p. 34)

2.2 Practice after 20+ years

SEA was introduced in China in the early 1990s (Wu et al., 2011). In the past two decades, China has gained abundant practical experience in SEA, and although statistical data on total SEA cases is lacking (Wu et al., 2011), a rough number of 500 has been mentioned (Lam et al., 2009). According to Wu et al. (2011), SEA is mainly applied in the areas of regional development, urban construction, industries and transportation under fast economic growth and urbanisation.

Bina (2008) pointed out that the start of Chinese SEA experiences was less than positive. Procedurally, Chinese SEA has been criticised for adopting the procedures and methods for PEIA that more or less resembled project EIA (Bina, 2008; Ahmed and Sanchez-Triana, 2008)

and for occurring late in the planning process (Lam et al., 2009; Wu et al., 2011). Earlier, a "pre-study" focusing on the investigation and analysis of baseline data was suggested by planning sectors, which could have been a great leap forward. However, neither the planning nor the environmental sector has seriously taken it as a part of SEA and consequently it could be squeezed out if there were conflicts with economic objectives (Bina et al., 2009). In addition to cultural issues (Tang et al., 2007), systematic infrastructure such as legislation, administration and management (Wu et al., 2011) and the ambiguous definition of the role and responsibilities of involved stakeholders (Bina, 2008; Lam et al., 2009; Zhu and Ru, 2008) are identified as factors limiting SEA's influence in being integrated with planning. Different values and priorities between practitioners and administrators towards sustainability and economic development (Lam et al., 2009) can also make SEA a bureaucratic hurdle (Zhu and Ru, 2008).

Methodologically, as mentioned by many scholars, a dominant stream of technical-led SEA, both in procedural and in institutional aspects, has been identified as the main face of the Chinese experience in SEA practice (Bao et al., 2004; Bina, 2008; Che et al., 2002; Wu et al., 2011; Zhu and Ru, 2008). Techniques are considered to be the most important issue affecting SEA's effectiveness in China (Bina, 2008; Zhu and Ru, 2008). A typical technical understanding of SEA is also shown in terms of the legislative context in China. On one hand, SEA is criticised for relying on technocratic and rational methods and having too narrow assessment scopes that focus mainly on the biophysical environment, but ignore social and economic issues (Lam et al., 2009). According to Ahmed and Sanchez-Triana (2008), Chinese SEA could be defined as "impact-based SEA" by adopting the EIA's procedures and methodologies (Wu et al., 2011). Chinese SEA implementation is regarded as technical and inferential (Bina, 2008; Wu et al., 2011). Quantitative methods are used widely in Chinese SEA, especially for forecasting and assessing potential impacts (Bina, 2008). On the other hand, despite being adopted in Chinese SEA practice, alternative research in SEA is understood and applied in practice by comparing "no action plans" with "recommended changes and mitigation measures from the environmental perspective" (Wu et al., 2011). Owing to the top-down decision-making and policymaking system, there are very limited opportunities for alternative study for SEA practitioners (Bina et al., 2009), and thus alternative research is frequently missing in SEA in comprehensive or strategic-level plans (Wu et al., 2011). This technocratic-rational approach also resists maximising the effectiveness of SEA in integrating environmental and social capability (Bina, 2008; Zhu and Ru, 2008), and the impacts considered in PEIA are often restricted to environmental impacts, whereas social impacts are downplayed. To this picture should be added that most SEA practitioners have engineering and science backgrounds (Gao, 2004). There are thus limited information and a lack of effective public participation (Zhu and Ru, 2008), which results in that the most effective way of public involvement is through expert consultation with sectoral stakeholders instead of public participation. Owing to insufficient information disclosure and sharing (Lam et al., 2009; Wu et al., 2011), public participation, for example in terms of questionnaire surveys, is also carried out only to fulfil the minimum legal requirements.

For SEA's future development, broader scopes, better information sharing, greater capacity building and fundamental and theoretical research are necessary (Wu et al., 2011). Other improvements include enhancing public participation and promoting transparency (Lam et al., 2009; Wu et al., 2011), improving regulations and guidance, promoting SEA application upstream to the policy and strategies levels, overcoming political resistance and changing the MEP's role from being a regulator to a facilitator (Lam et al., 2009). Based on those potential improvements, SEA is believed to be beneficial for attaining sustainability in many sectors at different levels in China (Lam et al., 2009).

2.3 Latest developments

After several years of practical experience, the Technical Guidelines (2003) called for reflection on and improvements in order to keep pace with SEA development in China. This theme often surfaces in the debate in China today, not only advocating SEA as low-hanging fruits to pick but also that a genuine integration into Chinese policies demands a more specific Chinese way of doing this, i.e. which reflects the complexity of Chinese administrative and political conditions. In 2007, the former State Environmental Protection Administration in China launched a committee board to revise the Technical Guidelines (2003). In 2009, the MEP of China issued a revised version of the guidelines and these are still under construction. In addition to providing a guideline at a general level, the Technical Guidelines (revised version, 2009) consist of a series of guidelines focusing on the following sectoral plans (MEP, 2009):

- Technical Guidelines for PEIA (Coal Industry Mining Area Plan) (2009–07, published)
- Technical Guidelines for PEIA (General principles) (2009–10, under revision)
- Technical Guidelines for PEIA (Urban Master Plan) (2009–10, under revision)
- Technical Guidelines for PEIA (Forestry Planning) (2009–10, under revision)
- Technical Guidelines for PEIA (Onshore Oil and Natural Gas Field General Exploitation and Development Plan) (2008–9, under revision)
- Technical Guidelines for PEIA (Land Use Plan) (2009–10, under revision)

The new guidance is expected to be implemented after addressing some of the problems experienced with the previous version. The revision of the guidance is related to the fact that the old version did not live up to the expectations and in a new version it is hoped for improving the incorporation of environmental concerns into planning and decision-making. The increased focus on the procedure goes hand in hand with a clearer understanding of the role to play for different parts of the process – and in light of the theme of this study – its connection to indicators and environmental objectives. In terms of the use of indicators, the Technical Guidelines (revised version, 2009) do not provide an indicator list at a general level, but instead provide six specific sectoral lists based on different sectors. The total number of indicators varies compared with the Technical Guidelines (2003). The Technical Guidelines (revised version, 2009) have mainly been developed from the following aspects:

- The general guidelines pay more attention to the principles and process of how to choose indicators rather than providing a list of indicators directly.
- They emphasise the core role of environmental objectives and indicators in SEA, which will influence the SEA's output significantly.
- They identify SEA as an assessment based on environmental objectives, while EIA is an assessment based on environmental quality standards.
- They delete the old recommended indicator lists, but provide more guidance on how to choose indicators in the "general principles" part and more detailed indicator lists are provided in each individual guideline for the different sectors (Urban Master, Forestry, Onshore Oil and Natural Gas, Land Use and Coal Industry).

Summary

This chapter provided an overall picture of the Chinese SEA system and practice experience, which sets a context for understanding and analysing the role of indicators in SEA. However, to explore answers to the proposed research questions, some basic knowledge on indicators is necessary before further studying using them in SEA. To gain a general understanding and systemic perspective of how to analyse an indicator, questions such as what is an indicator, how does one function, who uses indicators and experiences of using it in SEA are explored in the next chapter.

CHAPTER 3

KNOWLEDGE ON INDICATORS

This chapter explores knowledge on indicators. It aims at providing grounds for understanding indicators, both fundamentally and contextually. Section 3.1 presents definitions and some general functions and characteristics of indicators. Sections 3.2 looks into how indicators interact with SEA in an implementation process in Chinese practice.

3.1 Characterisation of indicators

By identifying phenomena that are typical or critical, indicators provide the simplicity necessary to communicate the complex reality of a situation. The EEA (2005) defined indicators as "a measure, generally quantitative, that can be used to illustrate and communicate complex phenomena simply, including trends and progress over time" (p. 7), which are often constructed from economic, social and environmental statistics. According to IETF (Indicators for Evaluation Task Force), an indicator is "a sign or symptom that makes something known with a reasonable degree of certainty" and which reveals and provides evidence. It also states that an indicator's significance "extend[s] beyond what is actually measured to a larger phenomenon of interest" (IETF, 1996, Chapter 2). Later, IETF (1996) defined an environmental indicator as "a measurable feature that provides managerial and scientifically useful evidence of environmental and ecosystem quality or reliable evidence of trends in quality" (Chapter 2). In the context of sustainability, indicators "represent an empirical model of reality, not reality itself, but are analytically sound and have a fixed methodology of measurement" (Hammond et al., 1995, p. 1). More recently, they have been defined thus: "An indicator is a variable, based on measurements, representing as accurately as possible and necessary a phenomenon of interest" (Joumard and Gudmundsson, 2010, p. 285).

3.1.1 Functions and quality

The main function of an indicator is to be an instrument that measures a phenomenon (IETF, 1996; Joumard and Gudmundsson, 2010). Measurement can be an element in subsequent assessment, decision-making or communication (Joumard and Gudmundsson, 2010). According to the literature, indicators' functions can be sorted into different levels (Cloquell-Ballester et al., 2006; Dale and Beyeler, 2001; Joumard and Gudmundsson, 2010). As for the scientific function, indicators represent the components of a system and the complex relationships among it (Walz, 2000). As a monitoring tool, indicators are used for monitoring programs (Strobel, 2000). As for the political function, indicators are used as a tool for decision-making units in policy or management strategies (Van der Loop, 2006). Here, those functions can be sorted into two aspects, scientific function and communicational function. Although the scientific function is considered to be central, "management and monitoring programs often lack scientific rigor because of their failure to use a defined protocol for identifying ecological indicators" (Dale and Beyeler, 2001, p. 3). Moreover, the communicational function of indicators as a monitoring tool and a management/political tool has also been discussed intensively (Hammond et al., 1995; Morrone and Hawley, 1998; Schiller et al., 2001; Walz, 2000).

To use indicators that have better functions, scholars have discussed criteria or the consideration to be taken into account when deciding on indicators (Geneletti, 2006; Donnelly et al., 2007; Kørnøv and Hvidtfeldt, 2003; Orsi et al., 2011). These criteria include practical considerations such as the number of indicators, data collection frequency, understandability and measurability obtainable, adaptable, non-biased choosing, as well as professional considerations such as scientific validity, policy relevance, coverage, aggregation, significance, trends and warning and conflict identifying.

3.1.2 Aggregation

The aggregation of information and indicators was studied by Hammond et al. (1995), who developed an information pyramid to demonstrate which users of indicators are taken into account and the appropriate level of aggregation for an indicator. Indicators and indices (aggregated indicators) are at the top of the pyramid and at the base are primary or raw data and analysed data. The higher the aggregation of information the more the construction of a system takes place. The complexity and aggregation of information go in opposite directions.

Aggregated indicators are also known as composite indicators, and no fundamental difference has been mentioned between aggregated and composite indicators, except the latter are considered to be mainly applied at a national level (Joumard and Gudmundsson, 2010). Composite indicators were defined as "based on sub-indicators that have no common

meaningful unit of measurement and there is no obvious way of weighting these sub-indicators" by Saisana and Tarantola (2002, p. 5). Another definition of composite indicators from Nardo et al. (2005) is a mathematical combination of individual indicators, which represents "multi-dimensional concepts which cannot be captured by a single indicator alone (p. 8). Hammond et al. (1995) argued that the challenge is to design indicators that both reflect the goals of the policy and – in their highly aggregated form – provide all the necessary technical information in a message that can be understood and accepted by politicians and the public.

3.1.3 Users, participation and dissemination

Many international sets of indicators used in the sustainability and environmental field have been developed. The OECD has been one of the main actors in relation to the development of indicators over the past 15 years. It has developed a core set of environmental indicators covering issues that reflect the main environmental concerns in OECD countries and the key environmental indicators, which are a reduced set of core indicators that serve communication purposes to inform the general public and provide key signals to policymakers (OECD, 2004). EU activities in relation to indicators started in the mid-1990s with a Eurostat project on pressure indices. The development and application of indicators at an EU level was speeded up after the European Council in 1998 together with activities in relation to the integration of environmental concerns into environmental policies (EEA, 2005). "The European Environmental Agency (EEA) have developed a core set of environmental indicators which provide a manageable and stable basis for indicator based reporting by the EEA and to streamline EEA contributions to other European and global indicator initiatives, such as EU structural indicators and OECD environmental indicators" (EEA, 2005). Each set has different criteria or cover a different geographical area such as worldwide (OECD) or European (EEA).

The different requirements of users create a challenge when designing indicators. Braat (1991) provided a general distinction between three groups of information and indicator users: firstly, scientists and researchers, who require raw data that can be subjected to statistical analysis (low level of aggregation); secondly, politicians, who require data in a format that represents policy objectives, evaluation criteria and target and threshold values (moderate level of aggregation); and thirdly, the public, who requires a simplified and unambiguous representation of data as a single piece of information (high level of aggregation). This classification was also developed further with illustration by other scholars (Figure 3.1).

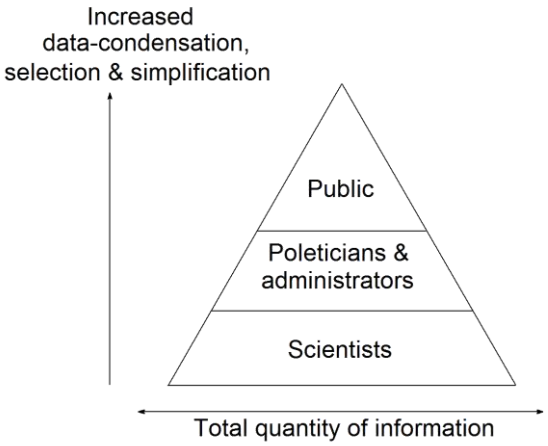

Fig. 3.1 Relationship between data condensation and users (after Shields et al., 2002, p. 149)

Hammond et al. (1995) argued that the information presented to users must be in an understandable form and convey meaningful information. This argument highlighted the context in which indicators are developed and used. Bond et al. (2011) also suggested that in sustainability appraisal, objectives and indicators should be developed with a broad range of stakeholders. Cloquell-Ballester et al. (2006) pointed out the need for participants and stakeholders in an impact assessment process to accept the indicators. Hammond et al. (1995) suggested the following characteristics of successful indicators in a decision-making process:

- User-driven. Be useful to their intended users by conveying meaningful information and in an understandable form. Also be able to reflect the goals to be achieved.
- Policy-relevant. Be pertinent to policy concerns. Not just technically relevant, but also easily interpreted in terms of environmental or societal trends or progress towards policy goals.
- Highly aggregated. Be few in number to ensure they are readily accepted by decision-makers and the public. The extent to be aggregated depends on users.

The participation of stakeholders as an integral element in indicator processes is widely accepted as necessary in order to both produce useful indicators and assessments and create an early awareness of the outputs of indicator processes.

3.2 Using indicators in SEA

Procedurally, indicators can be used in almost every stage in a SEA report. By checking against obligation criteria, indicators are used in screening to decide whether a SEA report should be conducted and at what scale. In the scoping stage, indicators are applied to decide the main assessment objectives. Indicators are also used in guiding data collection and in setting alternatives for prediction and assessment. If there should be any adaptions or mitigations, SEA

can apply indicators to set targets for those actions. For environmental authorities, indicators can provide assistance by offering clear information to approve the final SEA report or statement. For the monitoring program and SEA follow-up, indicators are employed to measure the actual impact of PPPs as the outcome of SEA. For public participation during all these procedures, indicators can be used to communicate with stakeholders. Further, when cooperating with planners or decision-makers, indicators can also act as a communication medium.

In the Chinese SEA system, indicators are used broadly and intensively. Being directly influenced by technical-based EIA, rationality in SEA still plays a crucial role by relying strongly on scientific calculation, model simulation and impact prediction. Indicator use is formally required by the guidelines in the Chinese SEA system. The Technical Guidelines (revised version, 2009) highlighted indicators' important role as thus: "This revised version extremely emphasizes the core role of environmental objectives and the indicators in SEA as the most important basis for the whole assessment process" (The explanation for The Technical Guidelines, revised version, 2009, p. 6). It also views indicators as an essential tool: "Environmental objectives are the base of Planning EIA, and indicators are designed to assess the feasibility and achievability of those objectives" (The Technical Guidelines, revised version, 2009, p. 8). In addition, it requires that "environmental objectives and assessment indicators" be described in the final SEA report (The Technical Guidelines, revised version, 2009, p. 14).

For choosing and using indicators in SEA, some of the revised guidelines mention the requirements of a participative process: "Based on the experts' consultation and public comments collection, indicators should be selected and to be relevant to plans in different sectors" (MEP, 2009: The explanation for The Technical Guidelines, revised version, 2009, p. 10). Moreover: "The indicators could be selected through plan analysis, experts' consultation and public participation" (MEP, 2009: Technical Guidelines for PEIA (Urban Master Plan), revised version, 2009, p. 8). And: "A broader public participation can facilitate a more precise evaluation of the impact on the sustainability development, reduce the possibility of excluding any themes or problems, and could make the decision-making more democratic" (MEP, 2009: Technical Guidelines for PEIA (Forestry Planning), 2009, p. 8). However, no further guides imply how to engage stakeholders, the public or decision-makers when deciding upon the indicators for a SEA report.

Summary

This chapter provided basic knowledge on indicators. After having offered a general understanding of indicators as well as the broad context of the Chinese SEA system, relating back to the state of the art in the field and the research questions, relevant theories to put this research into perspectives are introduced in Chapter 4.

CHAPTER 4

THEORETICAL FRAMEWORKS

In this chapter, the theoretical bases for this research are summarised. The presentation includes a description of which parts of the theories that have been employed in the research and an introduction of the angles from which these theories are applied. More explanation on how the theories are applied and how each theoretical base is connected to each sub-research question is demonstrated in Chapter 5.

4.1 An overall theoretical approach

> "*Begin with theory, you begin with the answer; begin with observation, you begin with questions."* Marshall McLuhan. (McLuhan, 2008)

After formulating the research aim and questions, instead of beginning with searching for theories, this study finds it necessary to deconstruct the SEA process to make it possible to analyse the specific research questions through a certain lens. Viewing SEA as an implementation process brings forward a clear logical structure for testing the application and role of indicators in different arenas in a SEA process (Figure 4.1). Implementation involves related SEA policies, the legislation and guidance system and SEA stages undertaken by practitioners, the output of SEA such as SEA conclusions or reports and the outcomes of SEA such as problem solving or capacity building. In addition to the socioeconomic context, the environmental condition and institutional setting affecting the whole SEA process and eventually will influence SEA outputs and outcomes. Through this lens, the research questions can be addressed and investigated. The first research question "How and why did the SEA indicator system change?" focuses on the guideline arena, the second question "How do the SEA

guidelines and practice address and mediate the science–policy interaction in the use of indicators?" focuses both on the guideline arena and on the SEA stages. The last two questions focus on the SEA stages and outputs. Based on this consideration, an overall theoretical approach is inspired to combine all four research questions in a comprehensive way.

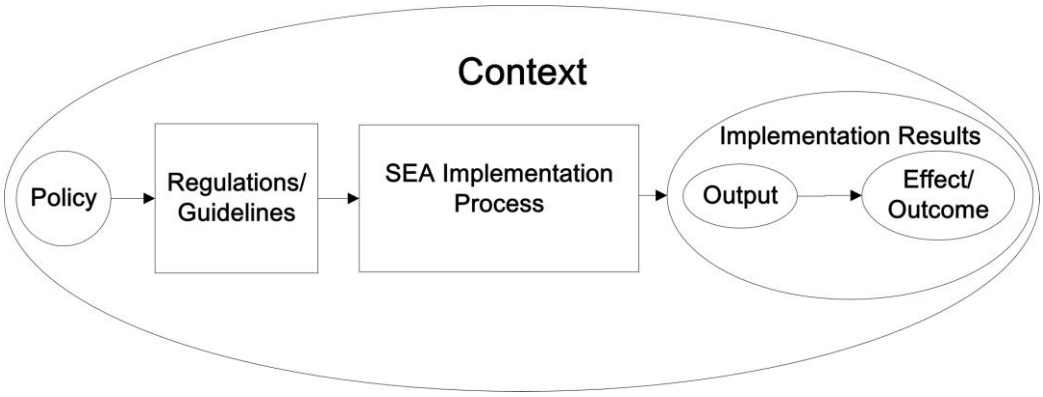

Fig. 4.1 SEA implementation process (Gao et al., 2012a)

In finding the appropriate theory(s) to employ in this research, building my own concerns about indicator's role on a ground described in Chapter 1, a primary research perspective is sketched out as studying indicators' application in SEA in the science-political interface. From this perspective, indicators' functions in SEA as a technical/calculation tool or as a communicational/political media become to the main concern. However when further develop those concerns into detailed analysis, it is found necessary to involve another perspective to deconstruct SEA system or practice into stages of a process to look over how indicators are understood, addressed, implemented and applied in the Chinese SEA practice. At this point implementation theory is found relevant in deconstructing SEA implementation process and providing a perspective to investigate those factors that influence indicators using in SEA. Under the background of the newly launched Technical Guidelines revising, implementation theory is applied to explore how the new guidelines are developed and why those new developments happened at the first place. Furthermore, the implementation theory provide an operational approach for this research to illustrate how the way of implementing indicators can make a difference in terms of influencing planning process. Combing the above two perspectives, an overall design for this research is proposed (Figure 4.2).

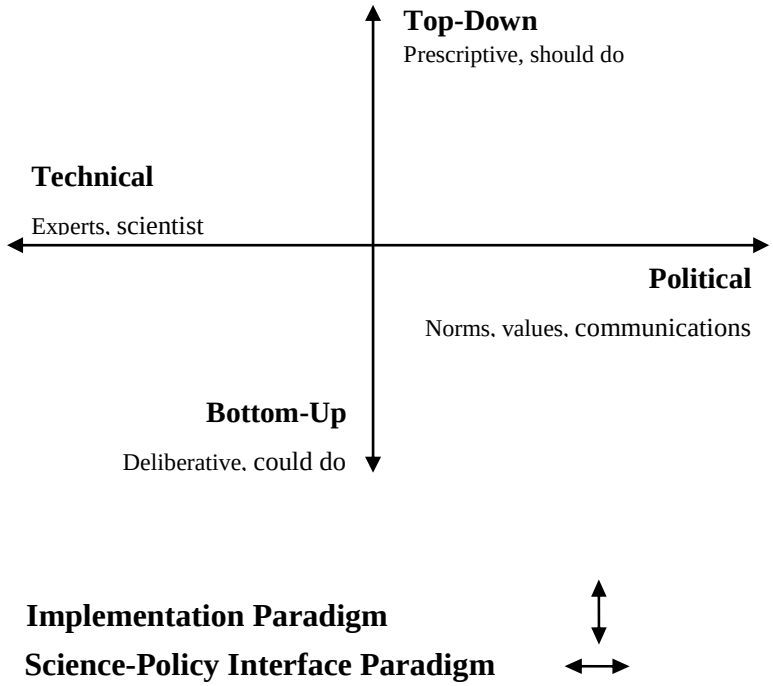

Fig. 4.2 Overall theoretical approach

In this overall approach, the vertical direction is constituted by the implementation dimension, where the two ends are whether indicator use in SEA is a top-down or a bottom-up process. Top-down in this study means a prescriptive process that focuses on "what should be done". In SEA practice, a top-down approach comprises setting up a goal to achieve (e.g., require using indicators in SEA and listing them in the report, using indicators to inform the decision-making process) and designing the way to achieve it (e.g., publish national guidelines regarding indicator use, require the appraisal committee to control SEA quality). Bottom-up means a deliberative process that focuses on "what could be done". In practice, a bottom-up approach comprises indicator application in an action-centred activity, where the differences between cases are highly respected, or interaction and negotiation exist between the environmental authority and SEA practitioners regarding indicator use. This vertical dimension is employed to primarily explore the first and second sub-research questions (Articles 1 and 2).

In the horizontal direction is a scientific–political interface dimension where the ends are whether indicator use in SEA takes technical or political perspectives. A technical approach normally emphasises the contributions of experts and professionals or the importance of using indicators in SEA, while a political approach acknowledges and involves values, norms and communication. This horizontal dimension is applied to explore the first, third and fourth sub-research questions (Articles 2, 3 and 4).

This overall research design is regarded as being innovative in two ways. Firstly, it identifies two characteristics of indicators that deserve careful investigation. These are function and implementation, which provide perspectives for studying the indicator's role in SEA. Secondly, it innovatively combines those two dimensions in one framework, which can firstly be regarded as a reference for the similar analysis, and secondly as creates a multi-criteria approach for future relevant research activities. Within this multi-dimensional approach, research into indicators can be meanwhile developed more broadly in perspective and more deeply in dimensions.

Based on these rationales, part of the work from implementation theory and planning and decision-making theory are found to be relevant and useful for analysing the proposed research questions. Here, implementation theory is employed to explain this vertical perspective of indicator implementation, while planning and decision-making theory is applied to investigate the horizontal perspective of the science-policy interface of indicator use. In the following sections, these theoretical perspectives are further described and discussed.

4.2 Implementation as a process

Implementation theory was introduced in 1973 by Presman and Wildavsky in their pivotal book on implementation (Presman and Wildavsky, 1973). The study of implementation theory flourished in the 1980s with a lot of studies trying to understand the success or lack of success of many major policies and programmes launched in that period. Since then, the mentioning of implementation theory has almost disappeared as an individual theory and it is now seen as an integrated part of the analysis of the policy process (Hill, 2009; Sabatier, 2007). The foundation for this is a short review of the implementation process and the perspectives this project will look into. Before reviewing the implementation process, there is a need to summarise the top-down and bottom-up approaches in implementation study.

4.2.1 Top-down vs. Bottom-up approach

The debate between the top-down and bottom-up approaches is strongly rooted in the recognition of whether there is a distinction between policy formulation and implementation; in another words, whether it can separate the policy implementation process from the process of how policy is formed (Hill and Hupe, 2002, p. 43). For top-down theorists, a clear distinction exists between policy formation and implementation as a distinction between politics and administration. In this case, implementation is looked upon as a "rational process" with a clear goal and standard procedures (Hill and Hupe, 2002, p. 44; Sabatier, 1986). The main exponents are Pressman and Wildavsky (1973), although Wildavsky (1984) later developed a bottom-up approach to emphasise how the communication and interaction process influences implementation. Van Meter and Van Horn (1975) believed the implementation process to start

from a pre-decided policy, although they did recognise the importance of participation in the policy formation instead of in the implementation process. Another highly top-down approach by Bardach (1977), whose work turned towards a bottom-up approach in his later work (1998), suggested implementing policies by emphasising "scenario writing" and "fixing the game", which focus on a well-structured procedure. Sabatier (1986) also believed in a clear distinction between policy formation and implementation, although recognised feedback's impact on reformulating policy. His earlier work with Mazmanian (Sabatier and Mazmanian, 1980) emphasised a top-down approach by suggesting how to control the implementation process in steps. By arguing that policymakers are democratically elected, Hogwood and Gunn (1984) defended the top-down approach and offered recommendations to policymakers. Pressman and Wildavsky (1973) summarised the key characteristics of a top-down implementation process as follows:

- The starting point is the policy to be implemented
- The goal must be seen as prior to implementation
- Stakeholders can influence the policy process just as the political level can impact the implementation process
- Means for achieving the goals are identified and used by politicians
- There are linkages between different organisations and departments at different levels
- Means and organisational control are part of the policy design
- Implementation problems can be overcome by changing policy design

For the bottom-up approach, one of the most important progresses is that the distinction between "policy formulation" and "implementation" is not watertight. It is seen as two interlinked phases of an on-going process from ideas and goals through policy formulation and executing the different steps in the implementation process. It was believed that during the implementation stage, policymaking continues (Hill and Hupe, 2002, p. 8). In reality, there are close links between the two phases as many feedback loops exist, (e.g., politicians intervene in administrative practices as well as different interest groups, while street-level bureaucrats and target groups influence the policy process). Being looked on as the founding father of the bottom-up approach, Lipsky (1980) emphasised the street-level bureaucrats' role in influencing policy implementation through decisions, routines and devices in carrying out the policy. Similar to Lipsky (1980), Barrett and Fudge (1981) explained why it is difficult to separate implementation from policy formation, arguing that policy is shaped by those involved not only through administrative processes, but also through political processes. However one of the main problems bottom-up theorists face is the methodological issues, that with no goals to compare the implementation process with and concomitantly how to control the quality of implementation by assessing effectiveness (Hill and Hupe, 2002, p. 56).

While this dichotomy of approaches only represented the early stages in the development of implementation theory, synthesisers of both top-down and bottom-up perspectives were soon developed by many theorists. These included the "back mapping" proposed by Elmore (1979), "coordination and collaboration as the centre of implementation" mentioned by Scharpf (1978) and "emphasising both performance and impacts of the implementation" by Ripley and Franklin (1982). Further, as mentioned earlier, Sabatier (1986) also emphasised the bottom-up approach's

strength in assessing policy outcomes other than government programmes. Based on the above summary, the implementation process can be analysed in both ways – top-down and bottom-up – as emphasised by Hanf (1982) and Yanow (1987).

4.2.2 Implementation process

Since the 1970s, implementation researchers have been exploring the implementation process and structures (Goggin et al., 1990; Van Meter and Van Horn, 1975). Van Meter and Van Horn (1975) defined the implementation process as those actions by public or private individuals or groups that are directed at the achievement of objectives set forth in prior policy decisions. In their policy implementation study, Van Meter and Van Horn (1975, p. 463) set up an implementation model to demonstrate how policy can be implemented. In their model (Figure 4.3), six elements are identified as having dynamic links with the policy outcome: "policy standards and objectives", which set goals and standards for the implementation, "resources" that provide input, "interorganisational communication and enforcement activities" and "characteristics of the implementing agencies" as the main implementers, "economic, social and political conditions" as the context for implementation and "the disposition of implementers" as the implementer's direct influence on the implementers outcomes. In this model, they identified the influence from the upper stages to the lower stages with forward or sideways directions except any feedback pathways. Therefore, this model is recognised as a clear top-down approach of the implementation process.

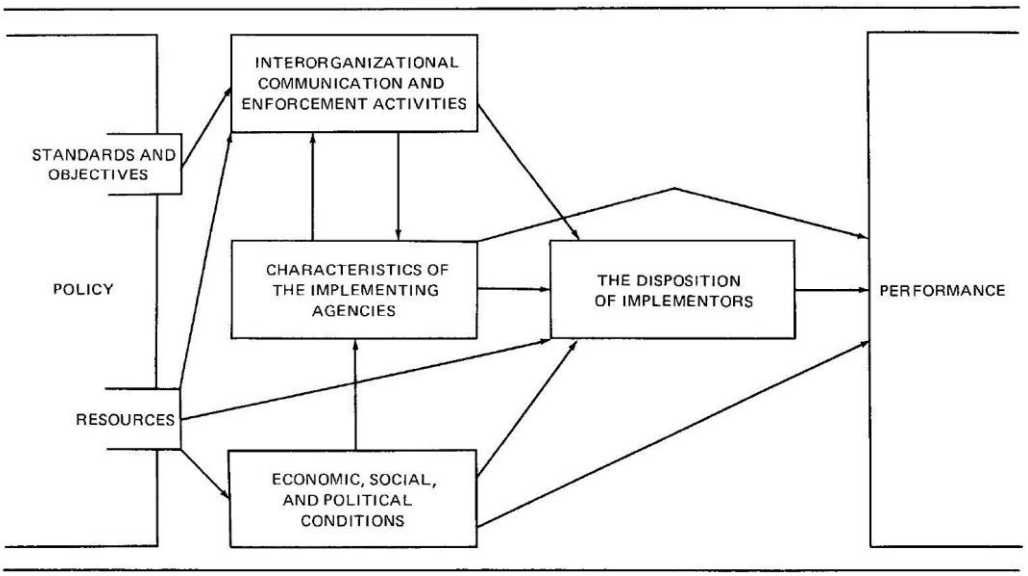

Fig. 4.3 Van Meter and Van Horn's implementation process model (Source: Van Meter and Van Horn 1975, p. 463)

As a different approach, Goggin et al. (1990) furthered the modelling methodology with a "communications model" (p. 32). This model (Figure 4.4) is designed within the American institutional setting and it offers a clear division between federal-, state- and local-level organisations. By emphasising the interaction between these layers of government, it highlights the feedback between them, not only from the upper implementers to the lower ones, but also the other way around. Therefore, there is a feedback flow from implementation to policy formulation. By stating this, differing from what Van Mater and Van Horn have proposed, besides the top-down approach, a bottom-up approach can also be identified.

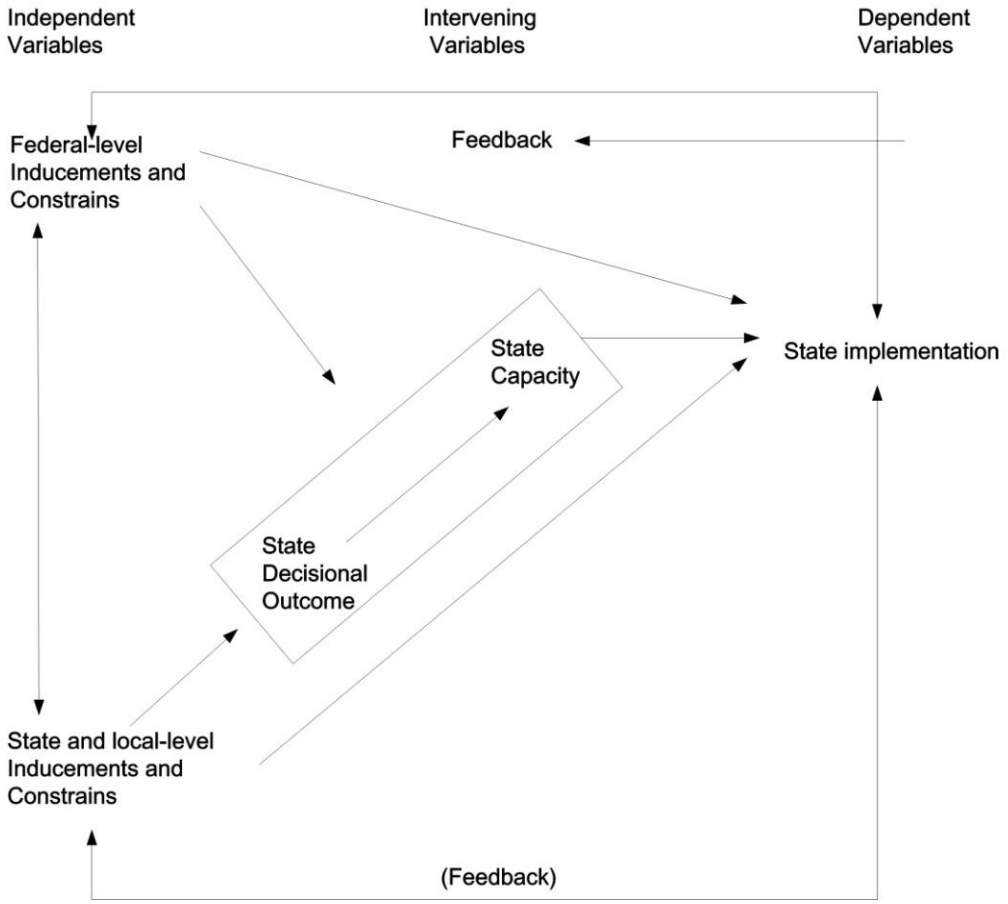

Fig. 4.4 Implementation process model by Goggin et al. (Source: Goggin etal., 1990, p. 32)

Methodological exploration was also furthered in various substantial research such as youth employment policy (Winter, 1986a) and disablement pension administration (Winter, 1986b). Being a synthesiser of the top-down and bottom-up approaches, Winter (1989), in his research on the implementation of Danish employment and training reform for long-term unemployed people, developed his implementation model (Figure 4.5). In this more comprehensive model, Winter identified five factors that affect implementation results. Firstly, the policy formulation

process, despite its remote position, is important for implementation results. According to Winter, invalid causal theory, for example, can lead to bad implementation results because of a lack of knowledge or insufficient means. Secondly, implementation is affected by the conflict of interests between organisations and the policymakers as well as among organisations. Further, direct implementers, namely the street-level bureaucrats and target groups of the policy, also affect implementation; however, according to Winter, only the target group has a direct influence on implementation outcomes. Finally, the context also indirectly affects implementation results.

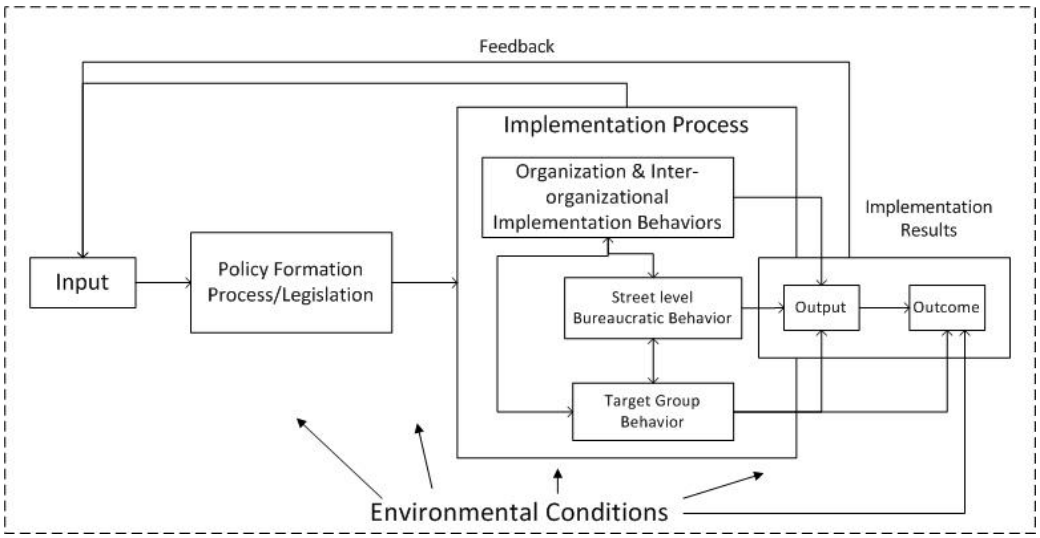

Fig. 4.5 The implementation process and determinants of implementation results (Winter, 1989)

Reviewing all these implementation models developed during the last decades shows that Winter's model is most relevant for this research. Firstly, it is a combination model including both the top-down and the bottom-up approaches in interpreting an implementation process. Secondly, the factors Winter identified can be translated into elements in the SEA context. Further, Winter's interpretation of street-level bureaucrats' behaviour is also considered to be relevant in this research when analysing how SEA practitioners influence SEA results. Therefore, Winter's work also inspires the design of the implementation model employed in this research (Figure 4.1). The next section will further explain this.

4.2.3 Influential factors

Van Meter and Van Horn (1975) identified six variables that link to implementation outcomes, namely policy objectives, resources and incentives, inter-organisational relationships, the

characteristics of implementation agencies, the response of implementers and context. Winter (1989) identified four socio-political variables that affect implementation results: the character of the previous policy formation process, conflicting or convergent interests and behaviour of multiple organisations participating in the implementation process, street-level bureaucrats' behaviour and the responses of target groups and context changes. Based on a review of both top-down and bottom-up theorists' work, Hill and Hupe (2002) suggested seven variables that influence implementation. They are policy characteristics, policy formation, vertical public administration, horizontal inter-organisational relationships, factors affecting the responses of implementation agencies in terms of agencies' characteristics and influences on street-level staff's behaviours, responses from those affected by the policy which could be understood as the target group and context.

When looking at individual SEA cases, we find that the undertaking of SEA by practitioners and the reactions of stakeholders can be explained and studied using the lens of street-level bureaucrats' implementation theory (Winter, 1994). According to Winter's street-level bureaucrats' theory, although both the national legislation and the context could influence the output of an implementation, the final outcome will strongly be influenced by street-level bureaucrats. According to Winter (1994), street-level bureaucratic behaviour can be affected by both external and internal aspects. Externally, firstly it can be affected by the type of policy mandate, which includes the degree of stringency, the power or statute granting the agency and the specificity to which the statute describes the standards. Secondly, it can be affected by the task environment of the agency. Thirdly, it can be affected by management style, such as the capacity in guiding the task, recruitment, caseload and implementation style. Further, it can also be affected by the organisational culture of the agency, capacity and individual background and attitudes. In addition, internal factors such as implementation effort and implementation style have also been identified to affect street-level bureaucrats' behaviour during implementation.

4.3 Planning and decision-making theory

As an instrument for integrating environmental considerations into decision-making, SEA has been intensively discussed in the environmental assessment community in terms of better integration and more flexible procedures. Influenced and inspired by planning and decision-making theory, there have been fundamental debates over whether traditional EIA-based SEA, which is "marked by instrumental rationality" (Fischer, 2003, p. 156), can reflect a reality that cannot be predefined and therefore whether it is effective at influencing decision-making (Fischer, 2003; Kørnøv and Thissen, 2000; Nilsson and Dalkmann, 2001; Partidário, 2000; Stoeglehner et al., 2009; Vicente and Partidário, 2006). Against this backdrop, this section presents the planning/decision-making theory applied to analyse the role of knowledge, information and communication in SEA and planning/decision-making.

4.3.1 A turning point in planning theory

A turning point in planning theory research should not be ignored as a foundation to understanding the emphasis of communication when studying SEA's integration into planning/decision-making. Since the traditional representative democracy hardly handles complicated societal problems alone (Fischer, 2003; Healey, 1992, 1997; Innes, 1995), and the observations that planners are rarely able "*to deliver unbiased, professional advice and analysis to elected officials and the public, who in turn make the decisions*", but instead spend a lot of their time communicating with various stakeholders and actors (Innes, 1998), communicative planning has been developed as an alternative to rational planning. This provides an arena to engage people by consensus building in the open (Habermas, 1981) and making power relationships transparent (Flyvbjerg, 1998). In a communicative planning process, a plan itself is looked on as the result of "*various discourses and how different ideas have come together through language to create a particular view or plan*" (Allmendinger, 2002, p. 198). Further, an agreed "storyline" means more than how the storyline is developed and what scientific knowledge it is based on (Allmendinger, 2002, p. 202). Along with the popularity of this alternative to rational planning theory, there have been challenges regarding the role of knowledge, information, participation and deliberation in planning, e.g. how to arrange the massive jumble of information during the discussion (Healey, 1996). Or, based on the assumption that judgement relies more on potential than on instrumental calculation (Allmendinger, 2002, p. 203), even deeper doubt about whether "profession" as expert knowledge still exists in the planning process as well as different opinions (Allmendinger, 2002, p. 206).

4.3.2 The politics of knowledge in planning/decision-making

Complexity means the same but is more vivid for those who need to make decisions. Knowledge and information's role has been touched upon in planning/decision-making (Foucault, 1980; March, 1994; Innes, 1998). The recognition of how to use information, especially scientific and technical data, is a learning process lead by planning theorists and practice. The standard way for planners/decision-makers to deal with the complexity in decision-making is to use "summary numerical representations of reality" (March, 1994, p. 15). In order to represent phenomena that are "elusive-real but difficult to characterize and measure" (March, 1994, p. 15), March (1994) concluded that "numerical representations" that provide specific, vivid and concrete information are more popular among decision-makers than those that are more general, pallid or abstract. According to Innes (1998), the study of prediction and forecasts, quantitative calculation and other scientific knowledge is one kind of information in the context of planning/decision-making. The conventional planning process is assumed to rely on techniques/calculation where the planner/professional's role is mainly to provide objective information, carry out scientific analysis and provide technical support to decision-makers, without adding value to the information provided, merely inform other than engaging in the planning/decision-making (Innes, 1998).

Knowledge, however, besides its scientific nature, also has political characteristics. On one hand, the choice of knowledge is political. Decision-makers have to be dependent on knowledge providers, which makes them not perfectly objective. Therefore, in decision-making theory, it is believed that "systems of information and knowledge are instruments of power that favour those who can control them at the expense of those who cannot" (March, 1994, p. 255). The way of using knowledge brings advantages to some decision-makers and disadvantages to others (March, 1994). On the other hand, beyond dependence on knowledge providers, knowledge itself is not politically neutral. Knowledge in decision-making "plays political favourites" (March, 1994, p. 257) with political biases towards which factors to be considered. Research by Innes (1998) shows that the influence of formal information is limited in actual decision-making. Decision-makers ignore scientific findings uncovered by the planner. By believing that knowledge fits the needs of some interests and does not fit others, March (1994) asked "how it is possible to decide whether gains to one person, measured in terms of that person's values, are greater or less than losses to another person, measured in terms of that person's values?" (p. 229). Therefore, scientific knowledge must be accepted by experts with different values and be contextually appropriate and socially meaningful (Innes, 1998). Just as Innes (1998) pointed out, "scientific knowledge has its place, but it is not privileged" (p. 58).

In exploring when and why information can be influential, theorists have attempted to find out what causes information/knowledge make difference since the 1980s. Power and communication are the most mentioned factors that determine information/knowledge's influence on decision-making (Allmendinger, 2002; Forester, 1999; Foucault, 1980; Healey, 1992; March, 1994; Innes, 1998; Sager, 1994). It was recognised by March in his authorised book (1994) that information's role is more in consensus building than in providing technical support. According to March, decision-making is more concerned with confidence than with accuracy. Consequently, more information means more confidence, but not necessarily more accuracy, "People seem to seek not certainty of knowledge but social validity" (March, 1994, p. 40). From this perspective, communication, deliberative participation and engagement are more important than scientific evidence in terms of getting decisions, since differences exist among different groups of society in the ways in which they shape, understand and simplify reality (March, 1994, p. 10). This argument was recognised later by Innes (1998), who stated that information's larger influence on planning/decision-making relies on its embedding in the understanding of participants and in communication within society. By looking into planning/decision forming, Innes proposed that the process of producing information is important and therefore it should be embedded in the involvement of participants. However, Innes (1998) did not deny information's role as technical/scientific support, which, according to her, is only part of the evidence that can influence in planning/decision-making. Information, of course, should be scientifically validated, but being socially recognised and accepted is the essential precondition for its usefulness as a technical support in planning or decision-making. In addition to formal, technical information, information from four other sources has been clarified, namely participants' experiences, participants' stories, the representations used in discussions and participants' personal senses of the situation and those of others. Along with conventional information, taking communication in terms of deliberative engagement was found to have an indirect influence on

planning/decision-making, by motivating individual and joint action "in a way that cold 'science' data never does" (Innes, 1998, p. 55).

As one of the important communicational characteristics, March (1994) also identified information's political influence by pointing out that among all the available information, decision-makers "try to find an answer that serves their own interests" (p. 17). They do this by choosing those interested "numerical representations", which in the context of environmental assessment is enacted by those objectives and indicators. Indicators' role in interpreting the complexity of reality in communication between different groups in society was also identified by Hammond et al. (1995).

4.3.3 Communication in planning/decision-making

Along with the debate on the technical/synoptic/rational and political/ incremental/ communicative models of planning since 1959 (Sager, 1994, p. 3), communication as an influential element in planning theory – and afterwards in the research of the environmental assessment's influence in decision-making – has been one of the most important developments (Fischer, 2003; Kørnøv and Thissen, 2000; Partidário, 2000; Vicente and Partidário, 2006; Therivel, 2004). In communication planning, by criticising the definition of communication as a "human-behavioural substitute for actual physical contact or collision" that should be understood as the "interpersonal transmittance of signs or messages in general" other than as communication (p. 63), Sager (1994) interprets the connection between the "person exercising power and the one being influenced" (p. 62) as communication in the context of planning by explaining how power works in planning. Communication is also looked on as a knowledge production process that is "exchanging perceptions and understandings and drawing on the stock of life experience and previously consolidated cultural and moral knowledge available to participants" (Healey, 1992, p. 153), or as an action beyond simply transmitting the truth (or perhaps untruth) to decision-makers (Innes, 1998). Forester (1989) saw the communication of a planner as a kind of warning that calls attention and prioritises. In most SEA practice and research, communication refers to the interaction among all involved stakeholders, focusing on information sharing, participation engagement and decision-making interacting.

There are many forms of communication that "one mind could affect another" (March, 1994, p. 121) besides speech, such as drawings (Sager, 1994, p. 107), narrative written stories (Greene, 1988), new mediation transmissions (McGreavy et al., 2012) and all kinds of human behaviour (Nagel, 1975, p. 33). In terms of the communication form, March further pointed out that the utilisation frequency of a communication form by a decision-maker heavily depends on those involved in the decision-making process (1994, p. 98). However, no matter which form communication takes, not all information could as planned reach to the receivers in the planned form (Schramm, 1971). Therefore, emphasises have been mentioned repeatedly in the literature, that the consideration of the receiver or partners' value and the common perception of context, reality and problem are important factors to be considered when communicating with

stakeholders (Greene, 1988; Hilden et al., 2004; McGreavy et al., 2012; Sager, 1994; Therivel, 2004; Vicente and Partidário, 2006).

Although communication is believed by many sustainability scientists to occur at the end of the project as a one-way process (Lindenfeld et al., 2012), Sager (1994) used communicative planning theory to point out that there are more kinds of communication flows than the one-way transmission of the information used in planning (p. 12). Considering the high degrees of uncertainty in decision-making, Lindenfeld et al. (2012) proposed a new model for a communication process to an engaged approaches in addition to the traditional one-way transmission. One-way transmission is described as when "scientists decide what to study and make information available to society by placing it on a 'loading dock', then waiting for society to pick that information up and use it" (Lindenfeld et al., 2012, p. 28), while the engaged model emphasises stakeholder and community engagement in producing information and understanding and using local knowledge (Lindenfeld et al., 2012).

4.3.4 Influence on planning/decision-making

In order to test how the use of indicators influences the impact of SEA on planning and decision-making, a theoretical analysis on the concept of "influence" is carried out. Inspired by the understanding of influence by Wrong (1979) and Sager (1994), influence, in the context of decision-making, can be studied from two perspectives, namely structural influence and actors' influence (Wrong, 1979, p. 24; Sager, 1994, p. 61). Structural influence comes from the system where actors in planning and decision-making are shaped and created, which facilitates the rationale of planning (Giddens, 1984; Sager, 1994). According to Sager (1994), structural influence is based on systemic capacity, which is impersonal and unperceived. Fighting structural influence is seen as "pursuing the planning-as-politics component of the compound rationale of planning" (Sager, 1994, p. 63), which states even more clearly the rational nature of structural influence. Moreover, Faludi (1984) pointed out that planning is considered to contribute in a way of taking the most efficient ways to approach ends. By emphasising the rationale in planning through highlighting the influence of rational action and science on planning, Faludi (1984) weakened the influence of political actions, which is also understood as actors' influence. According to Sager (1994), an actor's influence is based on collective capacity involving all actors in planning and decision-making (p. 66). By approaching collective agreements or decisions through means such as communication, dialog or action together, actors' influence/communicative influence is seen to presuppose communicative rationality (Arendt, 1970; Sager, 1994).

Summary

This chapter provided an overview of those parts of the theories considered to be relevant to explore each sub-research question. However, such a theoretical framework only provides an angle to understand reality; it does not necessarily suggest an operational methodology to investigate the empirical work. To guide the empirical investigation, conceptual models and practical methods have to be designed, as explained in Chapter 5.

CHAPTER 5

RESEARCH DESIGN

This chapter presents the methodological framework to describe how the research is structured and how the theories are connected to each sub-research question and thus applied in this study. The main approach to this research is conceptual model designing.

5.1 Methodological design

5.1.1 Indicator aggregation model

To answer sub-research questions 1 and 2, the aggregation levels of relevant indicators are studied in order to classify the information aggregation level of the indicators used in the Chinese SEA system and to explain how the latest change in the indicator system influences the implementation of the new guidelines. After reviewing the relevant definitions and criteria of aggregated indicators (see Section 3.1.2), it is found that applying those definitions to the Chinese SEA system makes it conceptually useful to classify the indicators listed in the guidelines according to the aggregation of information. However, empirical work is different from idea typology. It is only feasible to apply the above definition in cases where indicators are expressed clearly and unambiguously in terms of data compiling. In practice, aggregated indicators could be far more complex with an ambiguous structure description. To solve this issue, besides the typical one-dimensional model of aggregation, this research provides a second dimension of information structure complexity to illustrate the relationship between the structure complexity and information aggregation of an indicator (Figure 5.1).

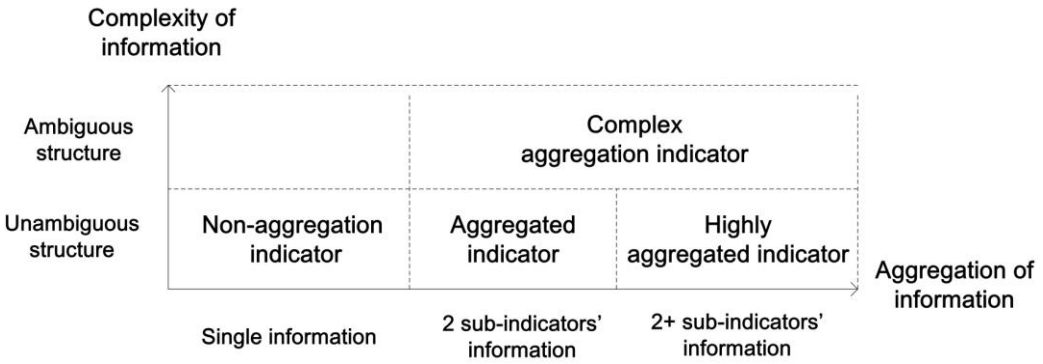

Fig. 5.1 Two-dimensional model developed for classifying the indicators used in SEA (Gao et al., 2012a)

In the above model, there are two dimensions. Horizontally is an indicator's information aggregation level. The three aggregation levels are "Non-aggregation indicator", "Aggregated indicator" and "Highly aggregated indicator". These three categories have a common factor that their information is combined in a straightforward way, which provides indicators with an unambiguous information structure. In practice, the indicators used in SEA could have a far more complicated nature. Therefore, this research develops a vertical dimension to show the structural complexity of the indicator. Here, by the "unambiguous structure", it means very little or even no room for interpreting how to understand indicators and knowing which datasets are required. And the "ambiguous structure" needs interpretation or elaboration for understanding how a complex nature is linked to a simple symbol when it is not easily translated into simple cause/effect relationships. The new developed dimension about complexity concerns two levels of aggregation, namely aggregated indicators and highly aggregated indicators. According to this two-dimensional model, four categories of indicators can be classified according to their information aggregation level and structure complexity (ambiguity) level:

- "Non-aggregation indicator" refers to the indicators based upon single units of information
- "Aggregated indicator" refers to the indicators composed of two sub-indicators from two different sets of information that are related
- "Highly aggregated indicator" refers to the indicators with more than two sub-indicators in which different pieces of information are combined
- "Complex aggregation indicator" refers to the indicator composed of two or more sub-indicators, but with a complex, unclear, ambiguous structure

5.1.2 Communication model

For sub-question 3, in order to study the communication occurring in SEA and to investigate how it is influenced by using indicators during the process, this research develops a conceptual model to demonstrate the communication elements in SEA and the relations between those elements (Figure 5.2). According to this model, firstly, all those involved in different communication arenas in a SEA process should be identified and then the communication flows clarified. For example, potential communication participants include SEA practitioners, stakeholders, planners and decision-makers, the public and NGOs. After identifying these participants, the communication flows between participants should be sorted according to flow direction and flow boundary. The communication flow direction consists of one-way and two-way communication. The former is the communication aiming at information sharing and informing, while the latter also includes feedback and the interaction and engagement of participants. The communication flow boundary consists of internal and external communication. The former is communication occurring among SEA practitioners within a SEA team, while the latter refers to all other communication between and among the SEA team and politicians, planners and decision-makers, stakeholders, the public and NGOs.

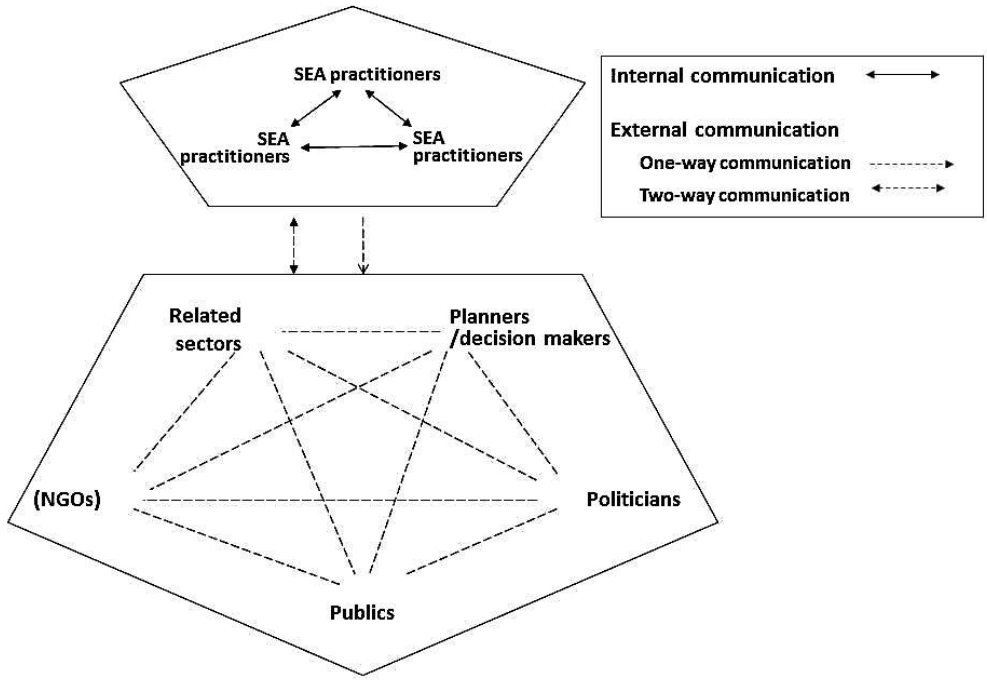

Fig. 5.2 Conceptual communicational model (Gao et al., 2012c)

5.1.3 A conceptual model of influence

For sub-question 4, a conceptual model is developed to analyse how using indicators could influence planning/decision-making through SEA. Inspired by Wrong (1979, p. 24) and Sager (1994, p. 61), this model aims to identify the potential elements that influence planning/decision-making. From the perspective of planning/decision-making theory, two channels through which SEA can influence planning and decision-making are structural influence, which refers to SEA's influence through procedures, and actor's influence, which refers to SEA's influence through actors' participation/engagement. Based on these two concepts, a conceptual model (Table 5.1) is designed to demonstrate how influence on planning and decision-making is studied and analysed.

Influence		**Goals**	**Influence on planning**
Through procedure	Screening	• Deciding whether to take SEA • Setting assessment boundary	• To improve/facilitate planning process
	Scoping	• Identifying the important objectives and targets	
	Data collection	• Guiding data collection	
	Assessment	• Qualifying the impact assessment • Making the assessment easier and clearer	
	Public participation	• Involving public's opinion	• To involve more actors in arenas
	Evaluation and approval	• Quality control • Evaluating SEA	• To improve planning quality
	Follow up and monitoring	• Adaption and mitigation implementing • Monitoring SEA's effect	• To improve/facilitate planning • implementation
Through actors	SEA practitioners	• Internal/technical communication	• Approaching internal agreement/decision
	Experts	• Professional/technical consulting	
	Stakeholders Public NGOs Political	• External/political communication	• To decide who should be involved in planning arenas
	Planners Decision makers		• Integrating SEA results into planning

Table 5.1 SEA's influence on planning and decision-making (Gao et al., 2012b)

In this model, for each type of influence, firstly the relevant aspects or elements are identified, then for each of these involved elements, the model clarifies its goal for SEA and its influence on planning and decision-making. Finally, the indicators' role relating to those goals and influences is investigated. For structural influence, those relatively fixed SEA procedures

required by the guidelines are identified, such as screening, scoping and assessment, which appear as the stages of SEA. The concept of "procedural effectiveness" by Bina et al. (2011) is found to be relevant for studying the structural influence. While for the actor's influence, it identifies those potential participants engaged in SEA such as practitioners, stakeholders as the public, NGOs and politicians. Hansen et al. (2011) studied structural power and actors' influence in decision-making, which is found to be relevant as well.

5.2 Methods and materials

This section provides an overview of the methods/approaches applied in this study (Figure 5.3). All the investigation and approaches concern four considerations: to elucidate the implementation of indicator use the understanding of indicator use in SEA from technical-political perspectives in Chinese SEA and , to explain how the use of indicators influences the communication in a SEA process, and to find out the influence of indicator use in SEA on the planning/decision-making process.

5.2.1 Documentary study

Documentary study is employed at two levels in this study, namely a general level and a case level. At the general level, to answer the first and second sub-research questions, the research analyses the relevant Chinese legislations, documents and guidelines. These documents include the Technical Guidelines (2003), which were launched on 1st September 2003 by the former State Environmental Protection Administration (now the MEP) and the Technical Guidelines (revised version, 2009). The majority of the discussion is based on the new set of guidelines. The aim of the general-level documentary study is twofold. First, it aims to determine the official basis for developing and using indicators in SEA at a regulative level and the technical requirements as formulated in the guidelines and how the science and policy domains embodied in these indicators are reflected in the guidance notes. It also tests the indicator aggregation by using the aggregation clarification model presented in Section 5.1.1 (Figure 5.1; Article 1). Second, it investigates the different aspects of the selection and use of indicators and the procedure and principles for how they should be selected and used as well as how they developed from the first guidelines in 2003 to the new ones in 2009. In this part, the number of indicators and their relationships to the overall themes and objectives are analysed (Article 1 and 2).

At the case level, to answer the third and fourth sub-research questions, this study takes two SEA cases studies and analyses the case reports and relevant materials to investigate how indicators are used in practical SEA cases. The materials are either in English or in Chinese. These documents include three SEA reports (two in Chinese), the SEA team work documents, two planning reports (in Chinese), case-based research publications including three articles (one

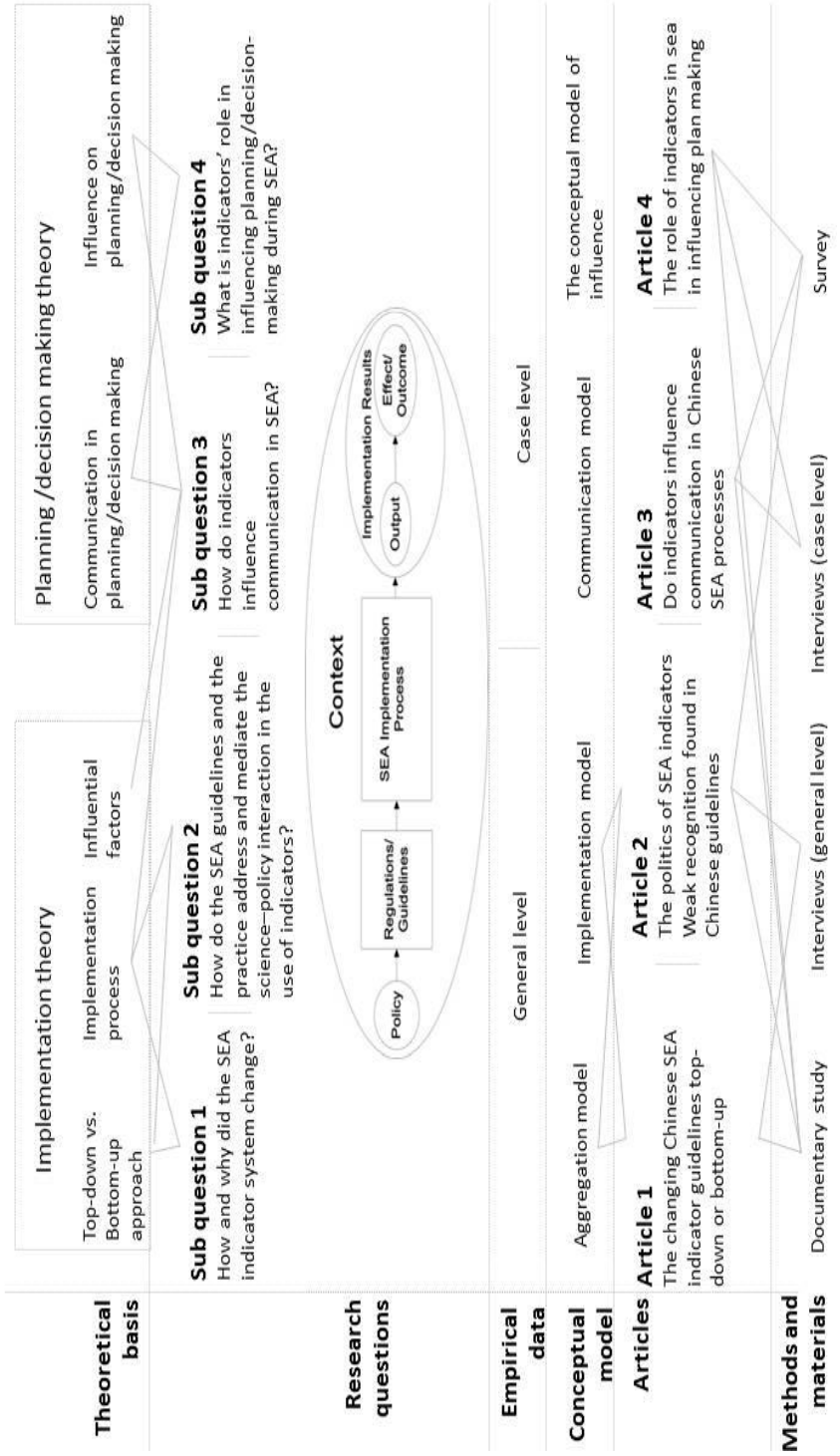

Fig. 5.3 Overview of the methodology

in Chinese), one Master's degree thesis and one book (in Chinese). The analysis at this level is also twofold. First, it aims to investigate which indicators are used in the studied cases and to find written evidence on how they are selected (Article 3). Second, it explores how indicator use influences the communication in SEA and the planning/decision-making process (Articles 3 and 4).

5.2.2 Interviews

Interviews in this study were employed to supplement the findings from the documentary study. Three rounds of interviews were carried out between January 2011 to June 2012, consisting of one round of interviews with four interviewees at the general level and two rounds of interviews with four interviewees at the case level. The purpose of this two-level design was the same as in the documentary study described above. Interviewees included administrative officers and researchers at the general level as well as SEA team leaders and members of the planning team at the case level. A semi-structured question list guided the interviews and conversations, while possibilities were still there to introduce new questions according to interviewees' responses. Except one interview carried out by phone, all others were face-to-face. An overview of the interview information is summarised in Table 5.2.

Level	No.	Interviewee Title	Time	Place	Mode
General	G01	Professor Beijing Normal University	Jan.2011	Beijing, China	Face-to-face
	G02	Vice General Engineer, MEP, China			
	G03	Director, MEP, China	Feb. 2011		
	G04	Director, MEP, China			
Case	S01	SEA project manager	Mar.2011	Shenzhen, China	Face-to-face
	S02	Planner			
	S03	SEA project manager	Apr.2011	Dali, China	
	S04	SEA project manager	Jun.2012	Denmark	Phone

Table 5.2 Overview of interviews

General-level interviews were carried out with SEA researchers/experts and administrators. Four interviewees from the national administration and university were conducted in January and February 2011 in Beijing, China. The interview questions were inspired by implementation theory and designed according to the conceptual model presented in Section 5.1.2 (Figure 5.2). Questions focused on the investigation of the scientific–political interface of choosing and using

indicators (Article 2), the changing of indicators' aggregation levels (Article 1 and 2), the rationales and expectations of authorities and administrations on the new guidance on indicator use in SEA (Article 2), whether a top-down or bottom-up approach is applied to guide indicator use in practice (Articles 1 and 2) and the factors affecting indicator use in SEA (Article 1 and 3).

Interviews at the case level were undertaken with four interviewees of SEA practitioners and planners. The interviews were conducted in March and April 2011 in Shenzhen and Dali, China, and in June 2012 in Denmark and the Czech Republic (via phone). The interviews at the case level were inspired by planning and decision-making theory and designed according to the communication conceptual flow presented in Section 5.1.2 (Figure 5.2). Questions concerned practitioners' experiences in choosing and applying indicators in practice and influence on communication in SEA (Article 3) and the influence of indicator use in planning/decision-making (Article 4).

5.2.3 Survey

To have a broader understanding of the national system of indicator use in SEA in China and to have grounds for the case investigation, a survey was taken between June and August 2012. The survey was designed with the help of the online program "SurveyXact" developed by Ramboll, Denmark. Data were collected online. Potential respondents included SEA practitioners, stakeholders, researchers and administrators. Of the 75 contacted respondents, 46 responded.

The survey consisted of three blocks of questions:

- General questions related to guidance and the handling of indicators
- Specific questions related to respondents' experiences with the choice of indicators
- Specific questions related to the impacts of using indicators based on respondents' experiences

The first block was designed for two purposes, namely to explore how political–scientific perspectives and indicator aggregation are understood and demonstrated in the national guidelines (Articles 1 and 2). The second block touched upon the indicators' role in influencing communication in SEA (Article 3). The last block focused more on the last sub-research question concerning indicators' influence on planning/decision-making (Article 4).

Summary

After designing the conceptual models and deciding on the methods for exploring each sub-research question, the research moves further to the empirical work. Applying these models to the Chinese SEA system, through empirical investigation based on the mentioned materials and

resources, generated many interesting findings. The results of the investigation and summary of the findings based on four journal articles are presented in Chapter 6 in Part 2.

PART 2

CHAPTER 6

ANALYSIS OF RESULTS

This chapter presents the main findings of this research. These findings are arranged according to each sub-research question. A brief summary of the overall results is presented at the end of this chapter.

6.1 Guidance development towards higher aggregation

This section presents the analysis results of the first research question: how and why did the SEA indicators system change? The results end with a documentary analysis of the two versions of technical guidelines and interviews, both on the general level and the case level.

6.1.1 Changes in scope

The Technical Guidelines (2003) provide a general procedure for SEA in one document and six recommended indicator lists for different sectors. The Technical Guidelines (revised version 2009), in addition to being a principal set of guidelines at a general level, consists of single documents with guidelines for five sectorial plans:

- Technical Guidelines for PEIA (General principles) (2009, under revision)
- Technical Guidelines for PEIA (Coal Industry Mining Area Plan) (2009, published)
- Technical Guidelines for PEIA (Forestry Planning) (2009, under revision)
- Technical Guidelines for PEIA (Onshore Oil and Natural Gas Field General Exploitation and Development Plan) (2008, under revision)

- Technical Guidelines for PEIA (Land Use Plan) (2009, under revision)
- Technical Guidelines for PEIA Urban Master Plan) (2009, under revision)

A comparison between the two versions of guidelines regarding their use of indicators has been undertaken (Gao et al., 2012a, 2012d). First of all, The Technical Guidelines (revised version 2009) indicate a narrowing down of the scope of the sectoral plans. The scope of the spatial plans was the same in 2003 as in 2009. The urban plan and the land use plan were the same, but the regional plan guideline disappeared in the 2009 version. Meanwhile, the scope of the resource plans had become narrower - the energy plan had become the coal plan and the oil and gas plan while the industry and agriculture plans had disappeared and a forestry plan had been introduced (Table 6.1). One contextual rationale behind this development of guidelines from more general to narrower topics could be the boom in the economy in Chinese society over the last decade and the consequently huge demand for natural resources, which significantly initialled a vast amount of development plans for various industries. In practice, those development plans called for more specific guidance when taking SEA. Furthermore, among the sectoral guidelines, there were also differences in the number of assessment objectives and indicators. On one hand, more themes and objectives addressed more comprehensive types of plans, such as urban plans and land use plans (later referred to as spatial plans). Likewise, fewer themes and objectives were found for dealing with resources like energy and forestry (later referred to as resource plans) which were presented in sector-oriented plans. On the other hand, the spatial plans, as more objectives were formulated, were expected to have a broader scope than the resource plans. There were a similar proportion of objectives in the two versions of the guidelines. A clear tendency towards more objectives per plan in the spatial plans than in the resource plans was identified.

Year	Plan type	Indicators for sectors	Themes	Objectives	Indicators
2003	Resource	Energy plan	5	5	19
	Resource	Agriculture plan	5	5	17
	Resource	Industry plan	7	7	31
	Spatial	Regional plan	8	19	28
	Spatial	Urban development plan	7	12	53
	Spatial	Land use plan	5	8	19
	Total		37	56	167
2009	Resource	Coal plan	3	4	35
	Resource	Forestry plan	3	5	50
	Resource	Oil and gas plan	4	10	30
	Spatial	Land use plan	5	8	28
	Spatial	Urban plan	15	18	38
	Total		30	45	181

Table 6.1 Indicators listed in Guidelines 2003 and 2009

When looking at the distribution of indicators, it was found that the spatial plans had a broader scope than the resource plans, with more objectives covering more 'ground'. Meanwhile only a few indicators were needed for spatial plans to describe each objective, while more indicators

were used in the resource plans to describe each objective. It could be therefore hypothesised that the spatial plans used more aggregated data to cover broader ground, while the resource plans used more specific indicators to describe more specific objectives. This comparison also implies that a common indicator list for all sectorial SEAs might be inappropriate, because it seemingly covers different aspects of sustainability as well as different levels of aggregation.

6.1.2 Changing of indicators aggregation

Using the four developed categories presented in Section 5.1.1 (Figure 5.1) to analyse the aggregation level of indicators listed in the two versions of the guidelines, a clear indications shifting from relying mostly on "non-aggregation indicators" and "aggregated indicators" in 2003 to more "complex aggregation indicators" in 2009 was identified (Figure 6.1 and Figure 6.2). It was also found that spatial plans had in general changed more dramatically from being based on more "non-aggregation" and "aggregated indicators" in 2003 to being based on more "complex aggregation indicators" in 2009 than those of the resource plans. An important observation is that the "complex aggregation indicators", due to their ambiguous structure, require interpretation in terms of how to understand the indicators and which data to collect.

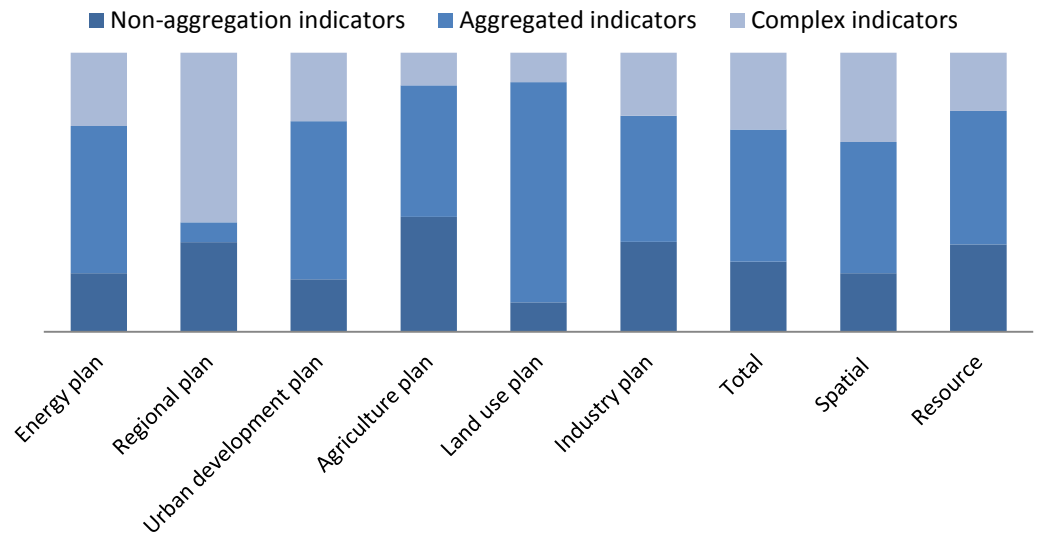

Fig. 6.1 Aggregation levels of indicators in the 2003 guidelines

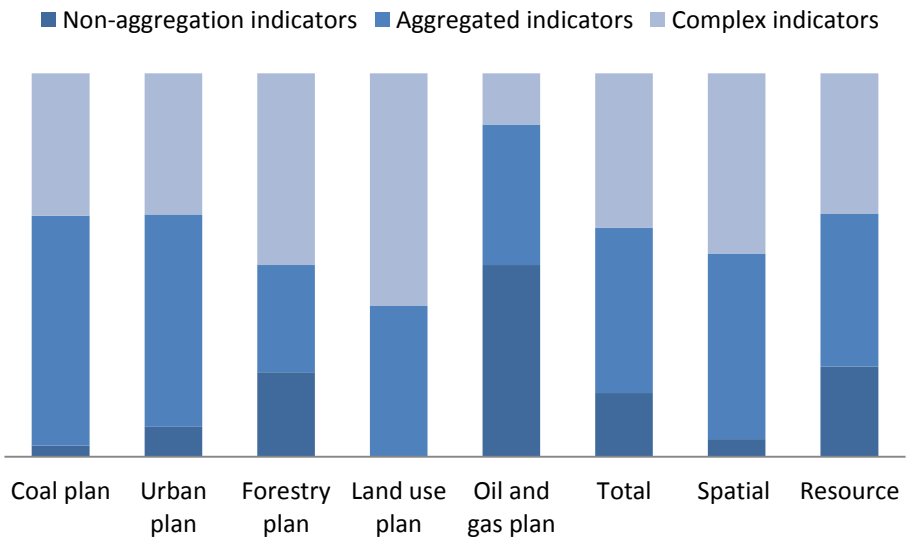

Fig. 6.2 Aggregation levels of indicators in the 2009 guidelines

This overall trend indicates that the new guidelines provide, and require, more room for interpretation in designing and using indicators in practice. This bottom-up approach is given more emphasis in the guidelines for spatial plans than in those for resource plans, for which one rationale could be that due to the nature of spatial plans, they are more likely implemented at local level, which demands more local, contextually relevant input in designing and using indicators, while resource plans could more likely be implemented at a general levels. The changes taking place between 2003 and 2009 show that the understanding and intention of using indicators is changing, while the reliance on indicators had continued to increase.

6.1.3 Stronger emphasis on indicators' application

Besides the scopes, changes on indicators' application are also identified in the Technical Guidelines (revised version, 2009). Firstly, it highlights the core role of environmental objectives and indicators in SEA and emphases their significant influence on SEA's output. The official explanation of the revised guidelines, explicates the important role of indicators in SEA "This revised version extremely emphasizes the core role of environmental objectives and the indicators in SEA as the most important basis for the whole assessment process" (The explanation for The Technical Guidelines, revised version 2009, p. 6). This shows that indicators are seen as an essential part of the SEA: "environmental objectives are the base of Planning EIA, and indicators are designed to assess the feasibility and achievability of those objectives" (The Technical Guidelines, revised version, 2009, p. 8). The increased focus on the procedure goes hand in hand with a clearer understanding of the roles played by different parts of the process and its connection to indicators and environmental objectives. The guidelines draw attention to all the steps or stages to stick to: "…the final SEA report should describe clearly the …environmental objectives and assessment indicators…" (Technical Guidelines, 2009, p.

14). Secondly, more attention has been paid to the principles and the process of how to choose indicators apart from those on the recommended indicators list (see Section 6.2.2).

6.1.4 Top-down intention – bottom-up effect

Two positions seems to be widespread among Chinese planners: firstly, the idea that guidelines should reflect the fact that sectors are different, and secondly that guidelines should in any case be strict and focused when it comes to the indicators they use: "The guidelines (2009) provide a more comprehensive and broader scope in covering sectors… it is better to base on sectoral-level plans instead of on a general level, and this will make the use of indicators more purpose-aimed and targeted" (G01, 2011). In this way the guidelines also provide clearer requirements on when and how indicators should be used: "Future guidelines should provide standard values for the recommended indicators in the related sectoral guidelines" (G03, 2011). This clearly states a more top-down intention to develop new guidelines, by requiring more specific sectoral guidelines and also by demanding official standard values for the applied indicators to enable even more central control. There is a vast amount of different SEA and EIA needs to be carried out in a society with such extreme growth potential. There are many "different development plans due to the rapid economy growth in China. With its own characters, each kind of plan requires its own framework to make a SEA" (G04, 2011). For some other commentators, this reflects the fact that "the biggest problem or challenge for SEA in China is that there are no specific regulations for the planning process, so it is hard for SEA practitioners to follow a standard guide to assess them" (G03, 2011).

Besides the top-down intention, on one hand, most of the interviewees agreed that there should also be room for the public and other stakeholders to be engaged in the selection of indicators. One of the expectations from an authority perspective is that: "we need a combination of recommendation and self-chosen indicators in every single SEA, identifying the environmental objects and targets by 1) experience from previous projects, 2) experts' experience 3) communication with planning sectors. We have several good examples, which had very effective communication and cooperation with the planning sector" (G04, 2011). On the other hand, it is important that the analysis of SEA does not become too detailed as this might lead to a situation of "choking in facts": "the more detailed it is, the more useless it is as a guideline. At this stage, the most efficient method of writing guidelines is to rely on some basic principles, instead of listing too much detailed information. For example, providing the environmental objects and key issues for SEA, highlighting the communicational process of SEA, and standardising the operation and application of the SEA process would be helpful" (G04, 2011). The way forward is to keep it simple and specific according to what sector is being addressed. A '…flexible way of using indicators in SEA has two criteria: 1) describing the relevant issues and impact clearly, 2) being selected and used in a rational process… with these two principles, they are excellent indicators' (G04, 2011). This was also emphasised by another interviewee: "Guidelines are useful for both the SEA team and the review committee. For SEA practitioners, they show what the expected output of an SEA is. For the committee, they give a standard by which to evaluate an SEA's quality… one thing that should be highlighted is the balance of qualitative and quantitative indicators" (G02, 2011).

As a consequence of the higher and more complex aggregation level found in the new guidelines, stronger discretion is given to the practitioners involved in each SEA. The empirical material collected through documents and interviews does not, however, reveal a Chinese consciousness towards this indirect consequence of operating on a higher and more complex aggregation level. This change and needed discretion therefore are not seen as a clear political choice of strengthening the bottom-up approach within SEA practice. This dialectic between bottom-up and top-down approaches to SEA indicators is further explored and discussed in the next section on the science-policy interface.

6.2 The science-policy interface of indicators – and the stronger discretion

This section presents the analysis results of the second research question: "How do the SEA guidelines and the practice address and mediate the science-policy interaction in the use of indicators? " The results are concluded through a documentary analysis of the two versions of technical guidelines, interviews and an online survey on the general level.

Science and technical knowledge are needed to specify SEA indicators. However, the development and use of indicators is also a political process. Earlier on, it was argued that the choice of indicators is a process of both using and producing scientific/technical knowledge and political norms and values. The latter involves questions like "what do we need to sustain ourselves", "how do we value different environmental qualities" and "how do we interpret the results from assessments". If objectives and indicators are clear and unambiguous, SEA experts can usually determine the data required. In contrast, in the Chinese context, the ambiguity makes the selection of specific indicators and data more dependent upon the political dimension and more likely reflect the practitioner's value. Whether and how the Chinese guidelines include recognition of indicators functioning at the interface between science and politics is presented and discussed in what follows.

6.2.1 From technical minimalistic to comprehensive systems

The quantitative nature of indicators is emphasised by the guideline: "According to the national and sectorial policy requirements, indicators should be selected to represent the environmental objectives quantitatively or semi-quantitatively" (The Technical Guidelines, revised version 2009, pp. 8–9). However, there was a clear tendency to have more indicators in the guidelines relying on higher aggregation and complexity indicators ('Complex aggregation indicators') in 2009 than in 2003, indicating that, by using more ambiguous aggregated indicators, practitioners would be informally given more discretion. With regard to this increased aggregation, 79% of the respondents thought this was positive but in order to quantify environmental and social concerns on an appropriate level; there is a limitation on how far indicators' aggregation can be

improved. 88% of the respondents said they wanted to have more guidance in selecting indicators for SEA, among which 79% emphasised more recommended indicators for specific sectorial SEA, 69% wanted more detailed procedures or methodologies for selecting indicators, and only 13% were concerned with the issues of stakeholders' engagement in selecting indicators.

The importance of indicators in simplifying the handling of vast amounts of information was also highlighted by the survey respondents. 88% of the respondents thought that indicators are useful or very useful in data collection, 97% found indicators useful or very useful in assessment and 84% saw experienced indicators as being useful or very useful in evaluation and approval. Based on these results, it seems that more technical prescription is called for.

6.2.2 Weak political reflexivity and guidance

The analysis shows that the Technical Guidelines (revised version, 2009) fail to incorporate statements or discussions about the value-laden elements in choosing indicators. This does not, however, explicitly reflect upon how indicators influence consideration of values and policies.

The respondents show a clear concern for the political aspects: 88% of the respondents view selection of indicators as both a technical and political process, although only 14% thought that the guidelines address the political and value-driven aspects of selecting and using indicators in SEA to an appropriate extent. Another gap between expectation and reality is that the quality review of SEA reports is expected to be based upon guidelines requirements including appropriate designing and using of the indicators (G01 2011; G03 2011), which actually embed value-laden activity. However, the experience of the Appraisal Centre for the Environment and Engineering (ACEE) shows that "the appraisal committees review an SEA mostly rely on personal experiences, which leads to a situation that different experts have different understandings of the project without a common standard" (G02 2011).

Indirectly, the Technical Guidelines (revised version, 2009) recognise that knowledge production is also a political process as it suggests an inclusive selection process and thus indirectly, such as:

- "Based on the experts' consultation and public comments collection, indicators should be selected relevant to plans in different sectors" (Ministry of Environmental Protection of China, 2009: The explanation for The Technical Guidelines (revised version, 2009, p. 10)
- "The indicators could be selected through plan analysis, experts' consultation and public participation" (Ministry of Environmental Protection of China, 2009: Technical Guidelines for Planning-EIA (Urban Master Plan), revised version, 2009, p. 8)
- "Broader public participation can facilitate a more precise evaluation of the impact on the sustainability development, reduce the possibility of excluding any themes or problems, and make the decision-making more democratic" (Ministry of Environmental Protection of China, 2009: Technical Guidelines for Planning-EIA (Forestry Planning), 2009, p. 8).

However, no indication can be found in the guidelines for addressing issues like the extent to which participation can influence the list of final indicators. The response from the Ministry of the Environment also expresses this expectation. One interviewee mentioned that "experience of previous projects, experts' personal experience and communication with planning sectors" is important in selecting and designing indicators (G04 2011), while no members of the public or politicians are included. This statement is supported by the survey results. In spite of 81% of the respondents in the survey recognising public/NGO involvement as being important or very important, in practice, very few of them had ever actually experienced public participation (70% had never or rarely experienced this) or engagement with NGOs (79% had never or rarely experienced this) in selecting indicators for the SEA.

As an on-going process, "The recommended indicators listed by these guidelines should be adjusted or extended during the SEA" (Ministry of Environmental Protection of China, 2009: Technical Guidelines for Planning-EIA (Land Use Plan), 2009, p. 6), which is also supported by the survey results: 74% respondents selected some indicators from the guidance and supplemented these with others, while only 21% relied only on the guidance. As for the flexibility of the selection process, 26% of the respondents' experience shows that indicators were selected at the early stages of SEA and had never changed during the process, while 30% had experienced these as an on-going process. The most frequent triggers for adjusting indicators during the process were the planning team's input (60%), the politicians' suggestions (58%) and sometimes, although not quite often, the public and/or NGOs' input (23%).

The above results show that the official recognition and understanding of the political aspect of indicators is considered to be weak. The lack of explicit recognition and reflexivity on the subjective and value-laden elements in indicator systems has been found to be critical.

6.3 Indicators' influence on communication in SEA

This section presents the analysis results of the third research question: how do indicators influence communication in SEA? The results are concluded in a case study on two Chinese Urban Planning SEA cases, interviews on a case level and the online survey.

6.3.1 Using indicators in internal and external communication

Based on general experience, the survey investigated whether using indicators influences the internal and external communication in SEA. The results show that 81% of the respondents experience indicators as being useful or very useful in communicating internally within the SEA team in their practice. During the internal communication in the different stages, the results showed that a high percentage of respondents agreed that indicators are useful or very useful in communicating with other practitioners in the stages of screening (84%), scoping (84%), data collection (88%) and assessment (98%) (Figure 6.3).

For those SEA stages involving external communication (Figure 6.4), the survey results showed that indicators are considered to be useful or very useful for evaluation and approval (84%), follow up and monitoring (86%), public participation (71%) and communicating with decision-makers (89%). But for "communicating with planners/decision-makers" the survey results also showed that more than 57% of the respondents found that there was not enough communication between SEA practitioners and decision-makers regarding how to use indicators in SEA and planning/decision-making. With regard to the interviews, various reasons have been mentioned for the existence of the challenges and barriers experienced in communicating between the SEA team and the planning team. One explanation is that the different kinds of consciousness of environmental considerations make the capacity vary between sectors (G02, 2011). Furthermore, institutional barriers seem to create problems in communication between the two teams/sectors, such as "the conflict between different sectors or departments regarding SEA's role in China" (G03, 2011), "the decision making mechanism and the conflict between different departments" (G04, 2011), and the weak capacity of SEA practice in China due to the use of SEA in the country still being in its infancy (G03, 2011).

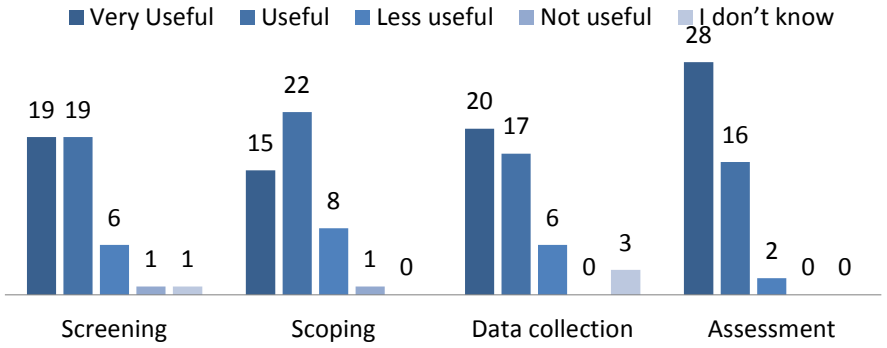

Fig. 6.3 Survey: Indicators using in internal communication within SEA team (N=46)

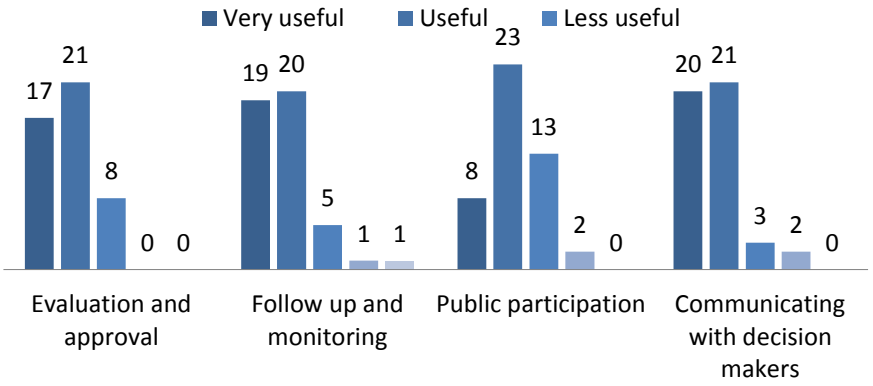

Fig. 6.4 Survey: Experience of contribution of indicators to improving communication at different stages of SEA (N=46)

When communicating externally, the survey also shows that indicators increase external involvement in the SEA process. 46% experienced increased political involvement (30% as partly and 23% not), 30% experienced the increased participation of the public/NGOs (32% partly and 34% not), and 39% experienced increased communication between authorities and the public/NGOs (30% partly and 27% not).

To explore further how those involvements are increased, two perspectives on the communication flow direction, one-way communication and the two-way communication were investigated. The survey shows the results of communicating with the three groups of external stakeholders (NGOs, the public and politicians) (Figure 6.5). The effects of communication were divided into "no influence" and "better informed", which represented the one-way flow of communication, and categories such as "more listened to", "more engaged in assessment and problem solving" and 'more part of decision-making", which represented a two-way flow of communication. The five effect levels represented a ladder of participation with partaking in decision-making as the highest step.

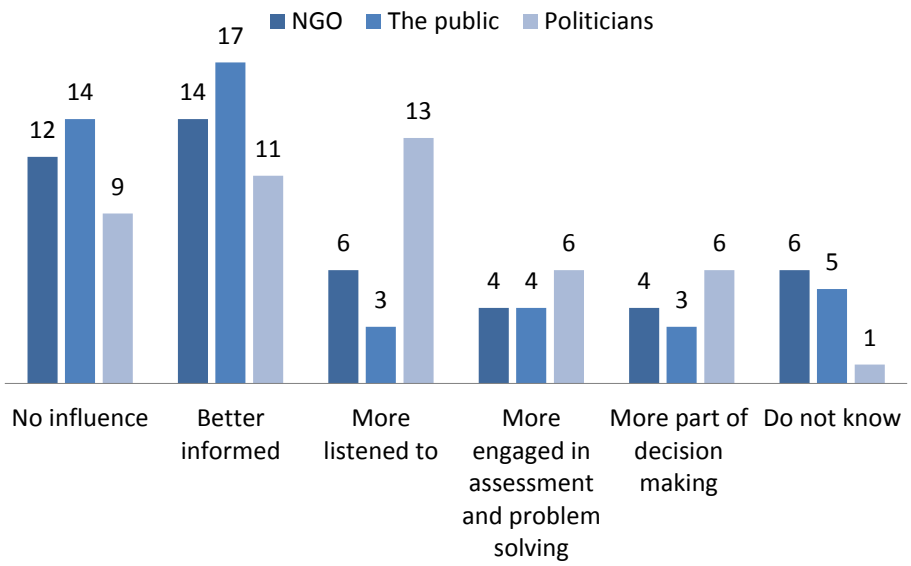

Fig. 6.5 Survey: Experience with how indicators influence the participation of stakeholders in the SEA process (N=46)

The experience of SEA practitioners reveals that indicators in SEA mostly influence one-way communication by providing better information to all external stakeholders, among whom the public seem to be most influenced, and politicians the least. For two-way communication a clear result is that indicators mainly influence the political involvement in the SEA process, compared with the public and NGOs.

6.3.2 Selecting indicators through communication

In the Shenzhen case, the SEA called for several consultation meetings with specialists and experts from the environmental sector and the planning sector to develop the list of indicators. But no project developer had participated as a stakeholder. Furthermore, public involvement did not happen in designing indicators either, due to the low level of public concerns. During the interview, an impression was gained that the planning team paid quite a lot of attention to public participation and found that the public actually only cared about issues directly influencing them or relating to them.

The Dali case presents another picture. As an internationally funded research pilot case, a different understanding of the SEA process can be observed. This case significantly emphasises the importance of cooperation and communication among sectors and stakeholders. Besides the SEA team, a comprehensive list of departments and organizations was involved in this process: local government, the environmental protection authority, planning authority, a consultation board with experts from the local Congress and Committee of the Political Consultative Conference (who used to work for environmental sector and construction bureau) and the vice mayor of Dali, who is in charge of environmental issues. In this case, an information sharing and collaboration mechanism was set up. Regular meetings of the cooperating sectors and stakeholders made data and information sharing possible, and the SEA team also updated and shared knowledge, understanding, recommendations and suggestions. A study of this case also showed that the scope of the objectives being assessed was intensively discussed. Environmental, social and economic issues were included and the environmental issues were paid the most attention (Dusik and Xie, 2009). Based on this collaborative platform, the SEA team listed the most basic environmental indicators according to the guidelines and the project. During the consultation process, the indicator list was adjusted according to the consulting suggestions.

6.3.3 Communicating by using indicators

Significantly different from the impression drawn from the interviews based on general experience, our investigation shows that external communication is conducted more extensively in the two cases, although in both cases the external communication mainly involves various sectors and experts, with low levels of public participation.

In the Shenzhen case, communication between the SEA and the planning process started even before the planning started, according to the account of one of the plan's leaders. On one hand, this early engagement facilitated the selection of objectives and indicators. On the other hand, using indicators also facilitated communication between the practices of SEA and planning. Using indicators as a tool to set some environmental requirements, and communicating with the SEA team also offered the planning team support in balancing the conflict between the different sectors involved. Indicators were also used as a main communication tool and for the

explanation of environmental targets. In terms of external communication in the Shenzhen case, it was found that the main communication was within the group of experts, with a low level of engagement by the general public. The SEA team chose those popular indicators that the public were familiar with (e.g. energy saving indicator). The public did not show much interest in the general development plan. Instead, more interest was shown in detailed planning such as construction projects that related more directly to the private sector. This was also seen as presenting a challenge to effective public participation in environmental assessment on the strategy level.

In the Dali case, indicators were frequently used in communicating with the cooperating departments, especially with the planning team. This was seen as one of the highlights of this case. In deciding on the key assessment objectives, the SEA team also involved the public by undertaking a survey with tourists. It was found that the survey provided certain information in giving a broad scope in helping decide on the key objectives. However, when communicating with decision-makers, a rather interesting finding was that the SEA team tried to avoid using too much detailed information, due to the consideration that "it needs more information than indicators can provide to influence the decision-making". But by initiating communication at a very early stage and involving decision-makers in the SEA process, this SEA had the opportunity actually to influence the decision-making process, by developing indicators of relevance for the decision-maker.

6.4 Indicator's influencing on planning

This section presents the analysis results of the fourth research question: "What is indicators' role in influencing planning/decision-making during SEA? " The results are presented through the case study on two Chinese Urban Planning SEA cases, interviews about the case level and an online survey based on general experience.

6.4.1 An intention of structural influence

The technical guidelines (2003 version and 2009 version) provide standard procedures, technical methods and skills, models and recommended indicators to practice. SEA was conducted according to the established standards and followed the fixed Chinese national legislation and technical guidelines in what was generally interpreted as a normative process. When looking into the steps taken in the SEA and how they interacted with planning (framing problems by screening, defining key objectives by scoping, establishing alternatives and scenarios, identifying consequences by assessing alternatives and scenario and, clarifying trade-offs by making decision among the alternatives), it needs to be clearly recognized that SEA in China has very clear stipulated goals to achieve and standard procedures to implement SEA and its interaction with planning and decision-making is clearly a structured process that easily can be

identified. It was found that the Chinese SEA relies very much on theoretical assumptions about perfect causation, an assumption that is one of the typical features of rational planning and decision-making. It obviously does not always work that way in reality, or the link between them may be much more complicated than envisaged in the theoretical assumptions. Besides all the above characteristics, this adds to a picture of a highly normative system, wherein indicators use standard values that are often applied in an EIA, and are also used in SEA in China. Being satisfied by assessing the alternatives against the standard values, the Chinese SEA practice is trying to provide "good enough" results instead of maximal recommendation for planning and decision-making. Based on these findings it suffice to recognize that the practise of SEA in China certainly have a structured way of undertaking SEA.

6.4.2 Indicators influence on SEA procedure

According to the survey, the use of indicators has a significant influence on the SEA procedure. In general, 81% or more of the total number of respondents thought that the indicators were useful or very useful in all the stages except for public participation, and more than 26% of the respondents showed that indicators were considered to be not useful or less useful (Figure 6.3 and 6.4, Section 6.3.1). The survey also explored the role indicators play during the procedure (Figure 6.6). Overall, 93% of the respondents said that indicators gave "a better overview of complex impacts" and 91% experienced "a boundary for the assessment". In identifying the important objectives and targets, indicators in 91% of the cases were found to be useful or very useful. 86% of the respondents stated that, in their experience, the indicators were useful in "guiding data collection", compared to which, only 77% of the respondents showed that indicators are useful or very useful in "communicating internally within the SEA team". Furthermore, 93% of the respondents thought that "indicators quantify the impact" and 84% of them agreed that "indicators make the assessment easier and clearer".

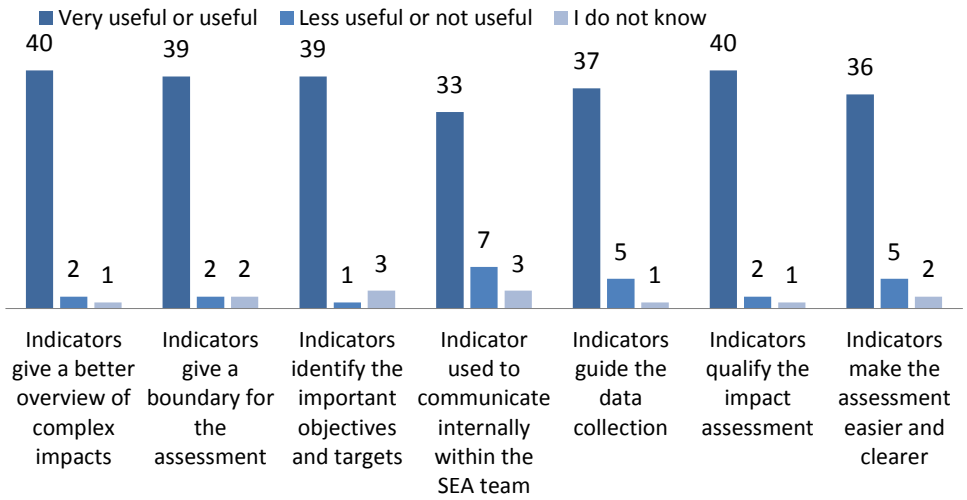

Fig. 6.6 Survey: The role indicators play in the SEA (N=46)

6.4.3 Indicators' influence on SEA through actor participation

The survey result in this study showed that, by using indicators, increased engagement of individuals (65%), NGOs (63%) and politicians (77%) have been observed (Figure 6.7). When further exploring the ways in which these engagements have increased, most respondents thought that is by informing public/NGOs/politicians better information through the indicators (Figure 6.5, Section 6.3.1). "Being more listened to" is also a way in which increased engagements are observed, but 26% of the respondents thought that "politicians are more listened to" while this number is only 14% for NGOs and 7% for the public. Besides the involvement of the various stakeholders, communication between stakeholders is also mentioned as being facilitated by using indicators. This is shown by the response (70%) that using indicators has increased the communication between authorities, the public and NGOs.

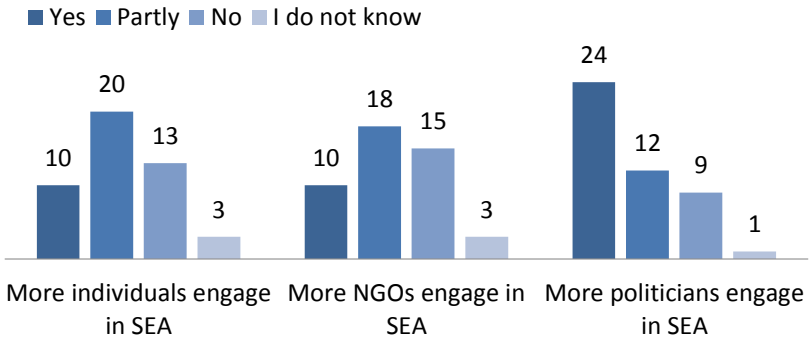

Fig. 6.7 Survey: Indicator's influence on actor's engagement (N=46)

In investigating indicators' influence on integrating SEAs into planning, the survey result showed that using indicators is believed to be useful or very useful in increasing the SEA's influence on plan making (86%), among which the indicators' role as a tool to coordinate with upper level plans is identified as the most useful (Figure 6.8). 84% of the respondents stated that the use of indicators is useful or very useful in implementing the output of SEA.

The survey results have also been reflected in the interviews. The findings from the interview show that the current challenge for a more effective SEA in China should not be considered in terms of technical aspects, since the methodologies of SEA have been well developed and discussed, which reflects the consideration of process being addressed effectively. The real challenge is from the practitioners and the stakeholders, lacking better understanding of effective communication between them in relation to planning and decision-making. One interviewee from the Dali case commented on the way Chinese SEA practitioners use indicators in SEA in that "…instead of using indicators as a mean to assess the impact of the plan and to communicate and cooperate with stakeholders, in many cases indicators are used as an end to be used directly by the planners and decision makers with information pieces other than a whole story", because the interviewee thought that "a whole story is something SEA practitioners should provide to decision-making instead of pieces of information, because the former type of information is more helpful in making plan." Thus, practitioners need to go further in creating a more comprehensive picture based on the information provided by indicators, but in many cases,

due to the "low sense of responsibility" of the practitioners, no more comprehensive information was generated. It is not so difficult to find a basis on which a rational assessment process which is "technical or calculation based" seems to be the standard form of information, and within a standard procedure, it is also believed that scientific information could explain everything, even including many causations, based on which the information was gained, which do not necessarily exist in reality.

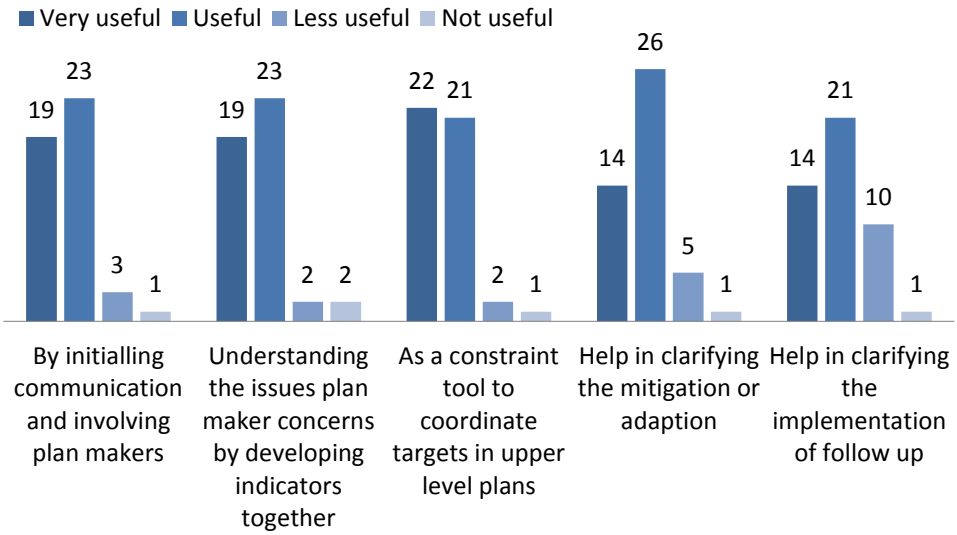

Fig. 6.8 Survey: How indicators increase influence on plan making through SEA (N=46)

Summary

Referring back to the overall approach applied in this research (Section 4.1, Figure 4.2), based on all the findings from the empirical investigation on general experience and case experience, a mapping of the roles of indicators in Chinese SEA practice can be drawn (Figure 6.9). The Technical Guidelines (2003) was identified as being very technical, with the rare political/communicational consideration of using indicators for SEA. Meanwhile a strong top-down intention was presented by providing six recommended indicator lists for different sectors. The Technical Guidelines (revised version, 2009) are again regarded as a technical instrument, although a trend towards to the political/communicational development was identified. With a top-down intention by developing several specific guidelines for five sectoral plan SEA instead of a general guidance, on one hand, The Technical Guidelines (revised version, 2009) emphasise the central control of the environmental authorities in managing SEA practice. However, on the other hand, by increasing the aggregation and complexity of the indicators, the use of The Technical Guidelines (revised version, 2009) also increases the need for discretion of practitioners in using indicators. In addition, the requirements for involving stakeholders in selecting indicators are also stated in some sectoral guidelines, although not in all of them. All

those changes imply a bottom-up effect of The Technical Guidelines (revised version, 2009) in spite of their top-down intention.

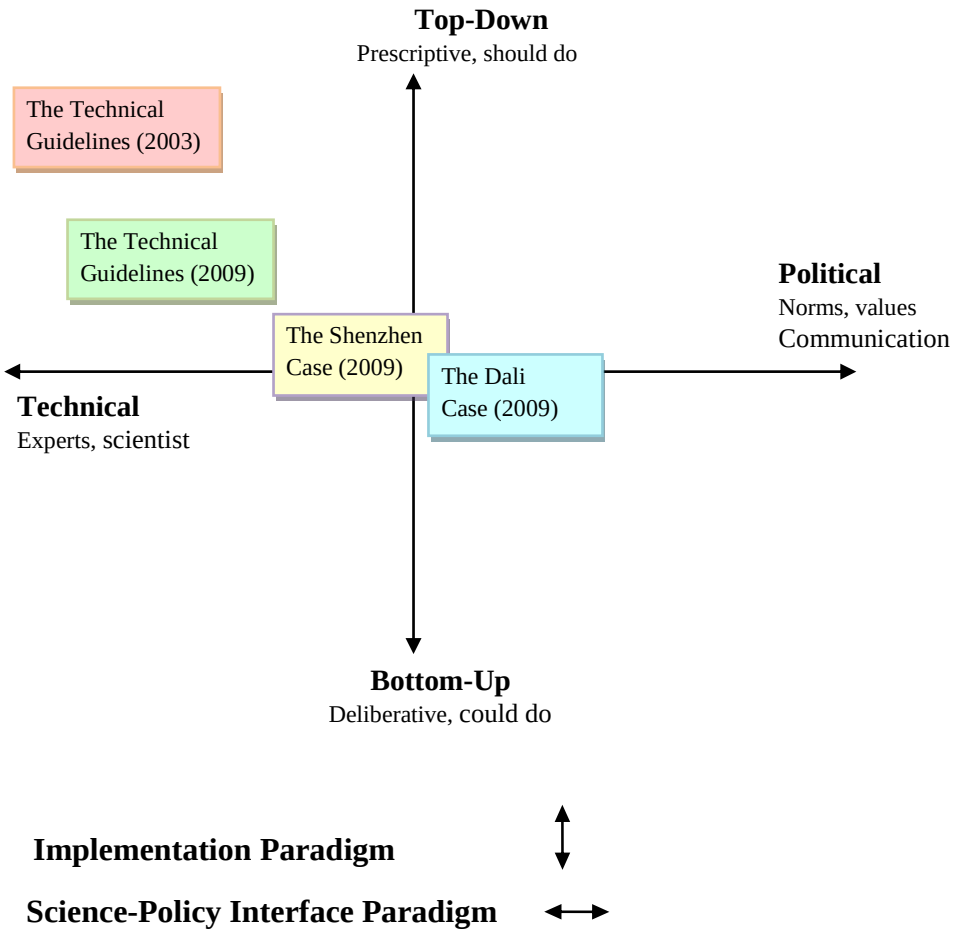

Fig. 6.9 A map of indicators showing the changing role in Chinese SEA practice

Beyond the general experience, two SEA cases in this research have also left their footprints on this map. First of all, in both of the cases, a bottom-up approach to designing and using indicators in SEA was identified. The extent of the bottom-up approach was found in two different cases though. By setting up a regular consulting meeting involving a broad scope of stakeholders, the Dali case adopted a more bottom-up approach than the Shenzhen case. Furthermore, in terms of the science-politics interface, both cases show that they regard and use indicators in a way including more political considerations and purposes. By directly involving some of the decision-makers, the Dali case could include decision-makers' concerns when designing indicators and later using indicators in communicating, in order to improve SEA's influence in making plans.

CHAPTER 7

CONCLUSION

Indicators are considered to be a useful tool in providing precise information on the technical-based EIA. Whether indicators as a typical quantitative and calculation-based tool should be applied in the same way in SEA as in EIA is one of the key concerns of this project. After decades of development, SEA is involved in a global turning of understanding from being a pure technical-based activity to being a deliberative and value-included political tool. At this turning point, it is necessary to ask which kind of information is needed for the environmental assessment and planning and decision-making. As one of traditional ways of transferring information in environmental assessment, do indicators provide the correct and enough information in an appropriate manner for the practitioners and planners/decision makers? In a communicative SEA process, it may be possible to ask whether the use of indicators actually has any influence on communication in a SEA. Also, the nature of the indicators' role in influencing planning or decision-making needs to be investigated. In this context, searching for answers about the indicators' role in SEA becomes even more urgent.

Looking at this issue in the Chinese context moves this research one step forward. After more than two decades of development and practice, the application of SEA in China has been facing the challenges of catching up with current knowledge and updating and renewing the SEA research. Along with the changes in understanding, SEA's implementation in China has also reached a crucial point in its development. Actions are being taken right now within the Chinese SEA system. Six years after it was issued, a revision to the Technical Guidelines for Planning EIA (at planning level) was undertaken in 2009. The updating of general knowledge of SEA, changing of assessment scopes and focus and replacement of the indicator system for sectoral SEA led the research towards a central concern: what are indicators' roles in the Chinese SEA system? To explore this overall objective, four questions of the investigation to answer were formulated for this project:

- How are indicators implemented in the Chinese SEA system?
- How do the national SEA guidelines mediate the science-policy interaction of indicators using?
- How do the indicators influence communication in SEA?
- What is the indicator's role in influencing planning/decision making during SEA?

Taking the Chinese SEA system as a whole as the research objective, although there is only limited experience in practice, this research is still taking risk of being too general and lacking of detailed information. To supplement any potential missing knowledge, besides a general investigation of indicators application in Chinese SEA as general experience, the research included two Urban Planning SEAs as a case study, which provided a much closer position to observe, record and analyse indicators using in SEA in practice.

This chapter concludes the PhD project as a research activity. Firstly, the main findings based on each research question will be summarised here. It will also provide some reflections on the research design for this project, including the choice of theories and employment of specific methods and will focus on how the project contributes to the filed both in academic research and the practice. The chapter ends with some short proposals for future research.

7.1 Main findings and contribution

To express my own concerns about the indicator's role on the grounds described above, a primary research perspective is sketched out to study the indicators' application in SEA in the science-political interface. From this perspective, indicators function in SEA as a technical/calculation tool and as a communicational/political media become to the main concerns. When those concerns are further developed in terms of detailed analysis, it was found necessary to create another perspective to deconstruct the SEA system or practice into various pieces as stages of a process in order to stand at a higher point to look over how the indicators are understood, addressed, implemented and applied in Chinese SEA practice. At this point, implementation theory may be relevant in deconstructing the SEA implementation process and in providing a perspective for investigating the factors that influence indicators using in SEA. Under the background of the newly launched revised Technical Guidelines, implementation theory can be applied to explore how the new guidelines could be developed and why those new developments happened in the first place. Furthermore, the implementation theory provides an operational approach for this study in order to illustrate how the way of implementing indicators can make a difference in terms of influencing the planning process. By combining the above two perspectives, an overall design for this research is proposed (Section 4.1, Figure 4.2).

This overall research design is regarded as being innovative in two ways. Firstly, it identifies two characteristics of indicators that deserve careful investigation. These are function and implementation, which provide perspectives for studying the indicator's role in SEA. Secondly, it innovatively combines those two dimensions in one framework, which can firstly be regarded

as a reference for the similar analysis, and secondly as creates a multi-criteria approach for future relevant research activities. Within this multi-dimensional approach, research into indicators can be meanwhile developed more broadly in perspective and more deeply in dimensions.

Overall, indicators are considered and employed as a useful tool in current SEA practice in China. A top-down intention to implement and guide indicators' applications can be identified by listing more specific indicators for sectoral plans in national technical guidelines, while both the revised version of technical guidelines with higher information aggregation level of indicators and the latest practice with more deliberative practice suggest a change to a more bottom-up effect, along with a willingness is happening. Being applied as mainly technical tool with its scientific function rather than as a political tool with its political function, the indicators mainly influenced the internal communication within the SEA team and sometimes the external communication with planners or other relevant sectors. When communicating externally with politicians, NGOs or the public, the indicators do not show SEA practitioners as having too much influence, although using indicators does have more influence in communicating with politicians than with NGOs or the public. As well as affecting communication, using indicators can also influence plan making, through either the structure of SEA or through those actors and practitioners engaged in SEA. The indicators are experienced enough to have more influence on planning through SEA structure like procedures than through actors such as practitioners, members of the public or politicians, which suggests that using indicators may improve SEA's efficiency or procedural effectiveness, but does not necessary improve the effectiveness of an SEA in terms of integrating SEA results into planning or decision making for direct effectiveness or engaging in more public participation as a form of indirect effectiveness.

7.2 Future research agenda

Completing PhD research involves working within a limited timeframe. Applying indicators in SEA is a systemic topic as part of the study of SEA methodologies. To give an overall picture of indicators' application in SEA, this concerns the question of why (use indicators), what (to use), how (to choose and use indicators), who (use indicators) and when (to use indicators). This research makes an attempt to explore questions of why (to use indicators) and who (use indicators and to whom use indicators on). However, questions such as what (to use), how (to choose and use indicators) and when (to use indicators) remain to be investigated. The question of how (to choose and use indicators) though is, to some extent, pursued in the analysis and discussion of the science-policy interface of indicators in this research.

"What to use" involves concerns like which types of indicators should or could be used in SEA. The term "type" here can be investigated from many perspectives, such as qualitative or quantitative, normative or descriptive, aggregative or non-aggregative, input-based or outcome-based. 'How to choose and use indicators' focuses on the approach for designing and applying indicators. With regard to this topic, some existing researches (Donnelly et al., 2006; Donnelly

et al., 2007) test an operational procedure for selecting indicators for SEA. They provide a very good starting point to inspire further investigation. However, perspectives such as how to deal with top-down requirements and bottom-up demands, or how to address indicators' science-politics interface when designing an indicator list for an SEA case, can also be explored further. Apart from the question of "how to choose indicators", "how to use indicators" is also very interesting. According to Brown and Thérivel (2000), cooperation with stakeholders is one of the key elements which influence the output of SEA. Although this research touches upon how the use of indicators influences communication between stakeholders, the question of "how to use" indicators in a better way to improve this influence could be investigated in much more detail. This question is also connected to another question of "when to use indicators". The term "when" here could be interpreted in two ways. Firstly, at which "stage" of SEA should or could indicators provide assistance, and secondly, in cooperating or communicating with whom, indicators could be a useful tool.

As part of the systemic research, this study has only made an attempt to draw part of an overall picture of the indicators' role in SEA. All of the above-remained proposals therefore could and should find a position on the future relevant research agenda.

REFERENCES

Ahmed, K., Sanchez-Triana, E. SEA and policy formulation. 2008. In: Ahmed, K., Sanchez-Triana, E, (eds). Strategic environmental assessment for policies: An instrument for good governance. Washington DC: The World Bank. p. 1–9.

Allmendinger, P. 2002. Planning theory. Hampshire: Palgrave Macmillan.

Arendt, H. 1970. On Violence. San Diego: Harcourt, Brace & World.

Atkinson. G., Hamilton, K. 1996. Accounting for Progress: Indicators for Sustainable Development. Environment: Science and Policy for Sustainable Development 38(7): 16–44.

Bao, C., Lu, Y. 2001. Study on the establishment and verification of indicator system for strategic environmental assessment. Shanghai Environmental Sciences 20(3): 113–115.

Bao, C., Lu, Y., Shang, J. 2004. Framework and operational procedure for implementing Strategic Environmental Assessment in China. Environmental Impact Assessment Review 24(1): 27–46.

Bardach, E. 1977. The implementation game: what happens after a bill becomes a law. Cambridge and London: MIT Press.

Bardach, E. 1998. Getting Agencies to Work Together: The Practice and Theory of Managerial Craftsmanship. Washington DC: Brookings Institution Press .

Barrett, S.M., Fudge, C. 1981. Policy and action: essays on the implementation of public policy. London: Methuen.

Bell, S., Morse, S. 2001. Breaking through the Glass Ceiling: Who really cares about sustainability indicators? Local Environment: The International Journal of Justice and Sustainability 6(3): 291-309.

Bina, O. 2007. A critical review of the dominant lines of argumentation on the need for strategic environmental assessment. Environmental Impact Assessment Review 27 (7): 585–606.

Bina, O. 2008. Context and Systems: Thinking More Broadly About Effectiveness in Strategic Environmental Assessment in China. Environmental Management 42(4):717–733.

Bina, O., Jurkeviciute, A., Zhang, H. 2009 Transition from plan environmental impact assessment to strategic environmental assessment: recommendations of the project "policy instruments for Chinese sustainable future". CHINA-EPI-SEA Paper No. 27_EN. Sweden: Stockholm Environment Institute.

Bina, O., Wu, J., Brown, l., Partidário, M.R. 2011. An inquiry into the concept of SEA effectiveness: Towards criteria for Chinese practice. Environmental Impact Assessment Review 31 (6): 572–581.

Bond, A.J., Dockerty, T., Lovett, A., Riche, A.B., Haughton, A.J., Bohan, D.A., Sage, R.B., Shield, I.F.,

Finch, J.W., Turner, M.M., Karp, A. 2011. Learning How to Deal with Values, Frames and Governance in Sustainability Appraisal. Regional Studies 45(8): 1157-1170.

Bossel, H. 1996. Integrated assessment. Deriving indicators of sustainable development. Environmental Modeling and Assessment 1(4): 193-218.

Braat, L. The predictive meaning of sustainability indicators. 1991. In: Kuik, O., Verbruggen, H. (eds). In research of indicators of sustainable development. Dordrecht: Kluwer Academic Publisher. p. 59-70.

Brown, A. L., Thérivel, R., 2000. Principles to guide the development of strategic environmental assessment methodology. Impact Assessment and Project Appraisal 18(3):183–189.

Brugman, J. 1997. Is there method in our measurement? The use of indicators in local sustainable development planning. Local Environment. 20(1): 59–72.

Centre of SEA for China in The Chinese University of Hong Kong (CSEAC). 2010. Effectiveness criteria for PEIA in China (Draft Version) March, 2010.

Che, X., Shang, J., Wang, J. 2002. Strategic environmental assessment and its development in China. Environmental Impact Assessment Review 22(2): 101–109.

Cloquell-Ballester, V.-A., Cloquell-Ballester, V.-A., Monterde-Diaz, R., Santamarina-Siurana, M. 2006. Indicators validation for the improvement of environmental and social impact quantitative assessment. Environmental Impact Assessment Review 26(1): 79–105.

Dale, V.H., Beyeler, S.C. 2001. Challenges in the development and use of ecological indicators. Ecological Indicators 1(1): 3-10.

Diamantini, C., Geneletti, D. 2003. Implementing sustainability through strategic environmental assessment: Indications from the experience of the Autonomous Province of Trento, Italy. Sustainable World 6: 203-211.

Donnelly, A., Jones, M., O'Mahony, T., Byrne, G. 2006. Decision support framework for establishing objectives, targets and indicators for use in SEA. Impact Assessment and Project Appraisal 24(2): 151–157.

Donnelly, A., Jones, M.B., O'Mahony, T., Byrne, G. 2007. Selecting environmental indicator for use in strategic environmental assessment. Environmental Impact Assessment Review 27(2): 161–175.

Dusik, J., Xie, J. 2009. Strategic Environmental Assessment in East and Southeast Asia: A progress review and comparison of country systems and cases. Washington DC: World Bank.

Elmore, R.F. 1979. Backward Mapping: Implementation Research and Policy Decisions. Political Science Quarterly 94(4): 601-616.

European Environment Agency (EEA). 1999. Environmental indicators: Typology and overview. Technical report No 25. Copenhagen: European Environment Agency.

European Environment Agency (EEA). 2005. EEA core set of indicators-Guide. EEA Technical report No 1/2005. Copenhagen: European Environment Agency.

Faludi, A. 1984. Planning Theory 2nd Edition. Oxford: Pergamon.

Fan, H., Zhou, J. 2008. Framing Indicator System of Strategic Environmental Assessment: A Case of Watershed Planning. Environmental Science and Management 33(11): 191–194. (in Chinese)

Fischer, T.B. 2003. Strategic environmental assessment in post-modern times. Environmental Impact Assessment Review 23(2):155–170.

Flyvbjerg, B. 1998. Rationality and power: democracy in practice. London: University of Chicago Press.

Forester, J. 1989. Planning in the Face of Power. Journal of the American Planning Association 48(1): 67-80.

Forester, J. 1999. The Deliberative Practitioner: Encouraging Participatory Planning Processes. Cambridge and London: MIT Press.

Foucault, M. 1980. Power/knowledge: selected interviews and other writings, 1972-1977. London: Harvester.

Fraser, E.D.G., Dougill, A.J., Mabee, W.E., Reed, M., McAlpine, P. 2006. Bottom up and top down:

Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. Journal of Environmental Management 78(2): 114-127.

Gao, J., Christensen, P., Kørnøv, L. 2012a. The changing Chinese SEA indicator guidelines: top-down or bottom-up? Environmental Impact Assessment Review. Submitted.

Gao, J., Christensen, P., Kørnøv, L. 2012b. The role of indicators in SEA in influencing on planning. Working paper

Gao, J., Kørnøv, L., Christensen, P. 2012c. Do indicators influence communication in Chinese SEA processes. Environmental Impact Assessment Review. Submitted.

Gao, J., Kørnøv, L., Christensen, P. 2012d. The politics of SEA indicators: Weak recognition found in Chinese guidelines. Impact Assessment and Project Appraisal. Submitted.

Gao, S. 2004. Comparison and analysis of EIA and strategic EA by China and Sweden. Environmental Protection (3): 56–58. (in Chinese)

Geneletti, D. 2006. Ecological evaluation of land: some considerations on approaches and shortcomings. International Journal of Sustainable Development and Planning. 1(4): 419–428.

Geneletti, D. 2011. Reasons and options for integrating ecosystem services in strategic environmental assessment of spatial planning. International Journal of Biodiversity Science, Ecosystem Services & Management 7(3): 143–149.

Geneletti, D. 2012. Environmental assessment of spatial plan policies through land use scenarios: A study in a fast-developing town in rural Mozambique. Environmental Impact Assessment Review 32 (1): 1–10.

Geneletti, D., Bagli, S., Napolitano, P., Pistocchi, A. 2007. Spatial decision support for strategic environmental assessment of land use plans. A case study in southern Italy. Environmental Impact Assessment Review 27 (5): 408–423.

Giddens, A. 1984. The Constitution of Society: Outline of the Theory of Structuration. Berkeley and Los Angeles: University of California Press.

Goggin, M.L., Bowman, A., Lester, J., O'Toole, L. 1990. Implementation theory and practice: toward a third generation. Michigan: Scott, Foresman/Little, Brown Higher Education.

Greene, J. C. 1988. Communication of results and utilization in participatory program evaluation. Evaluation and Program Planning 11(4): 341-351.

Gu, L., Sheate, W. 2005. Institutional Challenges for EIA Implementation in China: A Case Study of Development Versus Environmental Protection. Environmental Management 36 (1): 125–142.

Guo, H.L., Huang, Y.Y., Ma, W.C., Yu, Q., Chen, L.M. 2003. A Study on the Indicator Systems for Strategic Environmental Assessment. Journal of Fudan University (Natural Science) 42(3): 468–475. (in Chinese)

Habermas, J. 1981. The Theory of Communicative Action: Reason and the Rationalization of Society, Vol. 1, translated by McCarthy T. Boston, MA: Beacon Press.

Hammond, A., Adriaanse, A., Rodenburg, E., Bryant, D., Woodward, R. 1995. Environmental indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development. Washington D.C: World Resource Institute.

Hanf, K. 1982. Regulatory structures: Enforcement as implementation. European Journal of Political Research 10(2). 159–172.

Hansen, A.M., Kørnøv, L., Cashmore, M., Richardson, T. 2013. The significance of structural power in Strategic Environmental Assessment. Environmental Impact Assessment Review 39(February):37-45.

Healey, P. 1992. Planning through Debate: The Communicative Turn in Planning Theory. The Town Planning Review 63(2):143-162.

Healey, P. 1996 The communicative turn in planning theory and its implications for spatial strategy formation. Environment and Planning B: Planning and Design 23(2):217-234.

Healey, P. 1997 Collaborative Planning: Shaping Places in Fragmented Societies. London: MacMillan.

Hezri, A.A. 2004 Sustainability indicator system and policy processes in Malaysia: a framework for utilisation and learning. Journal of Environmental Management 73(4): 357–371.

Hezri, A.A., Dovers, S. R. 2006 Sustainability indicators, policy and governance: Issues for ecological economics. Ecological Economics 60(1):86–99.

Higgins, J., Venning, J. Introduction. 2001 in: Venning, J., Higgins, J. (eds.), Towards Sustainability: Emerging Systems for Informing Sustainable Development. Sydney: UNSW Press. p. 1–22.

Hilden, M., Furman, E., Kaljonen, M. 2004. Views on planning and expectations of SEA: the case of transport planning. Environmental Impact Assessment Review 24(5): 519–536.

Hill, M. 2009. The public policy process. 5th edition. Harlow: Pearson Longman.

Hill, M., Hupe, P. 2002. Implementing public policy. London: Sage Publications.

Hogwood, B.W., Gunn, L.A. 1984. Policy Analysis for the Real World. Oxford: Oxford University Press.

IETF (Indicators for Evaluation Task Force). 1996. IJC(International Joint Commission). Indicators to evaluate progress under the Great Lakes Water Quality Agreement, International Joint Commission, Canada/USA. http://www.ijc.org/php/publications/html/ietf.html (last access 2012/08/03)

Innes, J. E. 1995. Planning Theory's Emerging Paradigm: Communicative Action and Interactive Practice. Journal of Planning Education and Research 14(3):183-189.

Innes, J. E. 1998. Information in Communicative Planning, Journal of the American Planning Association 64(1): 52-63.

Janssen, R. 2001. On the Use of Multi-Criteria Analysis in Environmental Impact Assessment in the Netherlands. Journal of Multi-Criteria Decision Analysis 10(2): 101-109.

Joumard, R., Gudmundsson, H., 2010. Indicators of environmental sustainability in transport- An interdisciplinary approach to methods, Bron cedex: INRETS Institut national de Recherche sur les Transports et leur Sécurité.

King, C., Gunton, J., Freebairn, D., Coutts, J., Webb, I. 2000. The sustainability indicator industry: where to from here? A focus group study to explore the potential of farmer participation in the development of indicators. Australian Journal of Experimental Agriculture 40(4): 631-642.

Kørnøv, L., Hvidtfeldt, H. The Danish experience of Strategic Environment Assessment. 2003. In: Hilding-Rydevik, T. (ed.). Environmental Assessment of Plans and Programs: Nordic experiences in relation to the implementation of the EU directive 2001/42/EC. Stockholm: Nordregio. p. 9-39.

Kørnøv, L., Thissen, W.A.H. 2000. Rationality in decision- and policy-making: implications for strategic environmental assessment. Impact Assessment and Project Appraisal 18(3): 191–200.

Krank, S., Wallbaum, H., Grêt-Regamey, G. 2010. Constraints to implementation of sustainability indicator systems in five Asian cities. Local Environment: The International Journal of Justice and Sustainability 15(8): 731-742.

Lam, K., Chen, Y.D., Wu, J., 2009. Strategic environmental assessment in China: Opportunities, issues and challenges. Journal of Environmental Assessment Policy and Management 11(4): 369-385.

Lee, N., Walsh, F. 1992. Strategic Environmental Assessment: an Overview. Project Appraisal 7(3):126-136.

Lindenfeld, L.A., Hall, D.M., McGreavy, B., Silka, L., Hart, D. 2012. Creating a Place for Environmental Communication Research in Sustainability Science, Environmental Communication: A Journal of Nature and Culture 6(1): 23-43.

Lipsky, M. 1980. Street-Level Bureaucracy: Dilemmas of the Individual in Public Services. New York: Russell Sage Foundation.

Lyytimäki, J., Rosenström, U. 2008. Skeletons out of the closet: effectiveness of conceptual frameworks for communicating sustainable development indicators. Sustainable Development 16(5): 301–313.

Mao, W., Hills, P. 2002. Impacts of the economic–political reform on environmental impact assessment implementation in China. Impact Assessment and Project Appraisal 20(2): 101–111.

March, J.G., Heath, C. 1994. A primer on decision making: how decisions happen. New York: Simon and Schuster.

McAlpine, P., Birnie, A. 2005. Is there a correct way of establishing sustainability indicators? The case of sustainability indicator development on the Island of Guernsey. Local Environment: The International Journal of Justice and Sustainability 10(3): 243-257.

McGreavy, B., Webler, T., Calhoun, A. J. K. 2012. Science communication and vernal pool conservation: A study of local decision maker attitudes in a knowledge-action system. Journal of Environmental Management 95(1): 1-8.

McLuhan, E. 2008. Marshall McLuhan's theory of communication: The Yegg. Global Media Journal - Canadian Edition 1(1): 25–43.

Ministry of Environmental Protection (MEP) of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Coal Industry Mining Area Plan.

Ministry of Environmental Protection (MEP) of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Onshore Oil and Natural Gas Field General Exploitation and Development Plan (draft).

Ministry of Environmental Protection (MEP) of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Urban Master Plan (draft).

Ministry of Environmental Protection (MEP) of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Forestry Planning (draft).

Ministry of Environmental Protection (MEP) of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Land Use Plan (draft).

Ministry of Environmental Protection (MEP) of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - General principles (draft).

Ministry of Environmental Protection (MEP) of China. 2009. The explanation for Technical Guidelines for Plan Environmental Impact Assessment - General principles (draft).

Morrone, M., Hawley, M., 1998. Improving Environmental Indicators through Involvement of Experts, Stakeholders, and the Public. Ohio Journal of Science 98(3): 52-58.

Nagel, J.H. 1975. The descriptive analysis of power. New Haven: Yale University Press.

Nardo. M,. Saisana, M., Saltelli, A., Tarantola, S., Hoffman, A., Giovannini, E. 2005 Handbook on constructing composite indicators: methodology and users guide. OECD-JRC joint publication. OECD Statistics Working Paper STD/DOC(2005)3, T00188147.

National Development and Reform Commission (NDRC), China. 2001. The 10th Five-Years National Development Plan. http://www.sdpc.gov.cn/fzgh/ghwb/gjjh/P020070912638588995806.pdf (last access 2012/10/31).

National Development and Reform Commission (NDRC), China. 2006. The 11th Five-Years National Development Plan. http://ghs.ndrc.gov.cn/ghjd/115gyxj/001a.htm (last access 2012/10/31).

National Development and Reform Commission (NDRC), China. 2011. The 12th Five-Years National Development Plan. http://www.sdpc.gov.cn/fzgh/ghwb/gjjh/P020110919592208575015.pdf (last access 2012/10/31).

Nijkamp, P., Pepping, G. 1998. A meta-analytical evaluation of sustainable city initiatives. Urban Studies 35(9): 1481–1500.

Nilsson, M., Dalkmann, H. 2001 Decision making and strategic environmental assessment. Journal of Environmental Assessment Policy and Management 3(3):305-327.

Noble, B.F. 2002. The Canadian experience with SEA and sustainability. Environmental Impact Assessment Review 22(1): 3 –16.

OECD. 2004. OECD key environmental indicators. Paris: OECD Publications.

Orsi, F., Geneletti, D., Newton, A. 2011. Towards a common set of criteria and indicators to identify forest restoration priorities: An expert panel-based approach. Ecological Indicators 11 (2):337–347.

Partidário, M.R. 2000. Elements of an SEA framework - improving the added-value of SEA. Environmental Impact Assessment Review 20(6):647–663.

Pressman, J.L., Wildavsky, A. 1973. How Great Expectations in Washington Are Dashed in Oakland; Or, Why It's Amazing that Federal Programs Work at All, This Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation. Berkeley: University of California Press.

Pressman, J.L., Wildavsky, A. 1984. How Great Expectations in Washington Are Dashed in Oakland; Or, Why It's Amazing that Federal Programs Work at All, This Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation, 3rd edition. Berkeley: University of California Press.

Ramos, T.B. 2009. Development of regional sustainability indicators and the role of academia in this process: the Portuguese practice. Journal of Cleaner Production 17(12): 1101–1115.

Ramos, T.B., Alves, I., Subtil, R., de Melo, J.J. 2007. Environmental performance policy indicators for the public sector: The case of the defence sector. Journal of Environmental Management 82(4): 410–432.

Ripley, R.B., Franklin, G.A. 1982. Bureaucracy and policy implementation. Homewood: Dorsey Press.

Sabatier, P. A. 2007. Theories of the policy process. Boulder: Westview Press.

Sabatier, P.A. 1986. Top-Down and Bottom-Up Approaches to Implementation Research: a Critical Analysis and Suggested Synthesis. Journal of Public Policy 6(1): 21-48.

Sabatier, P.A., Mazmanian, D. 1980. The implementation of public policy: a framework of analysis. Policy Studies Journal 8(4): 538–560.

Sadler, B., Verheem, R. 1996. Strategic Environmental Assessment: Status, Challenges and future Directions. Hague: Ministry of Housing Spatial Planning and the Environment, The Netherlands.

Sager, T. 1994. Communicative planning theory. Aldershot: Avebury.

Saisana, M., Tarantola, S. 2002. State-of-the-art Report on Current Methodologies and Practices for Composite Indicator Development, EUR Report 20408 EN, European Commission, JRC, Institute for the Protection and Security of the Citizen, Ispra, Italy.

Scharpf, F. W. 1978. International policy studies: Issues, concepts and perspectives. In: Hanf, K. I., Scharpf, F.W. (eds). Interorganizational policy making: Limits to coordination and central control. London: Saga Publication. p.345-370.

Schiller, A., Hunsaker, C.T., Kane, M.A., Wolfe, A.K., Dale, V.H., Suter, G.W., Russell, C.S., Pion, G., Jensen, M.H., Konar., V.C. 2001. Communicating ecological indicators to decision makers and the public. Conservation Ecology 5(1): 19. http://www.ecologyandsociety.org/vol5/iss1/art19/ (last access 2012/8/15)

Scholes, R.J., Biggs, R. 2005. A biodiversity intactness index. Nature 434(7029): 45-49.

Schramm, W. 1971.The nature of communication between humans. In:Schramm, W., Schramm, W. L. Roberts, D. F. (eds). The process and effects of mass communication. Urbana: University of Illinois Press. p. 1-53.

Shields, D.J., Šolar, S.V., Martin, W.E. 2002. The role of values and objectives in communicating indicators of sustainability. Ecological Indicator 2(1-2): 149-160.

Stoeglehner, G., Brown, A.L., Kørnøv, L.B. 2009. SEA and planning: 'ownership' of strategic environmental assessment by the planners is the key to its effectiveness. Impact Assessment and Project Appraisal 27(2): 111–120.

Strobel, C.J. 2000. Application of the Indicator Evaluation Guidelines to Dissolved Oxygen Concentration as an Indicator of the Spatial Extent of Hypoxia in Estuarine Waters. In Jackson, L.E., Kurtz, J.C., Fisher, W.S. (eds). Evaluation guidelines for ecological indicators. Washington, DC: USEPA p.2-1 – 2-17.

Tang, T., Zhu, T., Xu, H. 2007. Integrating environment into land-use planning through strategic environmental assessment in China: towards legal frameworks and operational procedures.

Environmental Impact Assessment Review 27(3):243–265.

Tewdwr-Jones, M., Allmendinger, P. 1998. Deconstructing communicative rationality: a critique of Habermasian collaborative planning. Environment and Planning A 30(11): 1975-1989.

The Standing Committee of the National People's Congress, China 2003.The Environmental Impact Assessment Law.

The State Council of the People's Republic of China 2009. The Chinese Plan Environmental Impact Assessment Regulations.

The State Environmental Protection Administration of China (now named Ministry of Environmental Protection of China) 2003. Technical Guidelines for Plan Environmental Impact Assessment (on trial).

Th érivel, R. 1996. The practice of Strategic Environmental Assessment. London: Earthscan Publication.

Th érivel, R. 2004. Strategic Environmental Assessment in Action. London: Earthscan Publications.

Van der Loop J.T.A. 2006. Forum 2 Report: the fitness for purpose of definitions and indicators. Den Haag: AVV Transport Research Centre report.

Van Meter, D. S., Van Horn, C. E. 1975. The Policy Implementation Process: A Conceptual Framework. Administration and Society 6(4): 445-488.

Vel ázquez, L., Mungu á, N., Zavala, A., de los Ángeles, N. M. 2008. Challenges in operating sustainability initiatives in Northwest Mexico. Sustainable Development 16 (6): 401–409.

Vicente, G., Partid ário, M. R. 2006. SEA-Enhancing communication for better environmental decisions. Environmental Impact Assessment Review 26(8):696–706.

Wallington, T., Bina, O., Thissen, W. 2007. Theorising strategic environmental assessment: Fresh perspectives and future challenges. Environmental Impact Assessment Review 27 (7): 569–584.

Walz, R. 2000. Development of Environmental Indicator Systems: Experiences from Germany. Environmental Management 25(6): 613–623.

Wang, S., Liu, J., Ren, L., Zhang, K., Wang, R. 2009. The development and practices of Strategic Environmental Assessment in Shandong Province, China. Environmental Impact Assessment Review 29(6): 408–420.

Winter, S. 1986a. Studying implementation of top down policy from the bottom up: Implementation of Danish youth employment Policy. In: Ray, C. (ed). Finding work: Cross-national perspectives on employment and training. London, New York, and Philadelphia: The Falmer Press Ltd. p. 109-138.

Winter, S. 1986b. How Policy-Making Affects Implementation: The Decentralization of the Danish Disablement Pension Administration. Scandinavian Political Studies 9(4): 361-385.

Winter, S. 1989. Integrating implementation research. Aarhus: Institute of Political Science, University of Aarhus.

Winter, S. 1994. Street-level Bureaucrats and the Implementation of Political Reforms: Welfare, Employment, and Environmental Policies in Denmark. Aarhus: Institute of Political Science, University of Aarhus.

Wrong, D.H. 1979. Power. Its forms, bases and uses. New York: Harper & Row.

Wu, J., Chang, I., Bina, O., Lam, K., Xu, H. 2011 Strategic environmental assessment implementation in China - Five-year review and prospects. Environmental Impact Assessment Review 31(1):77–84.

Xu, W. 2009. Setup indicator system for sustainable development and SEA. Environmental Protection and Circular Economy 9(6): 37–38. (in Chinese)

Yanow, D. 1987. Toward a policy culture approach to implementation. Policy Studies Review 7(1): 103-115.

Zhao, W., Dong, D., Long, Z., Wang, X., Jiang; B. 2003. Study on the Framework of Indicator System for Strategic Environmental Assessment. Scientia Geographica Sinica 23(6): 751–754.

Zhu, D., Ru, J. 2008. Strategic environmental assessment in China: Motivations, politics, and effectiveness. Journal of Environmental Management 88(4): 615–626.

Zhu, T., Wu, J., Chang, I. 2005. Requirements for strategic environmental assessment in China. Journal of Environmental Assessment Policy and Management 7(1): 81–97.

PART 3

(Environmental Impact Assessment Review, accepted with revision)

The changing Chinese SEA indicator guidelines: top-down or bottom-up?

Jingjing Gao, Per Christensen and Lone Kørnøv

The Danish Centre for Environmental Assessment, Department of Development and Planning, Aalborg University, Aalborg 9000, Denmark

A B S T R A C T

In the last decades China has introduced a set of indicators to guide their Strategic Environmental Assessment (SEA) practice. The most recent indicator system, proposed in 2009, is based on sector-specific guidelines and it found its justification in past negative experiences with more general guidelines (from 2003), which were mostly inspired by, or copied from, international experiences. Based on interviews with practitioners, researchers and administrators, we map and analyse the change in the national guidelines. This analysis is based on a description of the indicators that makes it possible to discern different aggregation levels of indicators and then trace the changes occurring under two sets of guidelines. The analysis also reveals the reasons and rationales behind the changes found in the guidelines. This analysis is inspired by implementation theory and a description of some of the more general trends in the development of SEA and other environmental policies in a recent, Chinese context. Beside a more top-down, intentional approach specifying indicators for different sectors based on Chinese experiences from the preceding years, another significant change, following the new guidelines, is a more bottom-up approach which gives more discretion to practitioners. This entails a call for practitioners to make decisions on indicators, which involves an interpretation of the ones present in sector guidance.

Keywords:

Indicators;
SEA;
Guidelines;
China;
Implementation

1. Introduction

SEA was already being discussed in China in the 1990s, and on September 1st 2003 the Environmental Impact Assessment Law (The Standing Committee of the National People's Congress, China, 2003) was adopted. Since then, "Plan EIA" has been the Chinese name for SEA. Together with the launching of the EIA Law, a preliminary national "Technical Guidelines for Plan EIA" was issued (The State Environmental Protection Administration of China, 2003). The guideline was administered by the State Environment Protection Administration, which has since changed its name to the Ministry of Environment Protection (MEP).

After years of practice, The Plan EIA Regulation came into force on October 1st 2009, and Plan EIA became mandatory for many types of planning in China (The State Council of the People's Republic of China, 2009). Based upon the practical experiences gained since 2003, a revision of the guidelines for Plan EIA was launched by the authorities in 2009 (MEP, 2009). This revision resulted in a proposal for new, updated guidelines consisting of a series of sectoral guidelines for plans within different sectors rather than only a general guideline.

In China the new guidance, drafted in 2009, is expected to be implemented as it addresses some of the problems experienced with the first version from 2003. The revision of the guidance from general to sector-specific indicators owes its existence to the fact that the general guidelines did not cover many of the more sector-specific problems and thus did not address all concerns relevant to planning and decision-making. Following the process of establishing a system of guidance and then looking into the problems it encounters during its implementation will leave us with a more precise understanding of how the Chinese authorities work with these topics and how different opinions and expectations will influence the way that the guidance for indicators are being implemented in this case.

This article addresses how the use of SEA indicators has developed over the last decade. The development of the national guidance system is seen through the lens of implementation theory. The aim of the article is firstly, to describe the changing Chinese guidelines and how they have developed and secondly, to interpret the rationales behind this change, making use of recent experiences with Chinese implementation of environmental policies. This study underlines the fact that disputes on technical matters are often the companions of a dispute fuelled by political differences and conflicting interests. The process of changing one set of guidance for another is thus seen as part of a policy-formation process.

The study is based on the two versions of the Technical Guidelines for Plan EIA in China and the indicator sets that were launched concomitantly. Using information based on a content analysis of these texts as well as an analysis of the indicators developed and proposed for the two sets of guidelines, we also conducted interviews to unveil the practical use of indicators in Chinese SEA. Interviews were also used for analysing the content and background behind the changes to the 2003 version that were included in the new version drafted in 2009. In the following section, we present the theoretical basis for the study, which includes some aspects of implementation theory covering top-down and bottom-up processes and the role of practitioners. In Section 3 we describe the methodological design of this study. The results of the analysis are presented in Section 4, which includes a description of the SEA indicator system in China and how it has recently changed. In Section 5 we will reflect on the changes made to the guidelines, inspired by the viewpoint of implementation theory. In the last section, we conclude on our analysis.

2. Implementation theory as point of departure

In this article, based on some recent comprehensive books on the policy process as well as individual works by some prominent scholars in this field of research, implementation theory is used for sketching some of the tendencies in Chinese society that are helpful when trying to understand the way in which different environmental impact policies, such as SEA, are shaped. Pressman

and Wildavsky introduced implementation theory as early as 1973 in their pivotal book on implementation. The study of implementation theory flourished in the 1980s with a lot of studies trying to understand the success or lack of success encountered by many major policies or programmes launched in that period. Since then, the mention of implementation theory has almost disappeared as an individual theory; it is now seen rather as an integrated part of the analysis of the policy process (Hill, 2009; Sabatier, 2007).

Top-down versus bottom-up approach

The debate between the top-down and bottom-up perspectives in implementation theory is heavily rooted in whether a party recognises a clear-cut distinction between the formulation of a policy and its implementation (Hill and Hupe, 2002, p. 43). For those focusing on the top-down aspects of implementation theories, a clear distinction exists between policy formation and implementation as a distinction between politics and administration. In this case, implementation is looked on as a "rational process", with a clear goal and the use of standard procedures (Hill and Hupe, 2002, p. 44; Sabatier, 1986). Pressman and Wildavsky started out as top-down oriented researchers, but later developed towards a bottom-up approach, as they emphasised how communication and interaction processes influenced implementation (1984). Sabatier (1986) also believed in a clear distinction between policy formation and implementation, although recognising that the feedback from implementation has an impact on reformulating policy. In his earlier work together with Mazmanian, Sabatier had emphasised how a top-down approach could be instrumental in controlling the implementation process, step by step, through policy design (1979, 1980). An obvious argument for favouring top-down processes is that the policy makers are democratically elected. However, recent research has underlined that the increasing involvement of NGOs as well as ordinary people in the policy process gives rise to a society based more on governance and deliberative democracy at the expense of top-down government (Meadowcroft, 2007). The experiences gained from the implementation of such policies can be summarised in the following key characteristics:

- The starting point is the policy to be implemented
- The goal must be seen as prior to implementation
- Stakeholders can influence the policy process just as politics can impact the implementation process
- Means for achieving the goals are identified and used by politicians
- There are linkages between different organisations and departments on different levels
- Means and organisational control is part of the policy design
- Implementation problems can be overcome by changing policy design

For the bottom-up approach, one of the most important conclusions reached is that the distinction between "policy formulation" and the "implementation" process is not watertight. Rather, it is seen as two interlinked phases of an ongoing process from ideas and goal through policy formulation and the execution of the different steps in the implementation process (Hill and Hupe, 2002, p.8). There are close links between the two phases, as they are iterative, so politicians intervene in administrative practices just as often as different interest groups, street-level bureaucrats and target groups voice their concerns during the policy-process (Lipsky, 1980).

SEA guidance and the implementation process

To establish a better overview of the implementation process we have outlined a general model (Figure 1), mainly inspired by Winter (1994). The model presents a logical structure in the policy process from legislation, through the implementation, to the outcome of the SEA. The SEA decision-making process is initiated when designated plans, policies or programmes are decided upon – in this case, the national guidance for SEA involving indicator selection and use. It is often found that the guidelines established are broad in scope and allow for a variety of interpretations. The final effect of this implementation will be reflected in the output – as SEA statements or reports. The final effect also mirror how different aspects of the SEA process are orchestrated, leading to results that are substantive (improve environmental performance, for example) or leading to broader learning process related, for example, to democratization (Stoeglehner et al., 2009, Cashmore et al., 2010, Zhang et al., 2012). The implementation process often leads to results because the way in which policies and plans are formulated is stricter, and therefore misunderstandings are excluded and organisations controlled so that likewise unintended impacts on the process are avoided. These efforts are often referred to as changes in "policy design", making the influence from the legitimate decision makers so precise and detailed that influences from other stakeholders are controllable.

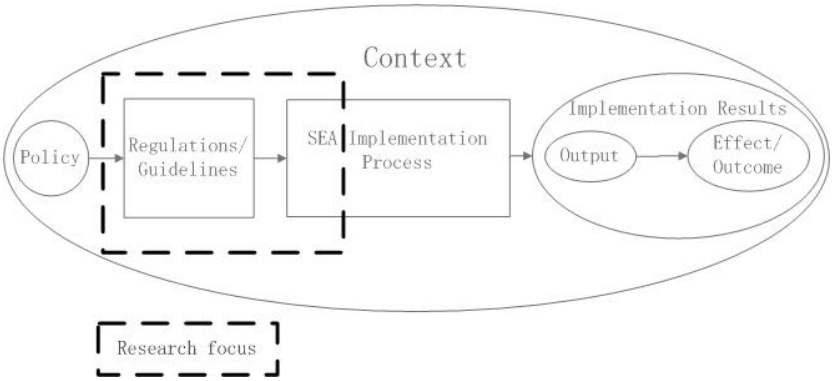

Fig. 1. SEA implementation model and the focus of the study

Within the whole of SEA implementation, the focus of this research is shown by the dotted line. This article focuses firstly on the top-down approach to SEA indicators through an analysis of national guidelines, and secondly on the bottom-up approach through including experiences and reflections by practitioners. Emphasising the bottom-up perspective will underline what is happening in the SEA practice of indicator use and it will also highlight how this practice has influenced the SEA and also empowered many of these groups so they had the means and understanding to continue making their voices heard.

3. Methods and data

In order to describe the changes in the Chinese SEA indicator system we created a documentary study which included a

comparison of the written guidelines from the 2003 version with the 2009 version. Furthermore, interviews were undertaken with researchers and authorities at the general level and with practitioners at case level, to explore the drivers behind changes and the key factors which may influence the use of indicators in the future.

Documentary Study

This study of the national guidelines for SEA covers both versions of the Technical Guidelines Plan EIA, from 2003 and 2009. The study concerns different aspects of the selection and use of indictors and how they developed from the first guidance issued in 2003 to the new one drafted in 2009. We first identify which themes are addressed and how they relate to the objectives of the assessment. Then the indicator sets presented in the two guidelines were analysed in order to see how they relate to the themes and objectives in the two guidelines.

Table 1
Overview of interviews.

Interviewee	Title	Time	Place	Mode
G01	Professor	January 2011	Beijing, China	Face to face
G02	Vice General Engineer, Ministry of Environmental Protection, China	January 2011	Beijing, China	Face to face
G03	Director, Department of Plan-EIA, Appraisal Center for Environment & Engineering, Ministry of Environmental Protection, China	February 2011	Beijing, China	Face to face
G04	Director, Department of EIA, Ministry of Environmental Protection, China	February 2011	Beijing, China	Face to face
C01	SEA project manager	March 2011	Shenzhen, China	Face to face
C02	SEA team member	April 2011	Kunming, China	Face to face
C03	SEA project manager	April 2011	Dali, China	Face to face
C04	SEA project manager	June 2012	Denmark	Phone

Interviews

Interviews were undertaken at two levels, first at a general level with researchers and authorities and secondly at a case level with SEA practitioners. Interviews at the general level were undertaken with four interviewees in January and February 2011 in Beijing,

China. The interviewees were from the national administration and from a university. Interviews at case level were with four interviewees who were involved in two SEA cases for Urban Master Plan. Case 1 is the Strategy Environmental Assessment of Shenzhen's Master Urban Planning (2007-2020). The Shenzhen municipality is located in the very south of China with a population of around 9 million. The SEA was carried out simultaneously with the embarkation of the Master Urban Planning. As one of the pilot SEAs tested by the Ministry of Environmental Protection in China, this project was appraised by the Ministry of Environmental Protection in March, 2009. Case 2 is an SEA for the Dali Urban Development Master Plan (2008). Dali Municipality is located in southwest China, with a population of 3.29 million. In 2007, this SEA was simultaneously commissioned for the master plan revision. Additional support was provided by a provincial SIDA (Swedish International Development Cooperation Agency)-sponsored project. The interviews were undertaken in March and April 2011 in Shenzhen, Kunming and Dali, China, and in June 2012 in Denmark by phone. Except for the one interview by phone, all the others were face to face. An overview of the interview information is summarised in Table 1. Every interview is given a code: G refers to the general-level interviews and C refers to those at case level. The interview questions were inspired by implementation theory and were carried out based on loosely-structured open questions and conversation.

4. Changes in SEA indicator system

This study of the national Chinese guidelines for the use of indicators in SEA covers both the old and new versions of the Plan EIA Guidelines, from 2003 and 2009 respectively. The old version of guidelines, from 2003, is one document which includes six sector-specific sets of recommended indicators lists as appendixes, while the new version of the guidelines, from 2009, consists of six separate documents as shown in Table 2 (below).

Table 2
Overview of The Technical Guidelines for Plan-EIA (2009 version).

Titles	Recommended indicators list
General principles	no
Coal Industry Mining Area Plan (published)	yes
Urban Master Plan	yes
Forestry Planning	yes
Land Use Plan	yes
Onshore Oil and Natural Gas Field General Exploitation and Development Plan	yes

Changing of focus

As is mentioned in the revised version of the guidance from 2009, it "*loudly emphasizes the core role of environmental objectives and the indicators in SEA as the most important basis for the whole assessment process.*" (The Technical Guidelines (revised version, 2009), p. 6). A comparison between the new and old versions of the guidelines regarding

their use of indicators has been undertaken. First of all, it is immediately apparent that the names of the sectoral guidelines of 2003 and 2009 differ a lot. What they indicate is a narrowing down of the scope of the sectoral plans. The urban plan and the land use plan are the same, while the regional plan guideline has disappeared by 2009. Generally though, it can be concluded that the scope of the spatial plans is the same in 2003 as in 2009. However, we also find that the scope of the resource plans becomes narrower; the energy plan becomes the coal plan and the oil and gas plan while the industry and agriculture plans disappear and instead a forestry plan is introduced.

When comparing the version from 2003 (Table 3, below) with the one from 2009 (Table 4), we find that there are more themes and objectives addressing more comprehensive types of plans, like urban plans and land use plans, in 2009 and urban development plans, regional plans and land use plans in the 2003 version. In the following analysis, these plans are referred to as spatial plans. Likewise, we found that fewer themes and objectives dealing with resources like energy and forestry - or resource plans as we will call them in the following analysis - were present in sector-oriented plans.

Table 3
Indicators listed in Guidelines 2003.

Plan's type	Guideline covering 6 sectors	Themes	Objectives	Indicators
Resource	Energy plan	5	5	19
Spatial	Regional plan	8	19	28
Spatial	Urban development plan	7	12	53
Resource	Agriculture plan	5	5	17
Spatial	Land use plan	5	8	19
Resource	Industry plan	7	7	31
	Total	37 (4.5 indicators/ themes)	56 (3 indicators/objectives)	167
	Spatial	20 (5 indicators/ themes)	39 (2.6 indicators/objectives)	100
	Resource	17 (3.9 indicators/ themes)	17 (3.9 indicators/objectives)	67

Table 4
Indicators listed in Guidelines 2009.

Plan's type	Sectoral guideline	Themes	Objectives	Indicators
Resource	Coal plan	3	4	35
Spatial	Urban plan	15	18	38
Resource	Forestry plan	3	5	50
Spatial	Land use plan	5	8	28
Resource	Oil and gas plan	4	10	30
	Total	30 (6 indicators/ themes)	45 (4 indicators/objectives)	181
	Spatial	20 (3.3 indicators/ themes)	26 (2.5indicators/objectives)	66
	Resource	10 (11.5 indicators/ themes)	19 (6.1 indicators/objectives)	115

Regarding the objectives, we find a similar proportion in the two sets of guidelines (56 in 2003 and 45 in 2009). Among the spatial ones listed above, there is clear tendency towards more objectives per plan in the spatial plans than in the resource plans. In 2003 we find 39 objectives in the three spatial plans and only 17 in the three resource plans; in 2009 the picture is almost the same, with 26 objectives in two spatial plans and only 19 for three resource plans. Therefore, the spatial plans are, as expected, broader in perspective than the resource plans, as more objectives are formulated for them.

The distribution of indicators paints another interesting picture. In 2003 (see Table 3, above) we find that 100 indicators describe the 39 objectives in the three spatial plans, while 67 indicators describes the 3 resource plans which only include 17 objectives. It seems quite clear that the spatial plans are broader in perspective than the resource plans as more objectives are formulated for them (more ground is covered). However, our analysis also found that for spatial plans only a few indicators are needed to describe each objective (a mean average of 2.6 indicators per objective) while the resource plans use more indicators to describe each objective (an average of 3.9 indicators per objective). In an overall picture, the three resource plans use much fewer indicators than the spatial plans do. With this background it could be hypothesized that the spatial plans have more objectives as they cover a broader ground, but they then use more aggregated data, unlike the more one-sided plans addressing specific types of resources which do that in more depth in the sense that more specific indicators are used to convey the more specific data which describe the relevant objectives. For 2009 the picture is that 26 objectives describe the 2 spatial plans while 19 objectives describe the 3 resource plans. Again we find that spatial plans use more objectives to describe the relevant environment (on average, 13 objectives per plan) while resource plans need only an average of 6.3 objectives per plan. The number of indicators per objective differs very much, in a similar way to the 2003 guidance. It seems that here, again, the objectives in spatial plans are broader and more aggregated in nature (2.5 indicators on average per objective) while the resource plans also uses more than this (an average of 6.1 indicators per objective) to describe an objective.

Changing of indicators aggregation

To classify the information aggregation level of the indicators used in the Chinese SEA system, the aggregation levels of relevant indicators are studied in this article. The information aggregation level of indicators has been studied by Hammond and his colleagues, according to whom the users of the indicators should be taken into account when determining the level of aggregation that is appropriate for an indicator and the type of communication involved (Hammond et al., 1995). Braat (1991) gives a general distinction between three groups of information- and indicator-users: firstly, scientists and researchers, who require raw data that can be subjected to statistical analysis (low level of aggregation); secondly, politicians, who require data in a format that represents policy objectives, evaluation criteria and target and threshold values (moderate level of aggregation); and thirdly, the public, who require a simplified and unambiguous representation of data as a single piece of information (high level of aggregation). The relevance of this

classification has also been recognised within the SEA community (Thérivel, 1996).

The different requirements of different groups of users create a challenge when designing indicators. Hammond *et al.* (1995) argue that the information presented to users must both be in an understandable form and convey meaningful information. The challenge is to design indicators that both reflect the goals of the policy and – in their highly aggregated form – are able to provide all the necessary technical information in a message that can be understood and accepted by politicians and the public. Donnelly et al. (2006) argue that SEA practitioners should be encouraged to develop or compose their own indicator sets that are specific to the proposed PPPs by concentrating on relevant and significant issues targeted in the scoping phase of SEA.

Several definitions and criteria are reviewed to define the aggregated indicators (also known as composite indicators). The relevant literature shows that no fundamental difference is found between 'composite' and 'aggregated' indicators, only that composite indicators are mostly used on national level (Joumard and Gudmundsson, 2010). Saisana and Tarantola (2002, p. 5) define composite indicators as "*based on sub-indicators that have no common meaningful unit of measurement and there is no obvious way of weighting these sub-indicators*". Joumard and Gudmundsson (2010, p. 283) define an aggregated indicator as "*[a]n indicator, composed of several sub-indicators not sharing a common characteristic or measurement unit*". Nardo et al. (2005, p. 8) look at composite indicators as a mathematical combination of individual indicators which represents "*multi-dimensional concepts which cannot be captured by a single indicator alone*".

When we apply these definitions to the indicators used in the Chinese SEA system, we find that it is conceptually useful to classify these indicators according to the aggregation of information, and therefore by how many types of data need to be collected in order to use an indicator. However, empirically this distinction and a quantitative approach is only possible when indicators are unambiguous and clearly express which data should be compiled. This is not always the case. Empirically, aggregated indicators can be more complex due to the ambiguous structure description. To handle this problem, the authors supplement the typical one-dimensional model of indicators, which distinguishes between levels of aggregation (and is often represented graphically as a pyramid), with a second dimension: complexity of information. Our two-dimensional model, illustrating the relationship between the complexity and aggregation of an indicator's information, is showed in Figure 2 (below).

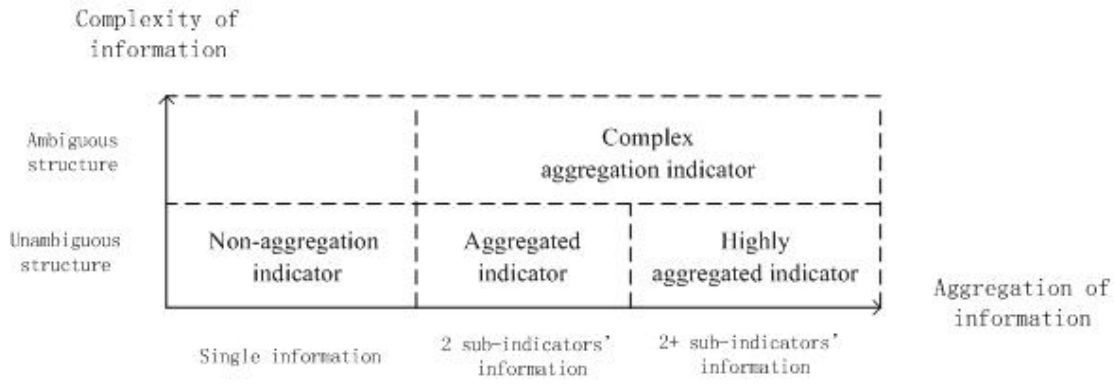

Fig. 2. Two-dimensional model developed for classifying the indicators used in SEA

The two dimensions above are used for describing the information carried by an indicator. The indicator's level of aggregation is shown horizontally in the model. For these three types of aggregations, a common factor is that the indicator produced consists of information that is combined in a straightforward way; in other words, it is unambiguous. But some of the indicators used in SEA are of a far more complicated nature. So in the above model, the complexity of the indicator is shown vertically, in which 'unambiguous structure' means that little or no room is left for interpretation as to how the indicator should be understood and what data is required. Conversely, an 'ambiguous structure' requires interpretation and elaborations in order to understand the links between one simple thing and a complex nature that is not easily translated into simple cause-effect relationships (for example, the indicator "eco-system sustainability"). This complexity dimension concerns both aggregated and highly aggregated indicators. Following the two-dimensional model, indicators can be sorted into four categories according to their aggregation level and complexity (ambiguity):

- "Non-aggregation indicator": indicators based upon single units of information (for example, X mg Pb/l, the measured concentration of Pb)
- "Aggregated indicator": indicators composed of two sub-indicators from two different sets of information that are related (for example, Y mg Pb/kg bodyweight of salmon)
- "Highly aggregated indicator": indicators with more than two sub-indicators in which different pieces of information are combined (for example, heavy metal impact on health: Z_1 mg Pb/kg bodyweigth of salmon + Z_2 mg Cu/ kg bodyweight of salmon + Z_3 mg Sn/kg bodyweight of salmon = total toxicity level of heavy metals in salmon).
- "Complex aggregation indicator": indicator composed of two or more sub-indicators, but with a complex, unclear, ambiguous structure (for example, sustainability of rivers).

To examine the aggregation level of the indicators, and how this has developed from the 2003 guidelines to the 2009 version, we have analysed each indicator mentioned in the two guidelines and established an overview of how their composition changed and how that relates to the different sectors. When analysing according to the four categories defined above, it was found to be

difficult, or even impossible, to distinguish between an "aggregated indicator" and a "highly aggregated indicator" in this case. Therefore all the indicators consisting of two or more than two sub-indicators with a simple, visible, unambiguous structure are sorted as "Aggregated indicators" in this study. The results are shown in Figures 3 and 4 (below).

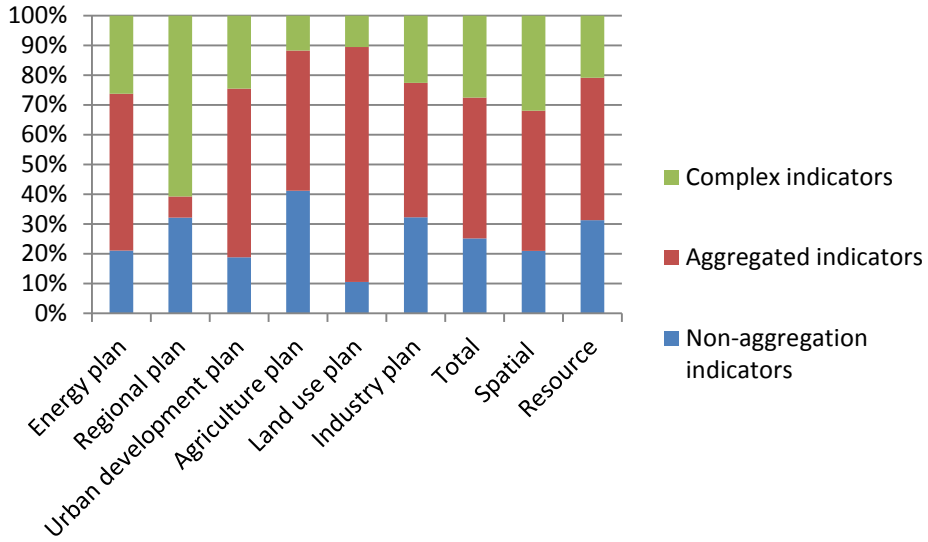

Fig. 3. Aggregation levels of indicators in the 2003 guidelines

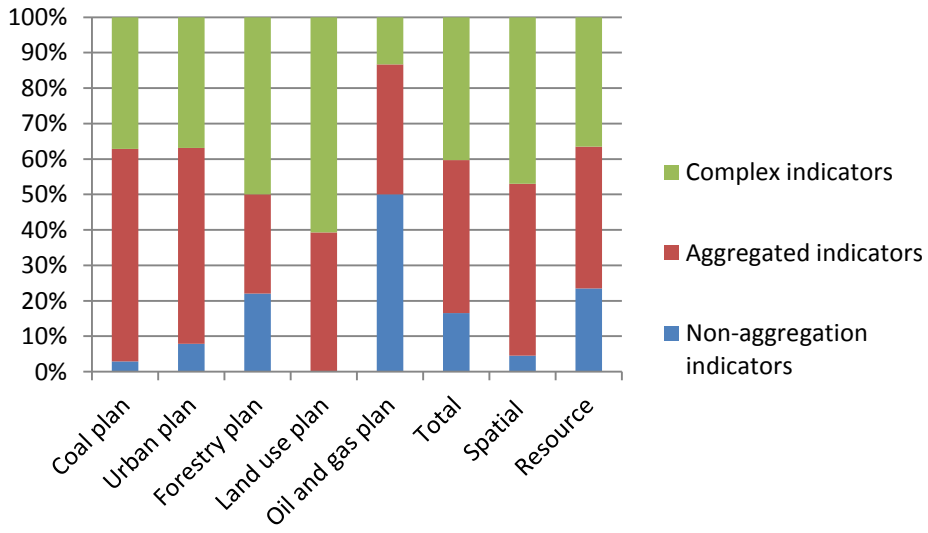

Fig. 4. Aggregation levels of indicators in the 2009 guidelines

As can be seen from Figures 3 and 4 (above), there are clear indications that the indicators are shifting from relying mostly on 'non-aggregation indicators' and 'aggregated indicators' in 2003 to more 'complex aggregation indicators' in 2009. Comparing the distribution of different ways of transferring information we can identify some interesting tendencies. For example, we find that spatial plans have in general changed more dramatically from 2003 to 2009 than resource plans have, as substantially more indicators in this category are now based on 'complex aggregation indicators'.

As stated above, one general tendency is that 'complex aggregation indicators' both for spatial and resource plans becomes the more dominant type of indicator. In general the total number of 'complex aggregation indicators' across both spatial and resource plans is increasing - from 28% in 2003 to 40% in 2009, while the relative amount of 'non-aggregation indicators' fell from 25% to 17% in the same period. The most spectacular progress is found in land use plans, which changed from being made up of only 11% to almost 61% 'complex aggregation indicators' in the guidelines published in 2003 and 2009 respectively. This overall developing trend also indicates that the new guidelines provide, and require, more room for interpretation in designing and using indicators in practice, as a more bottom-up approach. As analysed above, this bottom-up approach is given more emphasis in the guidelines for spatial plans than in those for resource plans, for which our argument is that, due to the nature of spatial plans, they are more likely implemented at local level, which demands more local, contextually relevant input in designing and using indicators, while resource plans could more likely be implemented at higher levels.

The number of indicators in the two versions varies a lot, but the total number of indicators increases from 167 in 2003 to 181 in 2009. One reason behind this could be that more 'complex aggregation indicators' are used in the 2009 version of the guidelines. The changes taking place between 2003 and 2009 show that the authority's understanding of indicators is changing, while the reliance on indicators had continued to increase.

5. Reflections on changes in guidelines

In this section we explore the rationales behind the changes found in the Chinese SEA indicator guidance. This exploration concerns both the contextual rationales and the more specific rationales found in official documents and expressed by practitioners and stakeholders.

SEA - Learning by doing

The first Chinese SEA experiences were not very positive (Bina, 2008). They started out by adopting a Plan-EIA which more or less resembled Project EIA (Bina, 2008), making use of the procedures and methods of project EIA at strategic level (Ahmed and Sanchez-Triana, 2008). In doing this, China was also inspired by experiences from other countries *"the first edition of the technical guideline [sic] is more or less just a copy of the international experience … 8 years before, when we had very little experience in how to do SEA in China*" (G01, 2011). This was also supported by other interviewees, who noted that *"EIA Law was launched in 2003, to provide practical guidance to assist SEA practitioners, the 1st edition of Technical Guideline was issued in a hurry, without enough rational study*" (G03, 2011), *"…the first version was published in a situation when we had requirement for SEA, and it was published to provide an immediate assistance to SEA practitioners then. But after several*

years of testing, the limitations of this guideline have been recognised" (G02, 2011). The authorities also underlined this: "*[w]e had not had enough experience to summarise a good enough guideline for the Chinese context in 2003. It has been a 'learning by doing process*" (G04, 2011). So, as knowledge of the SEA process and its dynamics increases, the view that there is a need for more specific instruments grows. This is a theme often surfacing in the debate in China today, not only advocating SEA or EIA as low hanging fruits to pick but also that a genuine integration into Chinese policies demands a more specific Chinese way of doing this, i.e. reflecting the complexity of Chinese administrative and political conditions "*After years of tests, we do think there is some part not suitable for Chinese current context*" (G03, 2011). In other words, China should try to do it, its own way.

Regulative changes with strong focus on procedure

The revision of the guidelines was launched in 2009 together with a new regulation of Plan-EIA, which meant that the law and the guidelines were more in accordance with each other: "*[i]n 2009 the Plan-EIA Regulations was also launched, actually the new version of this guideline has been in accordance with the Regulations in many aspects"* (G03, 2011). The increased focus on the procedure goes hand in hand with a clearer understanding of the roles played by different parts of the process – and in the light of the theme for this article - its connection to indicators and environmental objectives. The technical guidelines draw attention to all the steps or stages to stick to: "*[a]t least 10 parts (scoping, PPPs description, environment baseline, identifying environmental objectives, impact assessment, alternatives analysis, immigration, follow-up evaluation, public participation, results) should be included in the final SEA report, in which the environmental objectives identified should describe clearly the …environmental objectives and assessment indicators…*"(The Technical Guidelines, 2009, p. 14). Furthermore the guidelines can be used for different purposes: "*guidelines are both for technical and for governance use. For authority, they are the standard against which SEA will be valued and reviewed. For practitioners, it is for the application and practice"* (G01, 2011).

As in many other countries the questions of governance and decision-making are important, and, as is well known, this is one aspect of SEA which is debatable. But some Chinese researchers also manage to see this in a broader scope than just focusing on quantitative modelling: *"[w]hat we need to provide for the decision-makers is not the exact impact, but the possibilities [sic] of scenarios or alternatives. Using quantitative indictors (or variables) with different values, standing for different scenarios, to show the decision makers, is what SEA needs to do"* (G02, 2011).

Top-down intention – bottom-up effect

The institutional structure for environmental protection is under heavy pressure from other diverging interests that also exist in Chinese society (Gu and Sheate, 2005). The dual structure consists of a vertical environmental authority competing with the horizontal structures of local governments, and the sectors with more power might even be a threat to local environmental authorities which take the implementation of EIA seriously (Gu and Sheate, 2005). Environmental authorities are thus in a weak position in the political hierarchy, having only doubtful commitment to a strict implementation of EIA (Mao and Hills,

2002). Two positions seems to be widespread among Chinese planners: firstly, the idea that guidelines should reflect the fact that sectors are different, and secondly that guidelines should in any case be strict and focused when it comes to the indicators they use: "*the revised version of guidelines (2009) provides a more comprehensive and broader scope in covering sectors… it is better in guiding indicator use with instructions based on different sectoral-level plans instead of those on a general level, and this will make the use of indicators more purpose-aimed and targeted*." (G01, 2011). In this way the guidelines also provide clearer requirements on when and how indicators should be used: "*but they do not provide a standard value for indicators... future guidelines should provide standard values for the recommended indicators in the related sectoral guidelines*" (G03, 2011). These arguments clearly state a more top-down intention of developing new guidelines, by requiring more specific sectoral guidelines and also by demanding official standard values for the applied indicators to enable even more central control. There is a vast amount of different SEA and EIA to be carried out in a society with such extreme growth potentials. There are many "*different development plans due to the rapid economy growth in China. With its own characters, each kind of plan requires its own framework to make a SEA*" (G04, 2011). For some other commentators, this reflects the fact that: "*the biggest problem or challenge for SEA in China is that there are no specific regulations for the planning process, so it is hard for SEA practitioners to follow a standard guide to assess them*" (G03, 2011).

Besides the top-down intention, on one side, most of the interviewees agree that there should also be room for the public to be engaged in the selection of indicators. One of the expectations from an authority perspective is that: "*[w]e need a combination of compulsory and self-chosen indicators in every single SEA, identifying the environmental objects and targets by 1) experience from previous projects, 2) experts' experience 3) communication with planning sectors. We have several good examples, which had very effective communication and cooperation with the planning sector"* (G04, 2011).

On the other hand, it is important that the analysis of SEA does not become too detailed as this might lead to a situation of 'choking in facts': *"the more detailed it is, the more useless it is as a guideline. At this stage, the most efficient method of writing guidelines is to rely on some basic principles instead of listing too much detailed information. For example, providing the environmental objects and key issues for SEA, highlighting the communicational process of SEA, and standardising the operation and application of the SEA process [would be helpful]"* (G04, 2011). The way forward is to keep it simple and specific according to what sector is being addressed. A "*...flexible way of using indicators in SEA has two criteria: 1) describing the issues and impact clearly, 2) being selected and used in a rational process… with these two principles, they are excellent indicators*" (G04, 2011). This was also emphasised by another interviewee: *"[g]uidelines are useful for both the SEA team and the review committee. For SEA practitioners, they show what the expected output of an SEA is. For the committee, they give a standard by which to evaluate an SEA's quality… one thing that should be highlighted is the balance of qualitative and quantitative indicators. Quantitative indictors can be effective and useful only when selected in a rational manner and at a correct aggregation level. Qualitative indictors cannot give the same level or degree of the impact. What we assess for an SEA is not only what impacts are, but also the risk of those impacts*" (G02, 2011).

6. Bottom-up: SEA Practitioners' reflection

According to implementation theory, street-level bureaucrats play an important role in defining how indicators are used in the practice of SEA practitioners. In the following two sections we highlight the most common challenges facing the correct use of indicators. Firstly we try to sketch how the external context interacts with the practice of the SEA practitioner and secondly we reveal what the internal factors are that influence the use of indicators in a team of SEA practitioners.

External factors

The use of guidelines plays an important role in the SEA process. Due to the fact that China includes areas which differ tremendously, both in geography as well as economically, SEA guidelines cannot be used uniformly for all cases. As one practitioner comments, "*…the guidelines provide one pattern for SEA in all kinds of plans at all levels in the whole of China, regardless of whether it is a sectoral plan or a urban master plan. Therefore the recommended indicators are at a very general scope and level*" (C01, 2011). This is also concluded by a practitioner from another case: "It is necessary to have guidelines for different planning sectors" (C02, 2011). Therefore, there is a need to design detailed methods and indicators according to specific cases, while only using the guidelines as a principle reference point. "*…The recommended indicator list is uniform, while each SEA has to deal with different stages of development and therefore address different environmental problems facing different parts of Chinese society*" (C01, 2011). In the case of SEA in the urban plan looked at below (Case 1), this takes place in a totally urbanised region with specific environmental issues to be addressed. Furthermore the development goal in this region differs from that in the rest of China, so the SEA team developed their own unique indicators by considering the current situation and forecasting potential new problems. In the other case (Case 2), the "*[g]uidelines gave some aggregation principles that we could combine with our specific case*" (C02, 2011). The practitioners (C02, C03 2011) described how to decide and develop the indicator "Tourists Staying Duration". A professional tourism research team was invited to join in the discussion, and after a tourism economy analysis was made it was decided to take tourism as the key assessment object and "Tourists Staying Duration" as a key indicator.

Interviewee C01 (2011) points out that whether an indicator works or not depends on whether it has been taken into account in the assessed PPPs. On one hand, the indicators used in SEA should be related to those issues the plan faces; on the other hand, the plan's future goals and management requirements should also be taken into account in the SEA. Case 1 shows that, since SEA is still at quite an early stage in China, cooperation between SEA teams and planning teams has been a challenge for implementing SEA. Actually, environmental considerations have already been taken into account by the planning sector. SEA, on the other hand, prefers to look at these environmental issues from its own angle. An example is in Case 1, where SEA set some constraining requirements for the plan, which for the planning team is of course rather negative and critical. However, after several rounds of consultative meetings, the planning sector found that the SEA requirements were actually an indirect promotion of the plan before it needed to be approved (C01, 2011). In Case 2, interaction with decision-making process has been taken into account as the SEA practitioners used the

indicator in their communication with decision makers.

Internal factors

Relative good flexibility has been found in using indicators in both cases. Two factors that influence the use of indicators among practitioners have been pointed out by the practitioners in Case 1. One is capacity building - SEA practitioners' understanding of SEA and personal experience with SEA. The other is knowledge and information about the study area. The former factor relates to the methodology used to choose and use indicators, like an innovative understanding of why and how an indicator works; the latter concerns the correct identification of the contextual background of a plan. An example of this is that good indicators should also take into account upper level (provincial and national) requirements besides the local/municipal ones.

Personal experience in influencing the use of indicators was mentioned as a factor in Case 2. The previous experience of the SEA team leader in working as a vice mayor helps him to be familiar with what decision making requires. Besides, his working experience in an EIA review authority also provides him with the capacity to understand the importance of communicating with stakeholders like local authorities and enterprises. Also, in Case 2, the open atmosphere working mode was highlighted as playing an important role in influencing the decisions on core assessed objects and indicators. Case 2 managed to deal with the challenge of organising such a large team, which even included international experts.

7. Conclusion

Developing and applying SEA indicators is a complex task and many countries refrain from doing it as they prefer to discuss the progress of environmental factors based on more or less direct information on individual substances. The use of indicators has been investigated in the case of China, where SEA has, since its introduction, clung to the idea that indicators are necessary for conveying a more complete picture of the context to increase the effectiveness of SEA. Indicators can be very different as it is also underlined that they should, on the one hand, mirror differences in local environmental conditions but, on the other, also make it possible to make comparisons between different regions. It is therefore necessary to have some guidelines that can set the framework for how indicators should be used.

Comparing the two versions of China's SEA guidelines clearly demonstrates that a lot of changes took place between 2003 and 2009. First of all there is change in which problems were addressed. The sectors change to be more specifically aimed at a narrower group of industries. Moving in the direction of a more narrow definition of branches of these industries and a broader use of more aggregated information by indicators, the result could be a more streamlined indicator set. Firstly, although a narrowing down of the scope of the spatial plans is not found, as the scope of the spatial plans is roughly the same in 2003 and 2009, in terms of the resource plans the scope gets narrower. Secondly, there is a clear tendency towards having more objectives per plan in the spatial plans than in the resource plans. Spatial plans are, as expected, broader in their perspectives than the resource plans, as more objectives are formulated for those. Thirdly, the indicators in spatial plans are broader and more aggregated or complex in nature, while the resource plans still use more indicators to

describe an objective. Lastly, the indicators used are more aggregated or complex in the spatial plans than in the resource plans, which also indicates that more specific indicators describe the more narrow objectives in the resource plans.

Inspired by implementation theory, the rationales behind the changing indicator system and practitioners' reflections are explored. From a top-down perspective, contextual and specific rationales are found in documents and expressed by authorities. This shows that SEA in China is still undergoing a learning process, as is the use of indicators. Regulative changes are another driver for the revision of SEA practices. On the one hand, strong attention paid to predefined procedures also reflects an appreciation of top-down guidance. Developing from one general guideline covering all the sectors into a series of guidelines consisting of a general guideline plus five sector-specific guidelines also strengthens a top-down appreciation. An even narrower sectoral scope, in terms of indicator recommendation, further emphasises this intention. On the other hand, a developing trend towards a higher level of aggregation with high complexity due to ambiguity calls for a more bottom-up approach in practice. The complexity gives and requires more room for interpretation and flexibility in designing and using indicators with different stakeholders in different ways. This mixture of top-down intention with a bottom-up effect is definitely an interesting finding in this research. From the bottom-up perspective, practitioners reflect on their experiences. Firstly, guidelines play an important role in influencing the indicators use in Chinese SEA practice. Secondly, cooperation with stakeholders and interaction and communicating with decision makers are identified as the factors influencing indicators' effectiveness in SEA. Internally, capacity building, knowledge and information about the study area, personal experience and the open-minded working mode are found to be the main factors influencing flexibility in using indicators.

Overall it is demonstrated here that guidelines are one of the core instruments for defining indicators and their use both in the whole SEA system as well as in the single SEA case. On the one hand, a more sectorial-oriented guidance suggests a top-down approach intention to apply indicators in SEA in China by providing guidelines for more focused branches of industry; on the other hand, a more aggregated and complex indicators system paves the way for a bottom-up interpretation for using indicators, which also indirectly sheds light on including more public involvement in the decision making.

References

Ahmed K, Sanchez-Triana E. SEA and policy formulation. In: Ahmed K, Sanchez-Triana E, editors. Strategic environmental assessment for policies: An instrument for good governance. Washington DC: The World Bank; 2008. p. 1–9.

Bian Y, editor. Interpretation of law of the People's Republic of China on environmental impact assessment. Beijing, China: Law Press; 2003. p. 182–3.

Bina O, Jurkeviciute A, Zhang H. Transition from plan environmental impact assessment to strategic environmental assessment: recommendations of the project "policy instruments for Chinese sustainable future". CHINA-EPI-SEA Paper No. 27_EN. Sweden: Stockholm Environment Institute; 2009.

Bina O. Context and Systems: Thinking More Broadly About Effectiveness in Strategic Environmental Assessment in China. Environ Manage 2008; 42(4): 717-33.

Braat L. The predictive meaning of sustainability indicators. In search of indicators of sustainable development. Kuik O, Verbruggen H, editors. Dordrecht: Kluwer Academic Publisher; 1991. p. 59–60.

Cashmore M, Richardson T, Hilding-Ryedvik T, Emmelin L. Evaluating the effectiveness of impact assessment instruments: Theorising the nature and implications of their political constitution. Environ Impact Assess Rev 2010; 30(6):371–9.

Zhu D, Ru J. Strategic environmental assessment in China: Motivations, politics, and effectiveness. J Environ Manage 2008; 88(4):615–26.

Dalal-Clayton B, Sadler B. Strategic environmental assessment: a sourcebook and reference guide to international experience. London: Earthscan; 2005.

Donnelly A, Jones M, O'Mahony T, Byrne G. Decision support framework for establishing objectives, targets and indicators for use in SEA. Impact Assess Proj Apprais 2000; 24(2): 151–7.

Gao S, Comparison and analysis of EIA and strategic EA by China and Sweden. Environ Prot 2004; (3): 56–8. (in Chinese)

Gu L, Sheate W. Institutional Challenges for EIA Implementation in China: A Case Study of Development Versus Environmental Protection. Environ Manage 2005; 36 (1): 125-42.

Hammond A, Adriaanse A, Rodenburg E, Bryant D, Woodward R. Environmental indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development. Washington DC: World Resource Institute; 1995.

Hill M. The public policy process. 5th ed. Harlow: Pearson Longman; 2009.

Hill M, Hupe P. Implementing public policy. London: Sage Publications; 2002.

Jänicke M, Weidner H. National Environmental Policies. Berlin: Springer; 1997.

Wu J, , Chang I, Bina O, Lam K, Xu H. Strategic environmental assessment implementation in China - Five-year review and prospects. Environ Impact Assess Rev 2011; 31(1):77–84.

Joumard R, Gudmundsson H. Indicators of environmental sustainability in transport, an interdisciplinary approach to methods. Bron Cedex, France: Les collections de l'INRETS; 2010.

Lipsky M, Street-Level Bureaucracy: Dilemmas of the Individual in Public Services. New York: Russell Sage Foundation; 1980.

Meadowcroft J. Who is in Charge here? Governance for Sustainable Development in a Complex World. J Environ Assess Policy Manage 2007; 9(3-4): 299-314.

Ministry of Environmental Protection of China. Technical Guidelines for Plan Environmental Impact Assessment - Coal Industry Mining Area Plan. 2009.

Ministry of Environmental Protection of China. Technical Guidelines for Plan Environmental Impact Assessment - Forestry Planning (draft). 2009.

Ministry of Environmental Protection of China. Technical Guidelines for Plan Environmental Impact Assessment - General principles (draft). 2009.

Ministry of Environmental Protection of China. Technical Guidelines for Plan Environmental Impact Assessment - Land Use Plan (draft). 2009.

Ministry of Environmental Protection of China. Technical Guidelines for Plan Environmental Impact Assessment - Onshore Oil and Natural Gas Field General Exploitation and Development Plan (draft). 2009.

Ministry of Environmental Protection of China. Technical Guidelines for Plan Environmental Impact Assessment - Urban Master Plan (draft). 2009.

Ministry of Environmental Protection of China. The explanation for Technical Guidelines for Plan Environmental Impact Assessment - General principles (draft). 2009.

Nardo M, Saisana M, Saltelli A, Tarantola S, Hoffman A, Giovannini E. Handbook on constructing composite indicators: methodology and users guide. OECD-JRC joint publication. OECD Statistics Working Paper STD/DOC(2005)3, T00188147; 2005.

Pressman, J.L., Wildavsky A.B.. 1973. Implementation: How Great Expectations in Washington Are Dashed in Oakland: Or, Why It's Amazing That Federal Programs Work at All, This Being a Saga of the Economic Development Administration as Told by Two Sympathetic

Observers Who Seek to Build Morals on a Foundation of Ruined Hopes. University of California Press, London.

Pressman JL, Wildavsky AB. Implementation: How Great Expectations in Washington Are Dashed in Oakland: Or, Why It's Amazing That Federal Programs Work at All, This Being a Saga of the Economic Development Administration as Told by Two Sympathetic Observers Who Seek to Build Morals on a Foundation of Ruined Hopes. 3rd ed. London: University of California Press; 1984.

Sabatier PA, Mazmanian D. The conditions of effective implementation: a guide to accomplishing policy objectives. Policy Anal 1979; 5(4):481-504.

Sabatier PA. Top-Down and Bottom-Up Approaches to Implementation Research: a Critical Analysis and Suggested Synthesis. J Public Policy 1986; 6 (1): 21-48.

Sabatier PA, Mazmanian D. The implementation of public policy: a framework of analysis. Policy Stud J 1980; 8(4): 538–60.

Sabatier P A. Theories of the policy process. Boulder: Westview Press; 2007.

Saisana M, Tarantola S. State-of-the-art Report on Current Methodologies and Practices for Composite Indicator Development. Ispra, Italy: JRC-IPSC (Joint Research Centre, Institute for the Protection and Security of the Citizen); 2002.

Stoeglehner G, Brown AL, Kørnøv LB. SEA and planning: 'ownership' of strategic environmental assessment by the planners is the key to its effectiveness. Impact Assess Proj Apprais 2009; 27(2):111–20.

The Standing Committee of the National People's Congress, China. The Environmental Impact Assessment Law. 2003.

The State Council of the People's Republic of China 2009. The Chinese Plan Environmental Impact Assessment Regulations.

The State Environmental Protection Administration of China (now renamed the Ministry of Environmental Protection of China). Technical Guidelines for Plan Environmental Impact Assessment (on trial). 2003.

Thérivel R. The practice of Strategic Environmental Assessment. London: Earthscan; 1996.

Mao W, Hills P. Impacts of the economic–political reform on environmental impact assessment implementation in China. Impact Assess Proj Apprais 2002; 20(2): 101–11.

Winter S. Street-level Bureaucrats and the Implementation of Political Reforms: Welfare, Employment, and Environmental Policies in Denmark. Aarhus: Aarhus University; 1994.

Zhang J, Christensen P, Kørnøv L. Review of critical factors for SEA implementation. Environ Impact Assess Rev 2013; 38(January): 88-98.

(Impact Assessment and Project Appraisal, accepted with revision)

The politics of SEA indicators: Weak recognition found in Chinese guidelines

Jingjing Gao, Lone Kørnøv and Per Christensen

The Danish Centre for Environmental Assessment, Department of Development and Planning, Aalborg University, Aalborg 9000, Denmark

This article approaches the Chinese SEA indicator system from a science-policy perspective. The article aims at: 1) contributing to the general recognition of indicators functioning at science-policy interfaces in SEA, and 2) analysing, through a Chinese case-study, to what extent national guidelines mediate the science-policy interaction. Using of indicators is not only technical- and science-led, but is also a value-laden social process, and thus it also concerns, for example, public participation, political judgment and decision-making. The present article stresses the importance of viewing the use and development of SEA indicators as both a technical/scientific process and a political process involving values, norms and judgments at the science–policy interface. The overall finding is a strong emphasis on technical and science aspects found in the studied Chinese guidance, and a weak explicit recognition that policies plays a role in the development and choice of indicators. Recent Chinese practice, however, indicates a growing recognition of the politics involved and thus also leads to more involvement of stakeholders.

Keywords: Strategic environmental assessment, indicators, guidelines, science–policy interface, China

1. Introduction

Strategic Environmental Assessment (SEA) is used to ensure that potential environmental impacts are identified and considered in a strategic decision-making process and that this integration of environmental consequences occurs at the earliest possible stage of the decision-making process. One way of supporting this process is to use indicators as a tool for measuring and representing environmental conditions, predicting and measuring impacts, and communicating with relevant stakeholders. By identifying phenomena that are typical or critical, indicators provide the simplicity necessary to communicate the complex reality of a situation, and thus create a link between the "before and after" of the policies, plans and programmes. Indicators provide information in a "*simpler, more readily understood form than complex statistics or other kinds of economic or scientific data*" (Hammond et al. 1995, p. 1). They support informed judgment by decision-makers (Cloquell-Ballester et al. 2006), aid

communication (European Environment Agency 2005), and increase transparency of conflicts to all stakeholders (Helbron et al. 2011). Further, identification of appropriate indicators can secure a holistic understanding of impact of planning on a large space and time scale (Haughton and Bond et al. 2009). The criteria for selecting indicators, however, deserve careful consideration because the chosen indicators influence "*what baseline data are collected, what predictions are made and what monitoring systems are set up. Poorly chosen ones will lead to a biased or limited SEA process…*" (Thérivel 2004, p. 76). Owing to the complex nature of the environment and society, SEA practitioners face a number of difficulties when designing appropriate indicators (Scholes and Biggs 2005). These difficulties grow more complicated when the practical difficulties of measuring and collecting data are taken into account. Cloquell-Ballester et al. (2006) suggest that as well as being based as much as possible on indicators formulated in other parts of the planning system, all decision-makers and stakeholders should accept impact assessment indicators in the earliest stages of SEA. This also helps ensure objectivity and transparency, so indicator design can also positively affect the level of participation by the general public but also by experts and decision-makers. This inclusiveness is also supported by the studies of Kurtz et al. (2001), who argue that the complexity in choosing and using indicators invites different actors to be involved in the process, thus opening up new interpretations of the process of SEA. Donnelly and colleagues also emphasise the inclusiveness in the selection process, and have developed a multi-disciplinary team approach to develop criteria for SEA indicator selection (Donnelly et al. 2007).

While these authors all indirectly touch upon the politics of indicators, others directly stress that a political process is involved in indicator systems. Bossel (1996) underlines that indicators are expressions of values, and their development is characterised by Turnhout et al. (2007, p. 225) as *"demand-driven, interdisciplinary, uncertain and value-laden".* Levett (1998) adds to the discussion by emphasising that indicators "*are inputs to policy as well as consequences of it*" (p. 294) and that the chosen indicators reflect "*different world views*". When choosing indicators for environmental sustainability, some are based on scientifically described goals and measurements, but other more non-instrumental functions of indicators related to decision-making were identified by Gudmundsson et al. in 2010, such as "*providing common reference frames*" and "*suppressing attention to certain aspects that are not measured*" (p. 29). When using "*indicators a 'picture' is constructed of systems*" (Turnhout et al. 2007) and in that sense an empirical model of reality is built (Bossel 1996), which highlights some aspects at the expense of others. This more interpretive view of knowledge, which is complementary to the natural science models, invites some reflections about the linkage between social learning and indicators: "*indicators of sustainability will only be effective if they support social learning by providing users with information they need in a form they can understand and relate to*" (Shields et al. 2002, p. 150).

The point of departure for this article is that indicator development and use is always found at the interface between science and policy interface – here defined as "*social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making*" (van den Hove 2007, p. 807). Developing and using indicators involves, as discussed above, both

the scientific (technical/professional) domain and the political (communication/power) domain of decision-making. The scientific process relates to technical components such as describing cause–effect relationships, establishing data aggregation and providing data availability. The political process focuses more on the communicative aspects of the process, be it formal or informal, and relates to the question of whether to use indicators or not, which indicators to use, aggregation level and who will be involved in certain parts of the SEA process – and it involve both personal and political values.

Looking into the scholarly discussion, however, it appears that most of the research on SEA in China has focused on the concepts and theory (Che et al. 2002), as well as the legal requirements, key elements and procedures (Zhu et al. 2005). According to Zhao et al. (2003), current research on SEA focuses on "how to assess", while indicators are related to the question of "what should be assessed". The principles for classifying and selecting indicators for SEA were discussed in Bao and Lu (2001) by proposing a method for selecting and weighing indicators. Xu (2009) discusses how to establish and use the comprehensive index system in China's SEA by proposing a model with an integrated index that consists of several lower aggregation indicators. Guo et al. (2003) argue that the DPSIR (Drivers–Pressures–State–Impacts–Responses) model is useful for simplifying the complex relationship between human society and the environment and thus provides a basic framework for indicator use. By contrast, Fan and Zhou (2008) claim that the DPSIR framework oversimplifies cause–effect chains. They suggest that indicators based on the DPSIR model should be adjusted according to the context of the SEA in order to better reflect the complex reality of the situation and to improve the effectiveness of the indicators. Guo et al. (2003) also point out that most indicator studies of SEA in China have been limited to a general level, using a general framework without much guidance for practice. In a review of the integration of land use planning and SEA in China, Tang et al. (2007) conclude that an SEA report must include "*an illustration of the selected assessment indicators of SEA*" (p. 256). In the same study, a critical perspective of the *Technical Guidelines (2003)* was also given:

> *The TG [Technical Guidelines] are actually an extremely general process and lack a detailed procedure to instruct the PEIA (Planning Environmental Impact Assessment) of certain planning. This is necessary to complement the initial TG by sectoral guidelines that have been partly compiled by planning authorities* (p. 255).

Researchers at the Centre of SEA for China at the Chinese University of Hong Kong surveyed the '*Effectiveness criteria for PEIA in China*' in 2009–2010 (CSEAC 2010, draft) and according to this the best practice criteria for improving the effectiveness of SEA in China is to select assessment indicators for the objectives identified during scoping.

The use of SEA indicators is achieving more attention in China today, which is clearly reflected in the current revision of the Chinese SEA indicator system. The primary aim of this article is to contribute to our understanding of how Chinese SEA guidance handles both the scientific and the political sides involved in the process of selecting and developing SEA indicators, and whether any mediation of science-policy interaction is involved, as investigated in our survey with a larger group of SEA practitioners.

In the following section, the theoretical basis of the study is established. Firstly we investigate the linkage between indicators, decision-making and SEA, and secondly we scrutinize in more detail the interface

between science and policy. Section Three presents the methodology applied, and in Section Four we sketch our empirical work and present how legislation and guidelines interact with the science and policy domains, and the practitioner's perceptions and experiences with the use of indicators in SEA. Finally, the authors discuss and challenge the proposed technical model of SEA indicators.

2. SEA indicators at the science-policy interfaces

SEA indicators constitute in many ways the linkage between science and policy. Although this is generally perceived as a positive linkage, it is not without problems. It must be recognized that the indicators are not only determined by the indicators themselves but also by the interests, needs and values of the involved stakeholders. An iterative process is involved in developing and deciding upon indicators. If the political and value aspects are neglected and the focus is instead on the technical and practical aspects of improving indicator processes, the opportunity to benefit from a close relationship with the domain of policy- and decision-making might be missed.

The interface between SEA indicators and policy-making is influenced by a difference in contexts and by building upon different institutional arrangements. Our point of departure is the institutional arrangement consisting of the SEA guidance documents and other relevant laws, ordinances and written materials that feed into the process of decision-making. The guidance gives examples of a standardised 'boundary object', which promotes a certain practice by defining how different acts or steps must be taken, what is the meaning connected to these acts and what are the legitimate roles of the participants. Such recipes for action establish the way that "taken for granted" things like this guidance or other objects are constituted by pressures of a normative, regulative or cognitive nature (Scott 2001). Star and Griesemer in their definition of "boundary objects" back in 1989 (p. 393) underlined that they were:

> *objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identify across sites They are weakly structured in common use, and become strongly structured in individual-site use. They may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds*.

Building upon Star and Griesemer (1989), the Chinese guidance (the object of our study) is flexible and subject to some interpretation, and at the same time creates stability on the question of where the boundary of science and policy within SEA processes can be identified. We argue that the guidance plays this intermediary role between science and policy, establishing the recipes to follow, and thereby also defines the interface between SEA and policy-making.

How the guidance on development and use of indicators explicitly handles and sustains the interface, and acknowledges the political and value-laden dimension, is the first part of the analytical work in Section Five.

The analysis of the guidance documents, functioning as boundary objects between (SEA) experts and decision-makers and civic society, is based upon the following issues:

1. Recognition of the validity of each system of knowledge.

2. Recognition of the politics and value-laden activities involved in either the development and/or use of indicators in SEA processes, and guidance on how to handle this in practice.

3. Recognition of a collaborative model of interfacing science and policy, and guidance on how and who to engage in the process.

The same questions are involved in the survey where the practitioner's views and experiences are from the point of view of boundary objects.

3. Methodology and data

The case of China is a choice motivated by the new and interesting development taking place there. This development is aimed at handling the country's rapid economic growth, especially within the energy sector and in terms of urban development, as a consequence of which the Ministry of Environmental Protection has drafted more sector-oriented guidance on SEA indicators. The analysis is based upon a documentary study of the national guidelines, interviews with SEA practitioners, researchers and administrators, and an online survey.

Document analysis

The article analyses the *Technical Guidelines for Planning Environmental Impact Assessment* (on trial) (2003; hereafter referred to as the *Technical Guidelines (2003)*) which was launched on 1 September 2003 by the former State Environmental Protection Administration (now renamed the Ministry of Environmental Protection of China) and its revised version (a draft was prepared by the Ministry of Environmental Protection of China in 2009, hereafter referred to as the *Technical Guidelines (revised version, 2009)*). The majority of the discussion is based on the latter set of guidelines (Planning-EIA is the term used currently in China to refer to SEA). The aim of this documentary study is to determine the official basis for developing and using indicators in SEA at a regulative level as well as to establish the technical requirements as formulated in the guidelines, and to assess how the science and policy domains embodied in these indicators are reflected in the guidance notes. To test the indicators aggregation level, in another study (ANOMONOUS et al. 2012, in press), three aggregation levels of indicators are identified as "Non-aggregation", "Aggregated indicators" and "Complex aggregation indicators". A Non-aggregation indicator is an indicator which is based upon single information. An Aggregated indicator is defined as an indicator which is composed of two or more than two sub-indicators by different sets of information that are related. A Complex aggregation indicator is an indicator composed by two sub-indicators or more, but with a complex unclear ambiguous structure. Complex indicators require, due to the ambiguity, interpretation by the practitioners of the meaning of the indicator and following which data is required for using it.

Interviews

To deepen the analysis, four face-to-face interviews with SEA practitioners, researchers, experts and administrators were

undertaken in Beijing, China in January and February 2011 (Table 1). The interview questions were inspired by reflections upon the science-policy interface we presented above, and were carried out based on loosely-structured open questions and conversation. Questions focused on the investigation of the political aspect of choosing and using indicators, and whether a top-down or bottom-up approach is applied in guiding the use of indicators in practice.

Table 1: Overview of interviews

Interviewee	Title	Time
G01	Professor	January 2011
G02	Vice General Engineer, Ministry of Environmental Protection, China	
G03	Director, Department of Plan-EIA, Appraisal Center for Environment & Engineering, Ministry of Environmental Protection, China	February 2011
G04	Director, Department of EIA, Ministry of Environmental Protection, China	

Survey

An online survey was undertaken between June and August 2012. The survey was designed with the online program "SurveyXact" which is developed by Ramboll, Denmark. The potential respondents, including SEA practitioners, stakeholders, researchers and administrators, were contacted via e-mail. 71 people were invited to participate, and there were a total of 43 respondents. Of these, 5% are occupied in government/administration, 51% in evaluation/consultancy, 39% in academia and 5 % in other institutions.

The questionnaire contained three parts: a) general questions related to guidance and the handling of indicators, b) questions related to personal experience with the choice of indicators and c) questions related to the experience and impact of using indicators, of which the first two parts were designed for this study and the last part was used for other studies.

4. The case: The updated Chinese system for the use of indicators in SEA

The Environmental Impact Assessment Law (The standing committee of the national people's congress, China 2003) came into force on 1 September 2003. As the starting phase of SEA (Planning-EIA in China), information was collected from the experiences of a number of cases. This formed the basis for the Planning-EIA Regulation that came into force on 1 October 2009 (The State Council of the People's Republic of China 2009).

In China, indicators are widely used as tools for measuring the impact of implemented PPPs. The Technical Guidelines (2003) provide a recommended procedure to guide SEA practitioners in identifying indicators. This guide also informs SEA practitioners of the environmental objectives for plans at different levels and in different sectors. Based on these objectives, a list of recommended indicators is given. After several years of practical experience, the Technical Guidelines (2003) called for reflection and improvement to keep pace with (SEA)

development in China. In 2007, the former State Environmental Protection Administration in China launched a committee board to revise the Technical Guidelines (2003). In 2009, the Ministry of Environmental Protection of China issued the revised version of the guidelines for discussion. These are still under revision (except one sectorial guideline has been published, see below). In addition to providing a guideline at a general level, the Technical Guidelines (revised version, 2009) consist of a series of guidelines focusing on the following sectorial plans:

- Technical Guidelines for Planning-EIA (Coal Industry Mining Area Plan) (2009-7, published)
- Technical Guidelines for Planning-EIA (General principles) (2009-10, under revision)
- Technical Guidelines for Planning-EIA (Urban Master Plan) (2009-10, under revision)
- Technical Guidelines for Planning-EIA (Forestry Planning) (2009-10, under revision)
- Technical Guidelines for Planning-EIA (Onshore Oil and Natural Gas Field General Exploitation and Development Plan) (2008-9, under revision)
- Technical Guidelines for Planning-EIA (Land Use Plan) (2009-10, under revision)

Compared with the Technical Guidelines (2003), the Technical Guidelines (revised version, 2009) has mainly made changes to the following aspects:

1. The general principles guidelines pay more attention to the principles and the process of how to choose indicators rather than providing a list of indicators directly.
2. The core role of environmental objectives and indicators in SEA is emphasised, which will influence the SEA's output significantly.
3. SEA is identified as an assessment based on environmental objectives, while EIA is an assessment based on environmental quality standards.
4. The old recommended indicator lists are replaced, and in comparison, more guidance is given on how to choose indicators in the "General principles" part and more detailed indicator lists are provided in each individual Guideline for the different sectors (Urban Master, Forestry, Onshore Oil and Natural Gas, Land Use and Coal Industry).

Table 2 shows the differences between the number of assessment objectives and indicators between the sectorial SEAs. For example, the SEA for the Urban Master Plan, which normally involves a broader impact on society and the environment, has a broad description of impacts relevant to this specific case, while the Coal Industry Mining Area Plan and Forestry Planning, which generally have narrower and more focused impacts, only touch upon three themes. By contrast, the total number of indicators varies a great deal, which also implies that a common indicator list for all sectorial SEAs might be inappropriate, because it seemingly covers different aspects of sustainability as well as different levels of aggregation.

The following section presents the findings on how the guidance recognises and handles the science and policy aspects of selecting and using indicators.

Table 2. Number of assessment objectives and indicators recommended in The Technical Guidelines (revised version, 2009)

Sector	Themes	Objectives	Indicators
Coal Industry Mining Area Plan	3	4	35
Urban Master Plan	15	18	38
Forestry Planning	3	5	50
Land Use Plan	5	8	28
Onshore Oil and Natural Gas Field General Exploitation and Development Plan	4	10	30

5. Science-policy domains

The Technical Guidelines (2003) are classified as a recommendation, which means they are not legally binding, but technically they are a formal requirement, and part of SEA practice. That guidance plays a significant role is emphasised by respondents: 88% perceived guidelines either as very important or important for practice. In the following, the guidance documents and the practitioners' view is firstly analysed from a science-domain perspective, which is followed by showing how the political domain is embedded in guidance and experienced by practitioners.

5.1 The science domain: from technical minimalistic to comprehensive indicator systems

According to the Technical Guidelines (revised version, 2009), indicators are formally required in the SEA process and it is required that the final report describes "*environmental objectives and assessment indictors"* (The Technical Guidelines (revised version, 2009), p. 14). It also shows that indicators are seen as an essential part of the SEA process in China: *"environmental objectives are the base of Planning EIA, and indicators are designed to assess the feasibility and achievability of those objectives"* (The Technical Guidelines, revised version, 2009, p. 8). The official explanation of the revised guidelines, explicates the important role of indicators in SEA: *"This revised version extremely emphasizes the core role of environmental objectives and the indicators in SEA as the most important basis for the whole assessment process*" (The explanation for The Technical Guidelines, revised version 2009, p. 6).

The guideline also emphasises the quantitative nature of indicators: "*According to the national and sectorial policy requirements, indicators should be selected to represent the environmental objectives quantitatively or semi-quantitatively*" (The Technical Guidelines, revised version 2009, pp. 8–9). Looking into the nature of the indicators, in the other study (ANONYMOUS et al. 2012, in press) of examining the aggregation level of indicators, we compared all indicators listed in the two versions of guidelines from 2003 and 2009. The comparison shows a clear tendency that the indicators are shifting from relying mostly on lower aggregation indicators (Non-

aggregation indicator and Aggregated indicator) in 2003 to relying more on higher aggregation and complexity indicators ("Complex aggregation indicator") in 2009. According to ANONYMOUS et al. (2012), the share of 'Complex aggregation indicator' is increasing in the total recommended indicators from 28% to 40% from 2003 to 2009, and the 'Non-aggregation indicator' decreases from 25% to 17% in the same period. This development is found to be most significant for Land Use Plan with an increase from 11% of "Complex aggregation indicators" in 2003 guidelines to 61% in 2009 guidelines. As a consequence of more ambiguous aggregated indicators, more discretion is informally given to the practitioners.

Reflecting upon the currently increased aggregation, 79% of the respondents find that more aggregation of indicators is positive but that there is a limitation to how far we can go, due to the consideration that environmental and social concerns should be quantified.

The importance of indicators has also been highlighted among the survey respondents. 88% of the respondents think that indicators are useful or very useful in data collection, 97% of them find indicators are useful or very useful in assessment and 84% of them have experienced indicators as useful or very useful in evaluation and approval.

In our online survey, 88% of the respondents would like to have more guidance on the process of selecting indicators for SEA. And among those 88% respondents, 79% emphasised more recommended lists for specific sectorial indicators, 69% want more procedure/methodology for selecting indicators, and only 13% were concerned with the issues of who should be engaged in selecting indicators. So further technical prescription seem to be called for.

Although the analysis of the national guidelines shows a lack of explicit reflection on how indicators influence the SEA process and its outcome, it is evident that indicators are likely to be able to simplify the handling of vast amounts of information, because information can be condensed and thus feed more smoothly into the decision-making process. Thus, indicators are related to the political domain and the communication needs of the SEA process. How the guidance relates to this point is discussed in the following section.

5.2 The policy domain: weak reflexivity and guidance

Regarding the official recognition on the political side of the development and use of indicators, The Technical Guidelines (revised version, 2009) is considered to be weak. It does not incorporate statements or discussions about the value-laden elements in the process of choosing indicators. Furthermore, there is no explicit reflection upon how indicators influence the thinking and possible development of values and policies either. The respondents, conversely, clearly recognise the political aspect, and 88 % answered that the process of selecting indicators is both a technical and political process. However, only 14% of the total respondents think the guidelines to a large extent address the political and value side of selecting and using indicators in SEA. In addition, as part of the selection of indicators, the quality review of SEA reports is also based upon indicators, and embeds a value-laden activity. It is expected that the expert committee will appraise SEA cases against such guidelines (G01 2011; G03 2011). However, according to the experience of the Appraisal Centre for the Environment and Engineering, "*the appraisal committees do not review an SEA against this guideline but mostly rely on their personal experiences, which leads to a situation that different experts have different understandings of the*

project without a uniform standard" (G02 2011).

Regarding the specific guidance on how to handle the political aspect and the science–policy interface embedded in indicator systems, the Technical Guidelines (revised version, 2009) suggests an inclusive selection process and thus indirectly recognises that knowledge production through indicators in SEA is also a political process: *"Based on the experts' consultation and public comments collection, indicators should be selected relevant to plans in different sectors" (Ministry of Environmental Protection of China, 2009: The explanation for The Technical Guidelines (revised version, 2009, p. 10)*. In the sectorial guidelines, a similar suggestion is also explicated: "*The indicators could be selected through plan analysis, experts' consultation and public participation*" (Ministry of Environmental Protection of China, 2009: Technical Guidelines for Planning-EIA (Urban Master Plan), revised version, 2009, p. 8).

Arguments for involvement include securing proper scope in the assessment, and democracy:

"*A broader public participation can facilitate a more precise evaluation of the impact on the sustainability development, reduce the possibility of excluding any themes or problems, and could make the decision-making more democratic.*" (Ministry of Environmental Protection of China, 2009: Technical Guidelines for Planning-EIA (Forestry Planning), 2009, p. 8). However, there is no indication as to what extent participation will influence the final list and what the consequences would be, despite an encouragement for broader participation in the selection of indicators. Going beyond the written guidance, the question of how to decide upon indicators in the single SEA case, the response from the Ministry of the Environment was that the basis should be "*experience from the previous projects, experts' personal experience and communication with planning sectors*" (G04 2011). Inclusiveness is here touched upon, although not including the public or the politicians in the selection process.

In practice, although the importance of public/NGO involvement was recognized as important or very important by 81% of the respondents in our survey, very few of them have actually experienced involving the public (70% never or rarely experienced) or NGOs (79% never or rarely experienced) in selecting indicators for the SEA cases.

It is further argued that indicator selection is an on-going process: "*The recommended indicators list by this guidelines should be adjusted or extended during the SEA*" (Ministry of Environmental Protection of China, 2009: Technical Guidelines for Planning-EIA (Land Use Plan), 2009, p. 6). The survey results shows that 74% respondents normally select some indicators from the guidance and supplement them with others, while 21% rely only on the guidance. Regarding the flexibility of the selection process, 26% of the respondents experienced that indicators are selected at the early stage of SEA and never changed during the process, 30% of the respondents experienced that the selection of indicators is an on-going process. According to the survey results, the main triggers for adjusting the chosen indicators during the process are input from the planning team (60%) and from politicians (58%), and not so often due to input from the public and/or NGO's (23%).

However, despite the guidance in China on stakeholder involvement, indicators are presented in the guidance in such a way that they seem to be certain and objective. In particular, the lack of explicit recognition and reflexivity upon the subjective and value-laden elements in indicator systems is found to be critical.

6. Conclusion

Through a documentary study, interviews, and an online survey of Chinese guidance on indicators in SEA, this study analyses the national-level recommendations for the development and use of indicators in SEA from both a professional and a political perspective.

Regarding the professional aspect, in China there is currently a strong demand from decision-makers for using indicators in SEA in order to provide condensed information that can facilitate the setting of goals and objectives, assess impacts more easily, and design monitoring properly. However, there are challenges related to this. To a certain extent, SEA practitioners have some degree of discretion when it comes to the selection of indicators, which positively supports the context dependency and development of indicators fitting different purposes and cases. This discretion can be expected to increase due to the ambiguity embedded in the higher aggregation level of indicators outlined in guidance. However, as seen in the light of the overall conclusion that the technical/scientific domain is almost solely addressed in the guidance, how can the bias of experts be avoided?

This lack of explicit discussion about norms and values, and the implication related to indicators in assessments, is also discussed by Rametsteiner et al. (2011), who in a case study of sustainable development indicator processes found that "*political norm creation dimension is not fully and explicitly recognized in science-led processes*" (p. 61). The risk is that knowledge, which is more subjective and uncertain in nature, will not be involved in the selection and use of indicators unless they are explicitly presented and discussed. Therefore, they will not be fully recognised and appreciated as valuable inputs to the formulation of indicators for the SEA process. By contrast, the formulation of indicators could be biased because professionals could compose indicators in a way that is more in line with their ideas, or even manipulate this process.

The overall finding is a lack of both recognition and specific guidance on the political and value-laden part of indicator systems. From a societal perspective, there is a need for reflexivity and guidance on how to explicitly and transparently deal with both scientific and political processes. By making these processes more comprehensive, both knowledge production and norm creation can be involved in the selection and use of indicators in SEA.

Finally, as indicators become widely used in Chinese SEA, and as many practitioners think that indicators are useful in public participation and communicating with decision makers, it is increasingly important to critically examine how they are produced and how the focus of knowledge they create affects decision-making. It seems obvious that many of the problems encountered in traditional planning and SEA theory regarding rationality and decision-making (Kørnøv and Thissen 2000) surface again, albeit now also adding to the picture the fact that power is not only present in decision-making and other steps in the SEA process but also emanates through the construction of indicators. Some of these aspects will be further elucidated in future work looking more closely into the practises of indicator use in a few Chinese cases.

References

Bao, C., Shang, J. and Lu, Y. 2001. Study on the establishment and verification of indicator system for strategic environmental assessment. Shanghai Environmental Sciences. 20(3): 113-5.

Bond, A.J., Dockerty, T., Lovett, A., Riche, A.B., Haughton, A.J., Bohan, D.A., Sage, R.B., Shield,

I.F., Finch, J.W., Turner, M.M. and Karp, A. 2011. Learning how to deal with values, frames and governance in sustainability appraisal. Regional Studies. 45(8): 1157-70.

Bossel, H. 1996. Integrated assessment. Deriving indicators of sustainable development. Environmental modeling and assessment, 1(4): 193-218.

Braat, L. 1991. The predictive meaning of sustainability indicators. In Search of indicators of sustainable development, Edited by Kuik, O. and Verbruggen, H., pp.59-60. Dordrecht: Kluwer Academic Publisher.

Centre of SEA for China in The Chinese University of Hong Kong (CSEAC). 2010. Effectiveness criteria for PEIA in China (Draft Version). Hong Kong: The Chinese University of Hong Kong.

Che, X., Shang, J. and Wang, J. 2002. Strategic environmental assessment and its development in China. Environmental Impact Assessment Review. 22(2): 101-9.

Christensen, P., Kørnøv, L. and Nielsen, E.H. 2005. EIA as Regulation: Does it Work. Journal of Environmental Planning and Management. 48(3): 393-412.

Cloquell-Ballester, V., Cloquell-Ballester, V., Monterde-Diaz, R and Santamarina-Siurana, M. 2006. Indicators validation for the improvement of environmental and social impact quantitative assessment. Environmental Impact Assessment Review. 26(1): 79-105.

Donnelly, A., Jones, M., O'Mahony T. and Byrne, G. 2006. Decision support framework for establishing objectives, targets and indicators for use in SEA. Impact Assessment and Project Appraisal. 24(2): 151-7.

European Environment Agency (EEA). 1999. Environmental indicators: Typology and overview. EEA Technical report No 25. Copenhagen: European Environment Agency.

European Environment Agency (EEA). 2005. EEA core set of indicators-Guide. EEA Technical report No 1/2005. Copenhagen: European Environment Agency.

Fan, H. and Zhou, J. 2008. Framing Indicator System of Strategic Environmental Assessment: A Case of Watershed Planning. Environmental Science and Management, 33(11): 191-4.

Gudmundsson, H., Joumard, R., Aschemann, A. and Tennøy, A. 2010. Indicators and their functions. In Indicators of environmental sustainability in transport - An interdisciplinary approach to method, Edited by: Joumard, R. and Gudmundsson, H. pp. 23-42. Bron cedex: INRETS Institut national de Recherche sur les Transports et leur Sécurité.

Guo, H., Huang, Y., Ma, W., Yu, Q. and Chen, L. 2003. A Study on the Indicator Systems for Strategic Environmental Assessment. Journal of Fudan University (Natural Science). 42(3): 468-75.

Hammond, A., Adriaanse, A., Rodenburg, E., Bryant, D. and Woodward, R. 1995. Environmental indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development. Washington DC: World Resource Institute.

Haughton, A.J., Bond, A.J., Lovett, A. A., Dockerty, T., Sünnenberg, G., Clark, S.J., Bohan, D.A., Sage, R.B., Mallott, M.D., Mallott, V.E., et al. 2009. A novel, integrated approach to assessing social, economic and environmental implications of changing rural land-use: a case study of perennial biomass crops. Journal of Applied Ecology, 46(2): 315-22.

Helbron, H., Schnidt, M., Glasson, J. and Downes, N. 2011. Indicators for strategic environmental assessment in regional land use planning to assess conflicts with adaptation to global climate change. Environmental Impact Assessment review. 11(1): 90-5.

Innes J.E. 1990. Knowledge and Public Policy: The Search for Meaningful Indicators. 2nd ed. London: Transaction Publishers.

Kørnøv, L. and Hvidtfeldt, H. 2003. The Danish experience of Strategic Environment Assessment. In Environmental Assessment of Plans and Programs: Nordic experiences in relation to the implementation of the EU directive 2001/42/EC, Edited by: Hilding-Rydevik, T. p.33. Stockholm: Nordregio.

Kørnøv, L. and Thissen, W.A.H. 2000. Rationality in decision- and policy-making: implications for strategic environmental assessment. Impact Assessment and Project Appraisal. 18(3): 191-200.

Kørnøv, L., Christensen, P. and Nielsen, E.H. 2005.

Mission impossible: does environmental impact assessment in Denmark secure a holistic approach to the environment? Impact Assessment and Project Appraisal. 23(4): 303-14.

Kurtz, J., Jackson, L. and Fisher, W. 2001. Strategies for evaluating indicators based on guidelines from the Environmental Protection Agency's Office of Research and Development. Ecological Indicators. 1(1): 49-60.

Levett, R. 1998. Sustainability indicators – integrating quality of life and environmental protection. Journal of Royal Statistical Society. 161(3): 291-302.

Ministry of Environmental Protection of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Coal Industry Mining Area Plan. Beijing.

Ministry of Environmental Protection of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Forestry Planning (draft). Beijing.

Ministry of Environmental Protection of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - General principles (draft). Beijing.

Ministry of Environmental Protection of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Land Use Plan (draft). Beijing.

Ministry of Environmental Protection of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Onshore Oil and Natural Gas Field General Exploitation and Development Plan (draft). Beijing.

Ministry of Environmental Protection of China. 2009. Technical Guidelines for Plan Environmental Impact Assessment - Urban Master Plan (draft). Beijing.

Ministry of Environmental Protection of China. 2009. The explanation for Technical Guidelines for Plan Environmental Impact Assessment - General principles (draft). Beijing.

Noble, B.F. 2002. The Canadian experience with SEA and sustainability. Environmental Impact Assessment Review. 22(1): 3-16.

Partidario, M. 1999. Strategic environmental assessment-principles and potential. In Handbook of environmental impact assessment: Environmental impact assessment: Process, Methods and Potential: Vol. 1, Edited by Petts, J., Oxford: Blackwell.

Rametsteiner, E., Pülzl, H., Alkan-Olsson, J. and Frederiksen, P. 2011. Sustainability indicator development-Science or political negotiation? Ecological Indicator. 11(1): 61-70.

Runhaar, H., Driessen, P.P.J. and Soer, L. 2009. Sustainable urban development and the challenge of policy integration: an assessment of planning tools for integrating spatial and environmental planning in the Netherlands. Environment and Planning B: Planning and Design. 36(3): 417-31.

Sadler, B. and Verheem, R. 1996. Strategic Environmental Assessment: Status, Challenges and future Directions. Hague: Ministry of Housing Spatial Planning and the Environment, The Netherlands.

Scholes, R.J. and Biggs, R. 2005. A biodiversity intactness index. Nature. 434(7029): 45-9.

Scott, W. R. 2001. Institutions and Organizations. 2nd ed. London: Sage.

Shields, D.J., Šolar, S.V. and Martin, W.E. 2002. The role of values and objectives in communicating indicators of sustainability. Ecological Indicator. 2(1-2): 149-60.

Tang, T., Zhu, T. and Xu, H. 2007. Integrating environment into land-use planning through strategic environmental assessment in China: Towards legal frameworks and operational procedures. Environmental Impact Assessment Review. 27(3): 243-65.

The standing committee of the national people's congress, China. 2003. The Environmental Impact Assessment Law. Beijing.

The State Council of the People's Republic of China. 2009. The Chinese Plan Environmental Impact Assessment Regulations. Beijing.

The State Environmental Protection Administration of China (now named Ministry of Environmental Protection of China). 2003. Technical Guidelines for Plan Environmental Impact Assessment (on trial). Beijing.

Thérivel, R. 1992. Strategic Environmental Assessment. London: Earthscan Publications.

Thérivel, R. 1996. The practice of Strategic Environmental Assessment. London: Earthscan Publication.

Thérivel, R. 2004. Strategic Environmental Assessment in Action. London: Earthscan Publications.

Turnhout, E., Hisschemoller, M. and Eijsackers, H. 2007. Ecological indicators: Between the two fires of science and policy. Ecological Indicator. 7(2): 215-28.

Van den Hove, S. 2007. A rationale for science–policy interfaces. Futures. 39(7): 807–826.

Wang, S., Liu, J., Ren, L., Zhang, K. and Wang, R. 2009. The development and practices of Strategic Environmental Assessment in Shandong Province, China. Environmental Impact Assessment Review. 29(6): 408-20.

Xu, W. 2009. Setup indicator system for sustainable development and SEA. Environmental protection and circular economy. 29(6): 37-8.

Zhao, W., Dong, D., Long, Z., Wang, X. and Jiang, B. 2003. Study on the Framework of Indicator System for Strategic Environmental Assessment. Scientia Geographica Sinica. 23(6): 751-4.

Zhu, T., Wu, J. and Chang, I. 2005. Requirements for strategic environmental assessment in China. Journal of Environmental Assessment Policy and Management. 7(1): 81-97.

ANONYMOUS et al. 2012. In press.

(Submitted to Environmental Impact Assessment Review in December, 2012)

Do Indicators Influence Communication in SEA? - Experience from the Chinese practice

Jingjing Gao, Lone Kørnøv and Per Christensen

The Danish Centre for Environmental Assessment, Department of Development and Planning, Aalborg University, Aalborg 9000, Denmark

A B S T R A C T

Indicators have become one of the primary tools for Strategic Environmental Assessment (SEA) in the Chinese context, but what does this use of indicators mean for communication within the SEA processes? This article explores how the selection and use of indicators influence the communication between different stakeholders involved in SEA. The article provides a conceptual communication model covering directions and level of communication. Using this model on empirical findings from two specific SEA cases and from general experience collected, the results suggest that indicators are used mainly in internal communication although a change of approach, with more external communication and stakeholder engagement, is taking place as a consequence of working with indicators in the SEA. However, the external communication mainly involves the experts and other sectors, the involvement of the public and NGOs is still not well implemented in Chinese SEA practice, and the direction of communication is mainly one-way with the provision of information rather than a two-way dialogue and participation.

Keywords:

Strategic Environmental Assessment;
Indicators;
Communication;
China

1. Introduction

For EIA-based SEA, indicators are commonly used as a tool to describe and monitor the environmental baseline, and measure the impacts caused by planned activities (Donnelly et al., 2007; Joumard and Gudmundsson, 2010; Thérivel, 2004), and builds upon the rationale that by simplifying and measuring environmental phenomena, indicators provide valuable information for decision-makers, who will be willing and able to use this information.

The function of indicators can thus be divided into two aspects; a scientific function and a communicational function (Cloquell-Ballester et al., 2006; Dale and Beyeler, 2001; Joumard and Gudmundsson, 2010). As the scientific function, indicators represent the components of a system and the complex relationships within the system (Walz, 2000). Besides their scientific, and more instrumental, role in providing evidence of impacts and trends, indicators also have a communicational function (Hammond et al., 1995; Morrone and Hawley, 1998; Schiller et

al., 2001; Walz, 2000). The topic of this article is the role of indicators in supporting communication in the Chinese SEA system, which relies strongly on the use of indicators. The article discusses questions like: How and to what extent are different stakeholders involved in selecting indicators? Does the use of indicators increase communication and participation by e.g. the public and the politicians? And is the communication one-way from authorities only or do indicators support a two-way communication? The main contribution of this article is to explore the assumed linkages between indicators and communication in SEA empirically.

By communicating in a more condensed and simple form, which is believed to be more relevant for the public and policy- and decision-makers, indicators theoretically provide an arena for involvement, debate and deliberation. Other than information itself, indicators reduce the complexity of communication through aggregation and hereby support the common understanding and make communication more efficient (Morrone and Hawley, 1998; Hammond et al., 1995; Ramos et al., 2007; Ramos, 2009; Walz, 2000). By giving a general overview rather than detailed information, indicators provide comprehensibility as the communication background (Walz, 2000) and an "underlying concept of reality", and make "this world's view explicit to a specific audience, e.g. decision-makers" (Joumard and Gudmundsson, 2010, p. 38). Playing a communicational role, indicators can also "facilitate communication with general public and promote accountability" (Saisana and Tarantola, 2002, p. 72). According to a survey of the selection and usage of indicators (Joumard and Gudmundsson, 2010), one of the reasons for using indicators in environmental and sustainable evaluation is because that "it is easy to communicate the indicator to the public and decision-makers" (p. 95). Developing indicators together is believed to be helpful in facilitating communication with the public and decision-makers (Lyytimäki and Roenström, 2008).

The recognition of communication in SEA, and hereby the potential role for indicators, is also reflected in the SEA literature. This will be explored further in the next section with a brief review of research on communication in SEA seen from a communicative planning perspective. This section also includes a theoretical basis for how communication and communication flows are analysed in the study, and a conceptual model is set up and provides a basis for collecting and analysing the empirical data. In the following section 3, on methodology, the methods applied in this study are explained followed by a short description of two Chinese SEA case studies. In section 4 we present the results from the study: first, findings from the two case studies on how indicators are selected and used, and how indicators influence the communication and involvement in SEA, and second, findings from the general survey on practitioners' experience in using indicators to communicate in SEA and support participation. The conclusion is presented in the final section.

2. Communications and SEA

Influenced and inspired by planning and decision-making theory, fundamental debates regarding whether the traditional EIA-based SEA – "marked by instrumental rationality" (Fischer, 2003, p.156) – can reflect the complex and non-instrumental reality and be effective in influencing decision-making, can be found in a vast literature (Fischer, 2003; Kørnøv and Thissen, 2000; Nilsson and Dalkmann, 2001; Partidário, 2000; Stoeglehner et al., 2009; Vicente and Partidário, 2006). A turning in the research on planning theory is relevant as one departure point for understanding the emphasis on communication when studying

the integration of SEAs into planning and decision-making. Due to the observation that the traditional representative democracy cannot handle the complicated societal problems alone (Fischer, 2003; Healey, 1992, 1997; Innes, 1995), and to the observations that planners are not often able "to deliver unbiased, professional advice and analysis to elected officials and the public, who in turn make the decisions", but instead spend a lot of their time communicating with various stakeholders and actors (Innes, 1998), communicative planning has been developed as an alternative to rational planning by emphasising engagement and participation. An element in this is also to make power relationships more transparent (Flyvbjerg, 1998). In a communicative planning process, a plan itself is viewed as the result of "various discourses and how different ideas have come together through language to create a particular view or plan" (Allmendinger, 2002, p. 198). And an agreed 'storyline' means more than how the 'storyline' is developed and what scientific knowledge the "storyline" is based upon (Allmendinger, 2002, p. 202). Along with the popularity of this alternative to the rational planning theory, there have been challenges regarding the role of knowledge and information, along with participation and deliberation in planning, e.g. how to sort the jumble of the massive quantity of information during the discussion (Healey, 1996). Or, based on the assumption that judgement relies more on potential than on instrumental calculation, even deeper doubt has been cast on whether 'profession' as expert knowledge still exists in the planning process besides the different opinions (Allmendinger, 2002, p. 206).

The rise of interpretative communicative planning has also been observed in environmental assessment processes with the shift from analysis/evaluation to communication (Janssen, 2001), highlighting the communicative benefits of the assessment (Nielsen et al., 2005), as well as a new trend in decision-making and the implementation process of policy, plan or program (PPPs) with the involvement of multiple stakeholders, communication and participation (Joumard and Gudmundsson, 2010; Lam et al., 2009). Arguments based on the traditional EIA-based SEA – but going beyond it – for a more communication-based SEA rooted in the perspective of communicative planning (Fischer, 2003) have been proposed intensively in the last decade (Hilden et al., 2004; Partidário, 2000; Vicente and Partidário, 2006). Differing from the EIA-based SEA, a communication-based SEA calls for more participation of stakeholders and more communication within a more flexible procedure (Fischer, 2003; Partidário, 2000; Vicente and Partidário, 2006), though depending on the tier of decision-making, the need for communication differs (Fischer, 2003). The Chinese practice is also involved in this discussion (Bao et al., 2004; Che et al., 2011; Lam et al., 2009; Tang et al., 2007; Wu et al., 2011). The communication-based SEA model has been criticised, however, for placing too much emphasis on the process rather than effective outcomes (Fischer, 2003), especially considering the doubt as to whether free of power in reality can be reached (Tewdwr-Jones and Allmendinger, 1998). Therefore how to find a balance between the pure technical EIA-based SEA and the communication-based SEA is still being discussed.

2.1 Communication and flow

In his study of the act of communication, Lasswell (1948) identified four major questions concerned in studying a communication process: who says what, in which channel, to whom, and with what effect? The "who" question looks into the communicators, the "says what" question

concerns the content, the "in which channel" question studies the media, the "to whom" question explores the audience, and "with what effect" investigates the impact or the effect of the communication. The channel in our case is the use of indicators in the SEA process, and our study looks into the questions of "who" and "to whom", and at the effect aspect. The latter relates to the flow of communication and whether a possibility for dialogue is achieved. Following the same line of reasoning McLuhan criticised the common understanding of communication as "merely transporting messages from point to point". McLuhan argued that communication means change and further added that effect constitutes communication -"no effect means no communication" (McLuhan, 2008, p.31).

On this background, one way to investigate the communication flow is to follow the direction of flows. Depending on the degree of reciprocity between communicators and audience (Lasswell, 1948), communication in the context of society can be sorted into two categories of one-way communication and two-way communication (Cutlip and Center, 1952). Grunig and Hunt (1984) further suggested that the major difference between one-way and two-way communication is whether feedback exists. One-way communication flows from communicators to the receivers. According to Grunig and Hunt, in one-way communication, the communicators' role is to inform the public of their own opinion and values without explicit feedback from the receivers/audience back to the communicators. One-way communication focuses on "speaking" but not listening (Heath, 2006). One-way communication has been criticised as there is no probability for the communicators to be challenged for their stance and value (Grunig and Hunt, 1984). One-way transmission is also described as: "scientists decide what to study and make information available to society by placing it on a 'loading dock,' then waiting for society to pick that information up and use it" (Lindenfeld et al., 2012, p. 28), while the engaged model emphasises the engagement of stakeholders and communities in producing information and understanding, and use of local knowledge (Lindenfeld et al., 2012).

By relying on "listening for and sharing valuable information as well as being responsive, respectful, candid, and honest" (Heath, 2006, p. 106), two-way communication is from the communicators to the receivers and vice versa. Rather than only disseminating information, two-way communication emphasises the participation of the receivers in the communication with feedback (Grunig and Hunt, 1984). Two kinds of two-way flow are defined by Grunig and Hunt (1984); two-way asymmetric flow and two-way symmetric flow, where the former admits the importance of feedback while the latter emphasises the interaction between communicators and receivers as a driver to change the communicators' values and opinions.

Another way to investigate communication flows is from the perspective of the boundary of flow. Depending on the formal functional positions of those involved in the communication, communication can also be sorted into internal and external communication (Johnson and Chang, 2000). In the context of organizational communication, fundamentally as a management discipline, internal communication occurs among participators within the organization (Grunig, 1992). Internal communication can reduce confusion and resistance (Lippitt, 1997) therefore it is seen as an important factor for an effective and successful implementation (Quirke, 2008; Spike and Lesser, 1995). External communication relates to the boundary spanning in term of those involved (Johnson and Chang, 2000). Communication with external information sources supplies information for the internal users (Johnson

and Chang, 2000). External communication can facilitate information feeding into the system or organization. The distinction between internal and external communication is not clear-cut, however. Sometimes the results of external communication might feed back into internal communication that can be exported through external communication again (Nagpaul and Pruthi, 1979). Furthermore, due to the flatter structure of organizations in both formal and informal ways, it is harder to put a fixed boundary on those who should be involved in internal communication (Kitchen and Daly, 2002). Therefore internal and external communication should be defined depending upon the specific case.

According to these perspectives on communication, we develop a conceptual model to demonstrate the communication within two boundaries and in two directions. In this model (see Figure 1), we address constructor, participant and flow of communication within the process of selecting and using indicators in SEA.

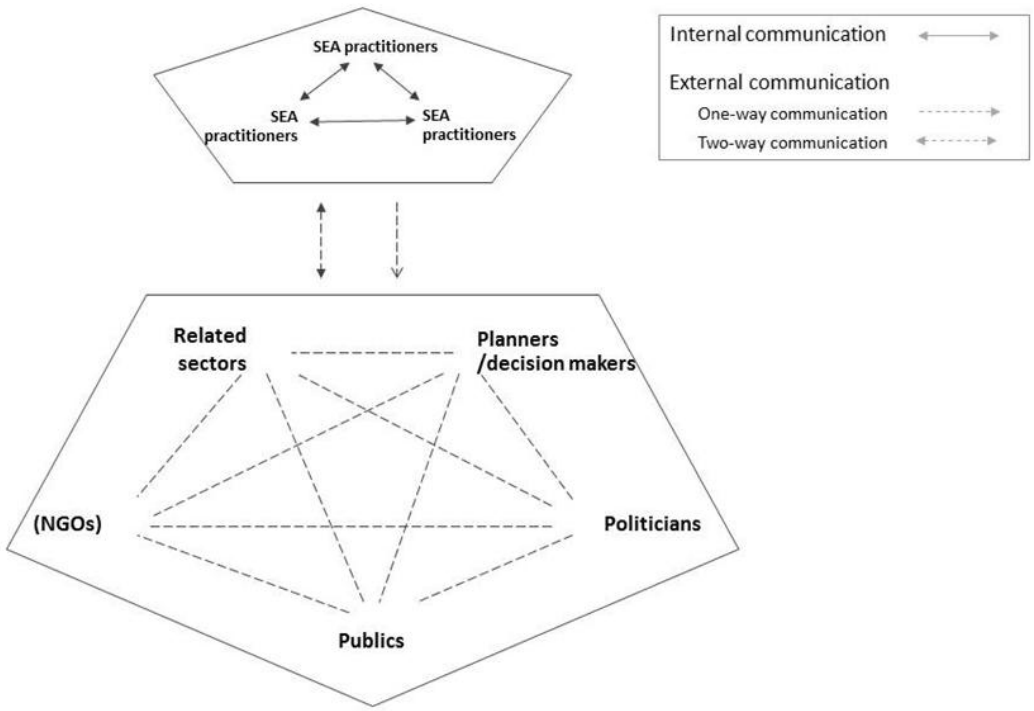

Figure 1 Communication model used for analysing communication and flow

Firstly, to analyse the influence of indicators on communication there is a need to identify those involved in the communication arenas, and then clarify the communication flow among them. In the context of Chinese SEA, those participants in communication include SEA practitioners, planners in other sectors, politicians, the public and sometimes NGOs. The next step is to group the communication flows according to two categories; flow direction and flow boundary. The first category consists of both one-way

communication and two-way communication. The one-way communication in this study refers to the communication that only aims at informing and transferring, while the two-way also involve feedback, interaction and participation. The second category consists of internal communication and external communication. Internal communication is between SEA practitioners within the SEA team. All the other communications with stakeholders, planners and decision makers, politicians, public and sometimes NGOs, if any, are classed as external communication.

3. Methodology and cases

The approach adopted in this study is a combination of an on-line survey on general level targeting SEA practitioners, and two SEA case studies within the urban planning sector. The case studies involved documentary analysis and interviews, and will be further described and discussed in the following.

3.1 Case studies

Two SEAs of urban master plans are chosen for case study:

- SEA of Shenzhen's Master Urban Planning (2007–2020) (hereafter called the Shenzhen case) and
- SEA for the Dali Urban Development Master Plan (2008) (hereafter called the Dali case).

The case studies were undertaken within the same time period (2007–2009) with similar institutional contexts and according to the same legislation system. They both involve urban development plans which currently are among the fastest growing plans in China, besides sectoral plans. Furthermore, both cases are pilot SEA projects under quality control by the Ministry of Environmental Protection in China, which were provided with the most advanced technology support. Finally, the SEA cases are undertaken by two different types of practitioners. A local research institute undertook the Shenzhen case, while the Dali case was a joint project undertaken by the local research institute and an international SEA team. The two cases are further described in Box 1.

The documents studied included SEA reports, SEA work documents, planning reports and case-based research publications. Besides documentary study, eight individual interviews (Table 1) were undertaken between January 2011 and June 2012. The interviews were conducted in Beijing, Shenzhen and Dali in China (face to face), and in Denmark (via phone). The interviews were taken at two levels; a general level based on the interviewee's general experience with Chinese SEA and, a case level based on the two urban planning SEA cases. Each interview is given a code with one letter and two numbers. Letter G represents general level interviews. Letter S represents the Shenzhen case and D represents the Dali case. The numbers represent the individual interviewees.

Box 1 Two urban planning SEA cases

Case 1 SEA of Shenzhen's Master Urban Planning (2007–2020)

Shenzhen, overlooking Hong Kong, is located in southern Guangdong, China. Shenzhen has a population of 8.6 million within its area of 2000 km^2. During the past three decades, benefiting from being the first "special economic zone" Shenzhen has experienced rapid economy growth from a small town to a booming region. In response to the environmental and resource issues brought by the fast development, Shenzhen Municipality issued the first master plan was in 1982 which was revised twice in 1986 (Shenzhen's Master Urban Planning 1986-2000) and 1996 (Shenzhen's Master Urban Planning 1996–2010). In 2006 the local municipality government started revising it as "Shenzhen's Master Urban Planning 2007–2020". The SEA was included in this revising process to ensure the environmental consideration is integrated into the plan making. As one of the pilot SEAs tested by the Ministry of Environmental Protection in China, this project was undertaken by the Academy for Environmental Science in Shenzhen, and was appraised in March 2009.

Source: Che et al., 2011.

Case 2 SEA for the Dali Urban Development Master Plan (2008)

Dali is one of the Autonomous Prefectures in Yunnan Province, in southwest China, with a population of 3.29 million in an area of 29,000 km^2. The rapid industrialization since the 1980s has caused degradation of the province's complex and fragile ecological systems. Yunnan has formulated strategies and action plans to address these problems. In 2007, Dali Municipal Government commenced the revision of its existing urban development master plan and simultaneously commissioned SEA for the master plan revision. The purpose of the SEA was to assess the proposed urban development objectives, population and territorial expansion, spatial layout, and planned industrial developments in the municipality. Due to delays in the formulation of the master plan, the SEA eventually ended up analysing impacts of possible development scenarios and providing related recommendations to Dali Municipal Government and the planning team. The SEA process was financed by the Dali municipality and carried out as an independent assessment that ran in parallel with elaboration of the plan. Additional support was provided from a provincial SIDA (Swedish International Development Cooperation Agency)-sponsored project. The SEA was and appraised in April 2009.

Source: Dusik and Xie, 2009.

Table 1

Overview of interviews.

Interviewee	Title	Date
G01	Professor in Environmental Assessment	January 2011
G02	Vice General Engineer, MEP, China	January 2011
G03	Director, Department of Plan-EIA, Appraisal Center for Environment & Engineering, MEP, China	February 2011
G04	Director, Department of EIA, MEP, China	February 2011
S01	SEA project manager	March 2011
S02	Planning leader	April 2011
D01	SEA project manager	April 2011
D02	SEA project manager	June 2012

The interviews were semi-structured, and were designed with the help of the communicational model as presented earlier. Both the documentary analysis and interviews investigated who was involved in the selection of indicators, and how the use of indicators influenced the communication among the stakeholders.

3.2 Survey of SEA practitioners

To give a broader understanding of the role and influence of SEA indicators on communication, an online survey was conducted between June and August in 2012 targeting the general experience of SEA practitioners.

"SurveyXact" developed by Ramboll, in Denmark, was employed for on-line data collection. We sent out 75 invitations to potential respondents including SEA practitioners, planners, stakeholders from other sectors, researchers and administrators, by e-mail, of which 46 responded the questionnaire. The survey is designed in three blocks of questions; "general questions related to guidance and the handling of indicators", "questions related to experience in choosing indicators" and "questions related to the experience and impacts of using indicators", of which the last two blocks are designed for this study (the first block is used for another study by the authors (Anonymous, 2012, in press). The survey focuses on how the indicators are used in SEA and their influence on communication within the SEA process.

4. Results

4.1 General experiences with the use and influence of indicators

Internal communication as defined above refers to the communication between SEA practitioners within the SEA team. The survey investigated whether using indicators in SEA has any influence on this communication. Survey results show that 76% of the respondents experience indicators as useful or very useful in communicating within the SEA team in their practice. When looking into the different stages, the results shows that a high percentage of respondents agree that indicators are useful or very useful in communicating with other practitioners in the stages of screening (83%), scoping (80%), data collecting (80%) and assessment (96%).

All the other communication flows are defined in this study as external communication. Overall, in those SEA stages involving external communication, survey results show that indicators are considered as useful or very useful in evaluation and approval (83%), follow up and monitoring (85%), public participation (67%) and communicating with decision-makers (89%) (Figure 2). For "communicating with decision-makers" the survey results also show that more than 59% of the respondents find there is not enough communication between SEA practitioners and decision-makers regarding how to use indicators in SEA and planning/decision-making.

From the communication perspective, a general finding can be drawn from the interviews about the challenges and barriers experienced in communicating between the SEA team and the planning team. Different reasons have been mentioned during the interviews. One reason is the different consciousness of environmental considerations: "In China, the consciousness has been built up well in the environmental sector, while in other departments it has been developed quite poorly" (G02, 2011), so the capacity varies between sectors. Further, institutional barriers are raised as causing challenges in communication between the two teams/sectors, like e.g. "the conflict between different sectors or departments

regarding SEA's role in China" (G03, 2011), "the decision making mechanism and the conflict between different departments" (G04, 2011), and the still weak capacity of SEA practice in China due to the current infancy of SEA in the country (G03, 2011).

Overall the survey shows that the respondents experience indicators as increasing the external involvement in the SEA process:

- 46% experience increased political involvement (30% as partly, and 22% not),
- 28% experience increased participation of the public/NGOs (33% partly, and 35% not), and
- 37% experience increased communication between authorities and the public/NGOs (30% partly, and 28% not).

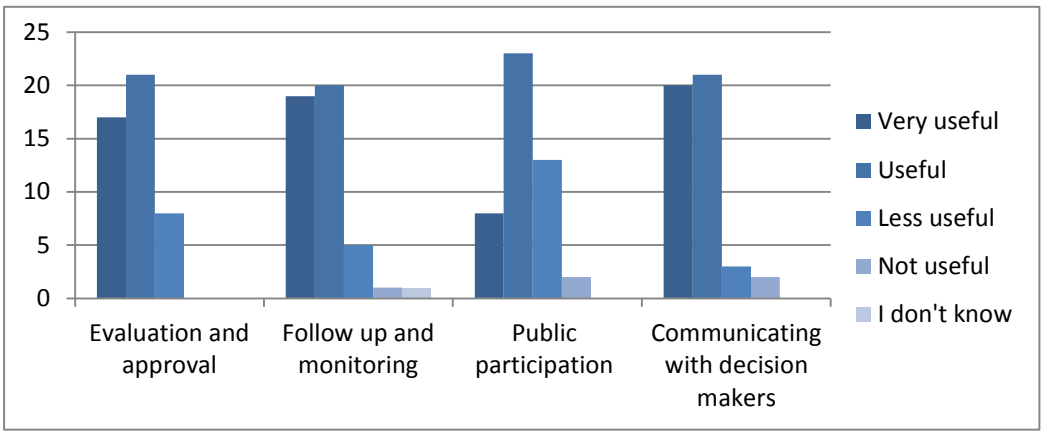

Figure 2 Experience of contribution of indicators to the improvement in communication in different stages of SEA (N= 46)

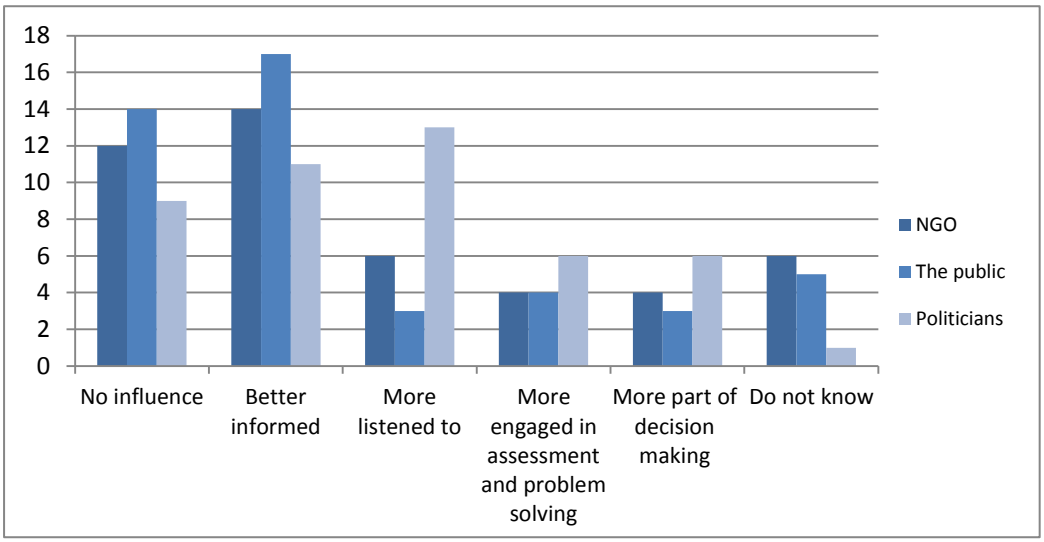

Figure 3 Experience with how indicators influence the participation of stakeholders in the SEA process. (N= 46)

Furthermore, external communication is also investigated from two perspectives of the flow direction; one-way communication and the two-way communication. Looking more into the flow of communication, and the effects of it, a more nuanced picture is revealed. Figure 3 presents results according to three groups of external stakeholders (NGOs, the public and politicians) and the effects of communication. The effects of communication are divided into: (a) "no influence" and "better informed", which represent the one-way flow of communication, and (b) "more listened to", "more engaged in assessment and problem solving" and "more part of decision-making", which represent the two-way flow of communication. The five effect categories represent a ladder of participation with partaking in decision-making as the highest step.

The experience of SEA practitioners reveals that indicators in SEA mostly influence one-way communication with better information to all external stakeholders, among whom the public seem to be most influenced, and politicians the least. For two-way communication a clear result is that indicators mainly influence the political involvement in the SEA process, compared with the public and NGOs.

4.2 Case studies

4.2.1 Selecting indicators through communication

In the Shenzhen case, the SEA called for several consultation meetings with specialists and experts from the environmental sector and the planning sector to develop the list of indicators (Che et al., 2011; S01, 2011). But no project developer had participated as stakeholder. The interpretation of the reason for that was given by one of the interviewees: "a Master plan is on a very general level [not directly related to any activities], so no project developer as stakeholders actually participated" (S01, 2011). Further, public involvement did not happen in the process of indicator design either, due to the fact that "the average level of publics' concern in environmental issues has not reached a high level of concern in this field" (S01, 2011). According to S01 and S02, currently in China the public pay more attention to the direct results and impacts of the urban plan than the technical process. During the interview, we also gained an impression that the planning team paid quite a lot attention to public participation and found the public actually only care about issues directly influencing them or relating to them. Based on this process, a list with a broad scoping of 22 indicators in eleven categories in the field of environment and energy was decided.

The Dali case shows another picture. As an internationally funded research pilot case, a different understanding of the SEA process could be observed. This case significantly emphasises the importance of cooperation and communication among sectors and stakeholders. Besides the SEA team, there was a comprehensive list of departments and organizations involved in this process: local government, environmental protection authority, planning authority, a consultation board with experts from the local Congress and Committee of the Political Consultative Conference (who used to work for environmental sector and construction bureau) and even the vice mayor of Dali who had environmental management experience. In this case, an information sharing and collaboration mechanism was set up. Regular meetings of the cooperating sectors and stakeholders made data and information sharing available, and the SEA team also updated and shared knowledge,

understanding, recommendations and suggestions (D02, 2011). Another study on this case further showed that the scope of assessed objectives was intensively discussed, themes and the potential scenarios were considered. Environmental, social and economic issues were included and the environmental issues were paid the most attention (Dusik and Xie, 2009).

Based on this collaboration platform, the SEA team listed the most basic environmental indicators according to the guideline and the project. During the consultation process, "sometimes some indicators were found too detailed to describe the key issues, so only those indicators most concerned were selected while aspects such as noise and waste problem were paid less attention to" (D01, 2011). Based on this cooperation platform, a list of 25 indicators was designed based on seven different themes: resource, biological environment, water, air, solid waste, tourist industry and social culture.

4.2.2 Communicating by using indicators

Sharply different from the impression drawn from the interviews based on general experience, our investigation shows that external communication is conducted more extensively in the two cases, although in both cases the external communication involves mainly various sectors and experts, with low public participation.

In the Shenzhen case, communication between the SEA and the planning process started even before the planning started, according to the description of one of the plan leaders: "The SEA team was involved in (planning) even before the plan began" (G02, 2011). On one hand, this early engagement facilitated the selection of objectives and indicators: "The SEA team developed their indicators by consulting many sectors including our planning team … we commented on their scoping … and the key objectives they would assess" (S02, 2011). On the other hand, using indicators also facilitated the communication between SEA and planning: "Planning also needs support by indicators to decide the final plan, to show the plan's aim and to implement the plan. Therefore from the planning perspective, we prefer a quantitative conclusion with indicators and if there is any, the standard value for indicators" (S02, 2011). Using indicators as a tool to set some environmental requirements: "Indicators are used as the explanation for the environmental aim, for example, we also used several biological and environmental indicators in the Plan to show our environmental aim" (S01, 2011), and communicating with the SEA team also offered the planning team support in balancing the conflict between the different sectors involved:

> Plan making is a process of balancing interests and we need to take many sectors' demands into account and the result is a trade-off conclusion … as a planner, how to balance the different demands and interests from many sectors, how to implement this plan in many different involved sectors? I think that SEA provided us a relatively systemic methodology in facing these conflicts ... It is also easier if you use the SEA's result to convince other sectors involved in the plan making … the most important thing is that we use SEA as a platform to solve those problems (S02, 2011).

Indicators have also been used as a main communication tool as they were used as the explanation for the environmental targets (S01, 2011). Several biological and environmental indicators were selected from the proposed plan to be used as constraints to

show the environmental target. For the external communication in the Shenzhen case, it was found that the main communication was within the group of experts, with low engagement of the general public (S01, 2011; S02, 2011). The SEA team shared the SEA report with many sectors and the public, and chose those popular indicators that the public were familiar with (e.g. energy saving indicator). The public did not show much interest in the general development plan, instead, more interest has been observed in detailed planning like construction projects that relate more directly to the private sector (S01, 2011; S02, 2011). We also see this as a challenge for effective public participation in environmental assessment on the strategy level.

In the Dali case, indicators are frequently used in the communication with the cooperating departments especially with the planning team, which is labelled as one of the highlights in this case. One of the experts who was involved in Dali case mentioned:

> As one of the very few cases achieving the aim of early integration of SEA in planning in China, in the Dali case several rounds of negotiations and consulting between the SEA team and the planning team were conducted, the early integration of SEA in planning process provided opportunities to the local planners to adjust the plan during plan making (G02, 2011).

Later in deciding the key assessment objectives, the SEA team also involved the public by undertaking a survey with tourists. The SEA team find the survey "provided certain information in giving a broad scope in helping decide on the key objectives" (D01, 2011). However, when communicating with decision-makers, a rather interesting finding is that the SEA team tried to avoid using too detailed information, due to the consideration that "it needs more information than indicators can provide to influence the decision-making" (D01, 2011). But by initiating communication at a very early stage and involving decision-makers in the SEA process, this SEA had the opportunity actually to influence the decision-making process, by developing indicators of relevance for the decision-maker (D01, 2011).

4.3 Discussion of findings

In terms of how indicators are designed, experience from the two Chinese SEAs shows a changing understanding of approaches for SEA. Although the indicator lists in both SEA cases are still centrally based on the national guidelines and have a very strong physical/biological focus, the process of selection of indicators, however, shows a trend towards a more communicative approach. In the Shenzhen case, a joint team was formed to develop indicators. In the Dali case, this trend is even more obvious, where information sharing and collaboration was set up to by holding regular consultation meetings, which not only provided a platform for stakeholders to participate, but also proactively included them in the decision making arena. When indicators were chosen in this way, a clear turning from a pure technical understanding of SEA practitioners to a more communicative and comprehensive approach can be assumed.

In terms of how indicators are applied, both the cases and the survey results suggest that the application of indicators in the Chinese SEA system is still more scientific than

communicative. The survey clearly shows that indicators are found more useful in internal communication than in external communication, which indicates that indicators are more used for technical purposes for communicating between practitioners on professional issues. Both of the two cases also show that indicators were mainly used in the internal communication, especially in the Shenzhen case, where indicators were used to influence the communication among experts. Although the case study shows that external communication between SEA practitioners, stakeholders and decision-makers is frequently mentioned and has even been regularised with the help of the cooperation mechanism by taking indicator design as one of the common goals to facilitate involvement indirectly, especially in the Dali case, the influence of indicators on external communication has been identified as limited. Besides, public and NGO participation was not really well implemented in the two case studies, due to the strategic nature of the plans. A positive finding from the survey is practitioners' experience that indicators influence communication and in general increase participation. However, this participation is mainly through one-way communication in terms of informing, and the two-way communication mainly involves politicians.

5. Conclusion

Along with increasing discussion and emphasis on communication in SEA, indicators as one of the tools to facilitate communication in terms of information transfer, consensus building and goal setting, deserve careful study. This article explores how indicators influence the communication in SEA between different stakeholders involved in SEA. Based on two SEA cases in China, we analysed case-based materials and interviewed SEA practitioners and planners involved in the cases. Besides, in order to have a broader view of practitioners' understanding and experience in using indicators in SEA, this study also uses data from interviews with experts and administrators, and a survey among practitioners based on their experience in Chinese SEA practice. To explore the influence of indicators on communication, a conceptual communication model is set up to demonstrate the relationship between those involved in the communication. According to this model, the communication occurring in SEA can be divided into internal communication and external communication in terms of communication flow boundary, through flow direction in either one-way channels or two-way channels.

Based on this illustration, the results of the case studies and survey show the following findings. Firstly, in selecting indicators, the approach used in both two cases reveals changes. Instead of being as a purely technical process taken by the professionals, a more engaging process is identified which is more open for including the stakeholders and planners in designing and developing indicators. Secondly, in terms of using indicators, it is shown generally that at the moment indicators are used mainly for scientific purposes rather than communicative purpose in Chinese SEA practice, due to the fact that it is more common to use indicators in internal communication among SEA practitioners rather than in external communication, although the practitioners perceive indicators as useful in increasing both internal and external communication. For the external communication between the SEA team and the planning team, the general experience indicates challenges and, due to different consciousness of environmental considerations, conflicting perceptions of the

role of SEA and low capacity building in some areas like the planning sector. However, the results from the two cases show the early involvement of SEA in the planning process and better capacity building – and a reduction of those barriers.

The results also show an increasing political involvement, especially – more than for the public and NGOs. Finally, the influence of indicators on communication is mainly seen in relation to one-way communication in terms of providing information. The influence on two-way communication in terms of engaging stakeholders in a dialogue, assessment and problem solving/decision-making is found to be limited. This finding, together with the findings from the two cases, also suggests that participation of and feedback from the public and NGOs is not very well implemented in Chinese environmental assessment practice on a strategic level.

References

Allmendinger P. Planning theory. Hampshire: Palgrave; 2002.

Bao C, Lu Y, Shang J. Framework and operational procedure for implementing Strategic Environmental Assessment in China. Environ Impact Assess Rev 2004; 24(1): 27–46.

Che X, English A, Lu J, Chen YD. Improving the effectiveness of planning EIA (PEIA) in China: Integrating planning and assessment during the preparation of Shenzhen's Master Urban Plan. Environ Impact Assess Rev 2011; 31(6):561–71.

Cloquell-Ballester VA, Monterde-Diaz R, Santamarina-Siuranaet MC. Indicators validation for the improvement of environmental and social impact quantitative assessment. Environ Impact Assess Rev 2006; 26(1):79–105.

Cutlip, SM, Center, AH. Effective public relations. Englewood Cliffs, NJ: Prentice-Hall; 1952.

Dale VH, Beyeler SC. Challenges in the development and use of ecological indicators. Ecol Indic 2001; 1(1):3–10.

Donnelly A, Jones MB, O'Mahony T, Byrne G. Selecting environmental indicators for use in strategic environmental assessment. Environ Impact Assess Rev 2007; 27(2):161–75.

Dusik J, Xie J. Strategic Environmental Assessment in East and Southeast Asia: A progress review and comparison of country systems and cases. Washington DC: World Bank; 2009.

Fischer TB. Strategic environmental assessment in post-modern times. Environ Impact Assess Rev 2003; 23(2):155–70.

Flyvbjerg B. Rationality and power: democracy in practice. London: University of Chicago Press; 1998.

Grunig JE. Excellence in public relations and communication management. Hillsdale, NJ: Lawrence Erlbaum Associates; 1992.

Grunig, JE, Hunt, T. Managing public relations. New York: Holt, Rinehart and Winston; 1984.

Hammond A, Adriaanse A, Rodenburg E, Bryant D, Woodward R. Environmental indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development. Washington DC: World Resources Institute; 1995.

Healey P. Collaborative planning: Shaping places in fragmented societies. London: MacMillan; 1997.

Healey P. Planning through debate: the communicative turn in planning theory. The Town Plan Rev 1992; 63(2):143–62.

Healey P. The communicative turn in planning theory and its implications for spatial strategy formation. Environ Plan B: Plan Des 1996; 23(2):217–34.

Heath RL. Onward into more fog: Thoughts on public relations research directions. J Public Relat Res 2006; 18(2): 93–114.

Hilden M, Furman E, Kaljonen M. Views on planning and expectations of SEA: the case of transport planning. Environ Impact Assess Rev 2004; 24(5): 519–36.

Innes JE. Information in communicative planning. J Am Plan Assoc 1998; 64(1): 52–63.

Innes JE. Planning theory's emerging paradigm: communicative action and interactive practice. J Plan Educ Res 1995; 14(3): 183–9.

Janssen R. On the use of multi-criteria analysis in environmental impact assessment in the Netherlands. J Multi-Criteria Decis Anal 2001; 10(2):101–9.

Johnson JD, Chang H. Internal and external communication, boundary spanning, and innovation adoption: an over-time comparison of three explanations of internal and external innovation communication in a new organizational form. J Bus Commun 2000; 37(3): 238–63.

Joumard R, Gudmundsson H. Indicators of environmental sustainability in transport, an interdisciplinary approach to methods. Bron, France: Les collections de l'INRETS; 2010.

Kitchen PJ, Daly F. Internal communication during change management. Corp Commun: An Int J 2002; 7(1):46–53.

Kørnøv L, Thissen WAH. Rationality in decision- and policy-making: implications for strategic environmental assessment. Impact Assess Proj Appraisal 2000; 18(3):191–200.

Lam K, Chen YD, Wu J. Strategic environmental assessment in China: Opportunities, issues and challenges. J Environ Assess Policy Manag 2009; 11(4):369–85.

Lasswell, HD. The structure and function of communication in society. In: Bryson L, editor. The communication of ideas. New York: Harper and Brothers; 1948.

Lindenfeld LA, Hall DM, McGreavy B, Silka L, Hart D. Creating a place for environmental communication research in sustainability science. Environ Commun: A J Nat Culture 2012; 6(1):23–43.

Lippitt M. Communication: Say what you mean, mean what you say. J Bus Strategy 1997; 18(4):18–20.

Lyytimäki J, Rosenström U. Skeletons out of the closet: effectiveness of conceptual frameworks for communicating sustainable development indicators. Sustainable Development 2008; 16(5): 301–13.

McLuhan E. Marshall McLuhan's theory of communication: The Yegg. Glob Media J-Canadian Edition 2008; 1(1): 25–43.

Morrone M, Hawley M, Improving environmental indicators through involvement of experts, stakeholders, and the public. The Ohio J Sci 1998; 98(3): 52–8.

Nagpaul, PS, Pruthi, S. Problem-solving and idea-generation in R&D: the role of informal communication. R&D Manag 1979; 9(3): 147–9.

Nielsen, EH, Christensen P, Kørnøv L. EIA screening in Denmark: a new regulatory instrument? J Environ Assess Policy Manag 2005; 7(1): 35–49.

Nilsson, M, Dalkmann, H. Decision-making and strategic environmental assessment. J Environ Assess Policy Manag 2001; 3(3): 305–27.

Partidário MR. Elements of an SEA framework – improving the added-value of SEA. Environ Impact Assess Rev 2000; 20(6):647–63.

Quirke B. Making the connections: Using internal communication to turn strategy into action. Hampshire: Gower; 2008.

Ramos TB, Alves I, Subtil R, Joanaz de MJ. Environmental performance policy indicators for the public sector: the case of the defence sector. J Environ Manag 2007; 82(4): 410–32.

Ramos TB. Development of regional sustainability indicators and the role of academia in this process: the Portuguese practice. J Clean Prod 2009; 17(12): 1101–15.

Saisana M, Tarantola S. State-of-the-art report on current methodologies and practices for composite indicator development. Ispra, Italy: JRC-IPSC (Joint Research Centre, Institute for the Protection and Security of the Citizen); 2002.

Schiller, A, Hunsaker CT, Kane MA, Wolfe AK, Dale VH, Suter GW, et al.. Communicating ecological indicators to decision makers and the public. Conservation Ecol 2001; 5(1):19. Online URL: http://www.consecol.org/vol5/iss1/art19/ (2012/8/15)

Spike BK, Lesser E. Change management: we have met the enemy… J Bus Strategy 1995; 16(2):17–21.

Stoeglehner G, Brown AL, Kørnøv LB. SEA and planning: 'ownership' of strategic environmental assessment by the planners is the key to its effectiveness. Impact Assess Proj Appraisal 2009; 27(2): 111–20.

Tang T, Zhu T, Xu H. Integrating environment into land-use planning through strategic

environmental assessment in China: towards legal frameworks and operational procedures. Environ Impact Assess Rev 2007; 27(3):243–65.

Tewdwr-Jones M, Allmendinger P. Deconstructing communicative rationality: a critique of Habermasian collaborative planning. Environ Plan A 1998; 30(11): 1975–89.

Thérivel, R. Strategic environmental assessment in action, London: Earthscan Publications; 2004.

Vicente G, Partidário MR. SEA-enhancing communication for better environmental decisions. Environ Impact Assess Rev 2006; 26(8): 696–706.

Walz R. Development of environmental indicator systems: experiences from Germany. Environ Manag 2000; 25(6): 613–23.

Wu J, Chang I, Bina O, Lam K, Xu H. Strategic environmental assessment implementation in China - Five-year review and prospects. Environ Impact Assess Rev 2011; 31(1):77–84.

Anonymous, 2012, in press.

(Final draft to be submitted to Journal of Environmental Assessment Policy and Management)

THE ROLE OF INDICATORS IN SEA IN INFLUENCING PLAN MAKING

JINGJING GAO PER CHRISTENSEN and LONE KØRNØV

The Danish Centre for Environmental Assessment
Department of Development and Planning
Aalborg University, Skibbroggade 5, 9000 Aalborg, Denmark
jingjing@plan.aau.dk

As an information carrier and communication medium, indicators provide useful assistance for decision-making, in setting goals for the process as well as reaching those goals effectively. The main focus of this article is to investigate indicators role in influencing planning during Strategic Environmental Assessment (SEA) especially related to the Chinese experience. From the perspective of planning and decision making theory, influence on planning is studied as influence of structure and influence of actors. Such a conceptual framework is applied to demonstrate how the use of indicators can influence planning through a SEA. The study takes place on two different empirical levels. On a general level, based on an online survey, this article investigates SEA practitioners' experiences in using indicators in the Chinese system. On a case level, two urban plan SEAs are selected to provide more detailed experiences. The case level investigation is based on a documentary study and individual interviews with SEA practitioners/planner. By exploring how indicators influence planning through SEA structure and SEA actors, this study tries to provide an overview of indicators role in SEA. The results indicate that indicators are conducted as a useful tool in the Chinese SEA system. By improving and simplifying the procedures of SEA, the indicators exert more structural influence on SEA and on plan making. On the other hand, indicators are also shown to have more influence through political actors than found among technical actors.

Keywords: Strategic Environmental Assessment; Indicators; Indicators; Influence; Plan making; China.

Introduction

As have been discussed intensively in the broader field of environmental assessment (EA) (Donnelly et al., 2006, 2007; Kørnøv and Hvidtfeldt, 2003; Thérivel, 2004) indicators are a

useful tool in decision making and planning. Due to indicators' dual function as being both scientific as well as political in nature (Gao et al, 2012b) it raises questions to which degree SEA should be based on communicative principles or more directly on quantitative, technical and scientific models, in the same way as it is in EIA. Debates on these issues have been one of the methodological hot-spots during the last decades (Fischer, 2003; Kørnøv and Thissen, 2000; Partidario, 2000; Vicente and Partidário; 2006). In this dilemma we encounter enthusiasm both in favour of models that are seemingly simple, although this need not always be the case (Gao et al., 2012a). Contrary to this we also find proponents of the idea that indicators are meant to be communicative in nature, thus being defined and used through participation of different stakeholders. Through such communicative praxis the stakeholders alter their preferences, widen their horizons (empowerment) and even demonstrate improvements in formulating their own goals. It is argued that this diversity and complexity require a better and more integrated process than a simple technical assessment or evaluation process (Partidario, 2000). Although SEA, by its very nature is a technical procedure, it generates (or contributes to) much more political output than purely scientific or technical output. Researchers who are sceptical towards communicative SEA, often consider more practical issues like time and financial constraints as limitations (Fischer, 2003). This could be seen as a debate on whether to focus on a rational procedure or structure, or on engagement of multiple actors in SEA. To sketch the roots for this dilemma, a brief introduction on the role of information in planning and decision making is provided. This would also help in exploring the role of indicators in planning and decision-making, as one of the important ways in carrying, transferring and transforming information.

The role of information in planning and decision making

The development of planning and SEA owe its existence to the fact that many models are based on quite different attitudes towards the use of information and knowledge. The conventional understanding of information and the part it plays in planning and decision making has been critically challenged in the last decades. Information is essential in all kinds of decision making, but the pivotal point is often to decide what should be integrated in a more communicative model .To cover not only information but also different ways in using information in planning and decision making (Innes, 1998).

Research on the role of information or knowledge in planning or decision making has intensively been discussed since the 1980s (Foucault, 1980; March, 1994; Innes 1998). In order to represent complex phenomena, which according to March (March, 1994, p.15), are "*elusive-real but difficult to characterize and measure*" one way for planners and decision makers is to use "*summary numerical representations of reality*" (March, 1994, p.15). March (1994) concluded that those "numerical representations" that could provide specific, vivid and concrete information are more popular among decision makers than those of a more general nature.

According to Innes (1998), predictions and forecasts, quantitative calculation and other kinds of scientific knowledge is only one among different kinds of relevant information to be used in planning and decision making. The recognition of how to use information, especially scientific, technical information is a learning process lead by planning theorists and practitioners alike. The conventional planning process is assumed to rely on technical models and calculations, entailing

that the role of planners and professionals is mainly to provide more objective information based on scientific analysis as well as give technical support to decision makers, without adding other value to the information, but merely tell the neutral side of the story without being engaged in the planning/decision making (Innes, 1998). Research made by Innes (1998) shows that the influence of formal information is limited in the actual decision making. Decision makers keep ignoring the scientific findings made by the planner. In exploring when and why information could be influential, theorists tried to find out why information and knowledge makes a difference. Power and communication are thus the most often mentioned factors that determine the influence on decision making (Allmendinger, 2002; Forester, 1999; Foucault, 1980; Healey, 1992; March, 1994; Innes 1998; Sager, 1994).

On the other hand, March (1994) recognised that the role of information in decision making is more in building consensus than in providing technical support. According to March, decision making is more based on confidence than accuracy. And more information means more confidence, but not necessarily more accuracy, "*People seem to seek not certainty of knowledge but social validity*" (March, 1994, p.40). Within this perspective, communication, deliberative participation and engagement are more meaningful than pure scientific evidence or rational process in terms of getting decision by consensus making, since difference exists among different groups of society in the ways they shape, understand and simplify the reality (March, 1994, p.10). This argument is recognised later by Innes (1998), who believes that information's greater influence on planning and decision making relies on its embeddedness in the understanding of the participants and in communicating within society. By looking into the planning and decision forming, she proposes that the process of producing information is important and therefore it should be embedded in the involvement of participants. However, Innes does not deny the role of information as technical or scientific support, but, according to her, information is just part of the evidence that could influence planning and decision making. Information should of course be scientifically validated, but being socially recognised and accepted is the essential precondition for the usefulness as a technical support. Apart from formal technical information, information in planning also originates from four other resources covering: 1) participants' experience, 2) participants' story, 3) the representation used in discussions, and 4) participants' personal sense of the situation and of others. Along with the conventional information, communication in terms of deliberative engagement was found to have an indirect influence on output of planning and decision making, by motivating individual and joint action "i*n a way that cold "science" data never does*" (Innes, 1998, p.55).

As one of the important communicative characteristics, March also identified information's political influence by pointing out that among all the available information, decision makers *"…try to find an answer that serves their own interests*" (March, 1994, p.17). Decision makers do this by choosing those interested "numerical representations", which in the context of environmental assessment, could for example appear as indicators. Indicators' role in interpreting the complexity of reality is found in the communication between different groups of society as also identified by Hammond, et al. (1995). To explore how indicators influence the planning and decision making process in a SEA, it merits a closer study of how SEA influences planning and decision making.

Chinese experience

The Chinese experience follows to a certain degree EIA and SEA experiences as also found in the international context. The result of these practices, are debateable, due to the fact that the dominant stream consists of technically lead SEA, both in relation to its procedure as well as its institutional aspect (Bao et al., 2004; Bina, 2008; Che et al., 2002; Zhu and Ru, 2008). The original official title for SEA in China is Planning-EIA, which underlines that the tradition of understanding SEA is based on EIA and thus the scientific and technical traditions inherited from here. A typical technical understanding of SEA is clearly encountered in the legislative context of China. As mentioned no specific SEA law is established in China so far. Instead, the EIA Law issued in 2003 covers the national requirements on SEA as well. The Ministry of Environmental Protection has published a test version of Technical Guideline for Planning-EIA in 2003 (The State Environmental Protection Administration of China, 2003), which is presently under revision. To establish more specific requirements on the implementation of SEA, a SEA regulation was launched in 2009 (The State Council of the People's Republic of China 2009). Focus of the SEA research undertaken in China has also been highly concentrated on the technical aspects (Bao et al., 2004; Bina, 2008; Che et al., 2002; Zhu and Ru, 2008). Research rarely touches upon the discussion of how information, and more specifically, indicators are used in SEA and how it interacts with planning and decision making.

To explore the role of indicators in SEA, this study tries to determine how the influence of SEA is understood and addressed in general terms but also more specifically how they are affected by the use of indicators. Hence the research question is formulated as follows: exploring the role of indicators in SEA and how they influence the impact of SEA on plan making.

The following section establishes a theoretical basis for discussing the concepts of indicator influence on SEA and how it, in a broader sense, determines the influence of SEA on planning. After shortly describing the methods and resources employed in this study, our results will be discussed in Section 3, and conclusions will be drawn in Section 4.

Research design

Influence on planning and decision making

In order to examine how the use of indicators influences plan making through SEA, a theoretical analysis on the concept of "influence" is undertaken. Inspired by the understanding of Wrong (1979) and Sager (1994), influence, in the context of planning and decision making, could be studied from two perspectives, namely structural influence and actors' influence (Wrong, 1979, p.24; Sager, 1994, p.61). Structural influence comes from the contextual and institutional system where planning and decision making actors are shaped. The structure influence facilitates the rationale of planning (Giddens, 1984; Sager, 1994). According to Sager, structural influence is based on systemic capacity, which is impersonal and unperceived (1994). Fighting structural influence is thus seen as *"pursuing the planning-as-politics component of the compound rationale of planning"* (Sager, 1994, p.63), which states even more clearly the rational nature of structural influence. Being in favour of structural influence, Faludi points out that planning is considered to contribute by taking the most efficient ways in approaching ends (1984). With

emphasising the rationale in planning by highlighting the influence of rational action and science on planning, Faludi weakens the influence of political actions (1984), which also appears as a reduction of communicative influence. According to Sager, actors influence is based on collective capacity in involving all the actors in plan and decision making (1994, p.66). By approaching collective agreements or decisions through communication, dialog or action, actors influence is seen as presupposing communicative rationality (Arendt, 1970; Sager, 1994).

When applying the above concept of influence into SEA, we identify two channels through which SEA can influence the plan and decision making, namely structural influence, which refers to SEA's influence through procedures, and actors' influence, which refers to SEA's influence through actor's participation and engagement. Based on these two concepts, we develop a conceptual model (Table 1) to demonstrate how the influence of using indicators on planning and decision making could be studied and analysed.

Table 1. SEA's influence on plan and decision making (Based on Sager, 1994).

Influence		Goals	Influence on planning
Through procedure	Screening	• Deciding whether to take SEA • Setting assessment boundary	• To improve/facilitate planning process
	Scoping	• Identifying the important objectives and targets	
	Data collection	• Guiding data collection	
	Assessment	• Qualifying the impact assessment • Making the assessment easier and clearer	
	Public participation	• Involving public's opinion	• To involve more actors in arenas
	Evaluation and approval	• Quality control • Evaluating SEA	• To improve planning quality
	Follow up and monitoring	• Adaption and mitigation implementing • Monitoring SEA's effect	• To improve/facilitate planning • implementation
Through actors	SEA practitioners	• Internal/technical communication	• Approaching internal agreement/decision
	Experts	• Professional/technical consulting	
	Stakeholders Public NGOs Political	• External/political communication	• To decide who should be involved in planning arenas
	Planners Decision makers		• Integrating SEA results into planning

For each type of influence, the relevant aspects or elements are firstly identified. Then for each of the involved elements, the model tries to clarify its goal for SEA and its influence on plan and decision making. Finally indicators' role relating to those goals and influence is investigated.

For structural influence, we identify those relatively fixed SEA procedures required by the guidelines, such as screening, scoping and assessment, which appear at the relevant stages of SEA. For the actors' influence, we identify those potential participants engaged in SEA such as the public, NGOs and politicians.

Methods and resources

The research is based on two levels of investigation i.e. a general level based on empirical evidence collected amongst practitioners as well as a case level. The general investigation concerns Chinese SEA practice, and is based on an analysis of the national SEA technical guidelines and practitioners' general reflections of experiences under these guidelines. The case study includes two SEAs of master urban plans: Strategic Environmental Assessment of Shenzhen's Master Urban Planning (2007-2020) (hereafter called Shenzhen case) and SEA for The Dali Urban Development Master Plan (2008) (hereafter called Dali case).

The study employs methods combing documentary study, interviews and a survey. The aim of the documentary study is to determine, at a general level, how the issues of structure and actors are considered and addressed by the national technical guidelines. At the case level, we examine how these issues are handled by the practitioners. The materials studied in this article include SEA reports and working documents based on cases and publications.

Two rounds of interviews with four interviewees were carried out between January 2011 and June 2012. The interviewees include three SEA practitioners and one planner. A semi-structured interview guide allowed the interviews to develop in different directives and new questions could be addressed during the interview. Interviews are coded with one letter and two numbers which identify the single interviewees. An overview of the interviews is listed in Table 2.

Table 2. Overview of interviewees.

Interviewee	Title	Time	Place
S01	SEA project manager	March 2011	Shenzhen, China
S02	Planner	March 2011	Shenzhen, China
D03	SEA project manager	April 2011	Dali, China
D04	SEA project manager	June 2012	Denmark

An online survey is conducted at the general level. The survey is designed with the online program "SurveyXact" developed by Ramboll, Denmark. Potential respondents are mainly SEA practitioners, experts, researchers and administrators. 75 respondents were invited of which 46 responded. Among the 46 respondents, 41 (89%) have science or engineering background, 52% work as consultants and 39% work for academic institutes. 37% have more than 5 years' experience, and 50% have 2-3 years' experience, only 13% of the respondents have less than 2 years' experience. 24% of the respondents have experience with more than 10 SEAs, 7% have 7-10 SEAs, 28% have 4-6 SEAs and 33% have 1-3 SEAs. Among their experience, the most frequent sectors which respondents engage in are land use/infrastructure (63%), energy (43%), transportation (22%) and water resource (20%). Three questionnaires were designed for the interviews and survey:

- General questions related to guidance and the handling of indicators
- Specific questions related to respondents' experience with the choice of indicators
- Specific questions related to the impacts of using indicators based on respondents' experience

The first group of questions are designed to reflect how structural/procedural issues are addressed in the Chinese SEA system in relation to the use of indicators. The second group of questions touch upon both the consideration of the engagement of SEA actors and how they are affected by the use of indicators. The last group of questions place greater focus on the output of SEA as it is influencing planning and decision through the use of indicators.

Result and discussion

SEA in China – the role of structural influence

The technical support to guide the SEA practice in China is made by the two versions of national technical guidelines issued in 2003 and 2009 respectively (The State Environmental Protection Administration of China 2003; Ministry of Environmental Protection of China, 2009). In both guidelines, standard procedures for making a SEA are established and the content of the final SEA report or statements is stipulated. Even technical methods and skills, as well as models to assess indicators are recommended. SEAs made according to the standards and following the fixed Chinese national legislation and technical guidelines have been interpreted as a normative process (Tang et al., 2007; Zhu and Ru, 2008). When looking into the steps taken in a SEA and how it interacts with planning and decision making (framing problems by screening, defining key objectives by scoping, establishing alternatives and scenarios, identifying consequences by assessing alternatives and scenarios and, clarifying trade-offs by making decision among the alternatives), it should be clearly recognised that SEA in China has very clear stipulated goals and a standard procedure to implement SEA. And its interaction with planning and decision making is clearly a structured process that can be easily identified. One of the interviewee underlines this by mentioning an uncomfortable truth in Chinese practice; namely that SEA very much relies on theoretical assumptions on perfect causation, an assumption that is one of the typical features of rational planning and decision making. It obviously does not always work that way in reality, or the link between them are evidently much more complicated than envisaged in the theoretical assumption (S02, 2011). Besides all the above characteristics, adding to a picture of a highly normative system, where indicators use standard values that are often applied in an EIA, are also still used in SEA in China. Being satisfied by assessing the alternatives against the standard values, the Chinese SEA practice tries to provide "good enough" results ("satisficing", March, 1994) instead of maximal recommendation for planning and decision making. Based on these findings it suffice to recognise that the practise of SEA in China certainly have an intention of "structured" way of undertaking SEA, although practice may show a different picture.

Using indicators significantly influence SEA procedure

Defining the structure of SEA is in this study, done in accordance with the model presented in Table 1. According to the survey conducted, the use of indicators is found to be very useful in influencing the procedure of SEA. Looking into the individual steps of the procedure, Figure 1 clearly shows that indicators used in the different stages are found to be useful. In general 80% or more think indicators are useful or very useful at all stages except for public participation, where more than 33% of the responses show that indicators are considered as being not useful or less useful.

To explore which role indicators play during a SEA procedure, this survey investigates practitioners' experience in using indicators (Figure 2). Based on literatures and previous interviews, the roles that indicators could potentially play was designed and predefined by the authors in the survey. Overall, 91% of the respondents experience that indicators give "a better overview of complex impacts", set "a boundary for the assessment" and "identify the important objectives and targets. 87% of the respondents indicate that in their experience, indicators are helpful in "guiding data collection", whereas, only 76% of responses show that indicators are useful or very useful in "communicating internally within the SEA team". Furthermore, 83% of them agree that "Indicators make the assessment easier and clearer".

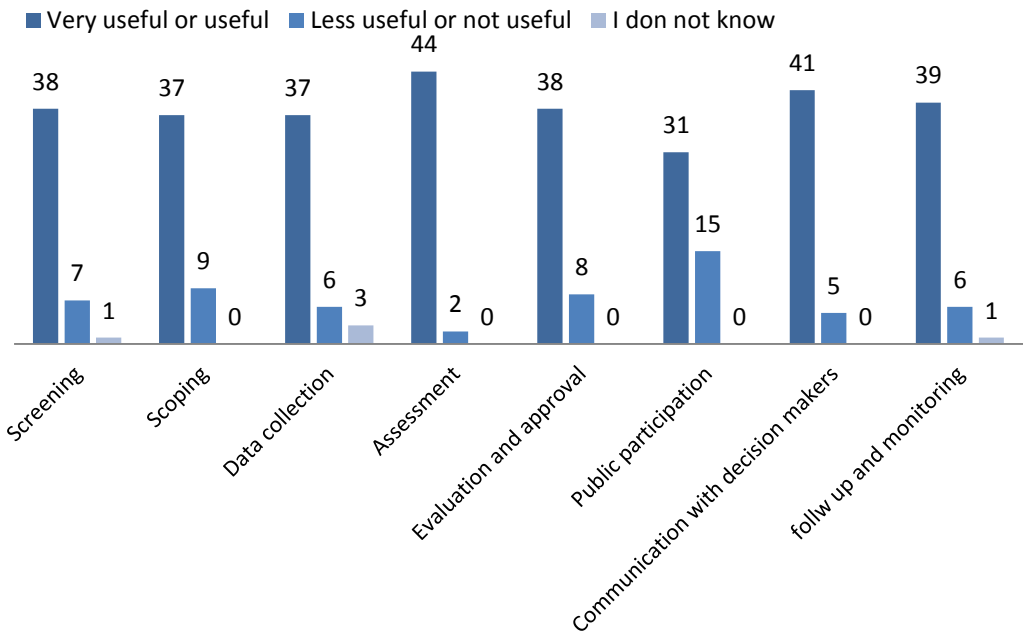

Fig.1. Survey: experience in using indicators at different SEA stages.

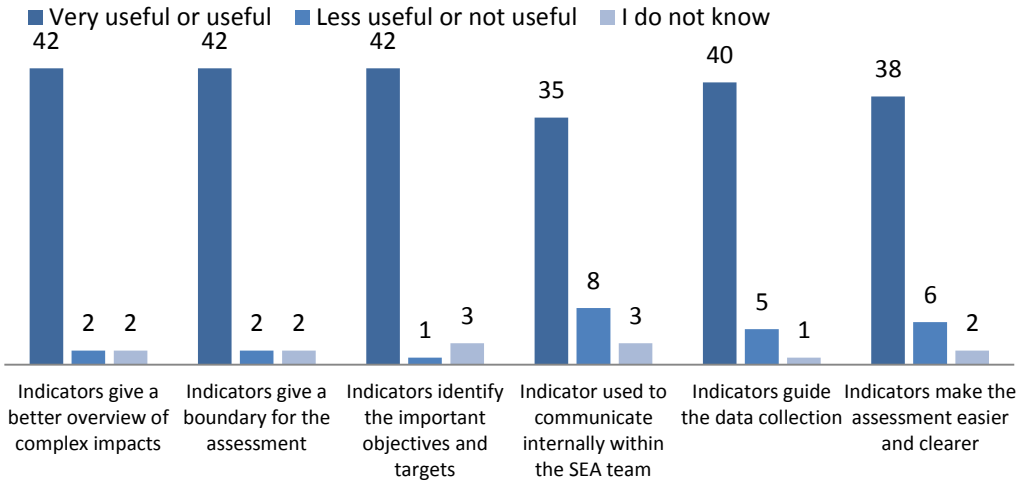

Fig. 2. Survey: In what way indicators play a role in the SEA.

Indicators' influence on SEA output through actors

According to Brown and Thérivel (2000), the cooperation with stakeholders is one of the elements influencing the output of SEA that could reflect involvement of politicians and NGOs in public participation. Survey results in this study show that by applying indicators, increased engagement of individuals (65%), NGOs (61%) and politicians (78%) have been experienced (Figure 3). Moreover, it is shown by the responses (67%) that the use of indicators has increased the communication between authorities, the public and NGOs.

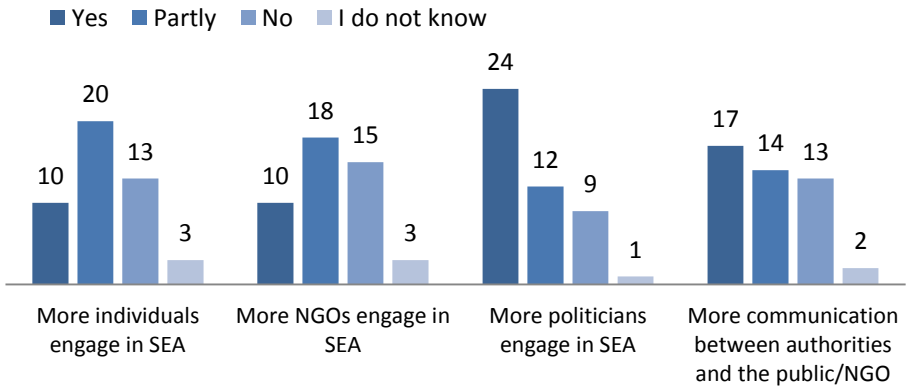

Fig. 3. Survey: Indicators' influence on actors' engagement.

When being asked further in what ways these engagements increase, most respondents think is by informing public/NGOs/politicians better information with indicators (Figure 4). Increased

engagement is also created when those participants are "being more listened to" although 28% of the respondents think that "politicians are more listened to" by using indicators while this number is only 13% for NGOs and 7% for the public. Apart from the involvement of the various stakeholders, communication between stakeholders is also mentioned as being facilitated by using indicators. 70% of the respondents state that using indicators has increased the communication between authorities and the public and NGOs.

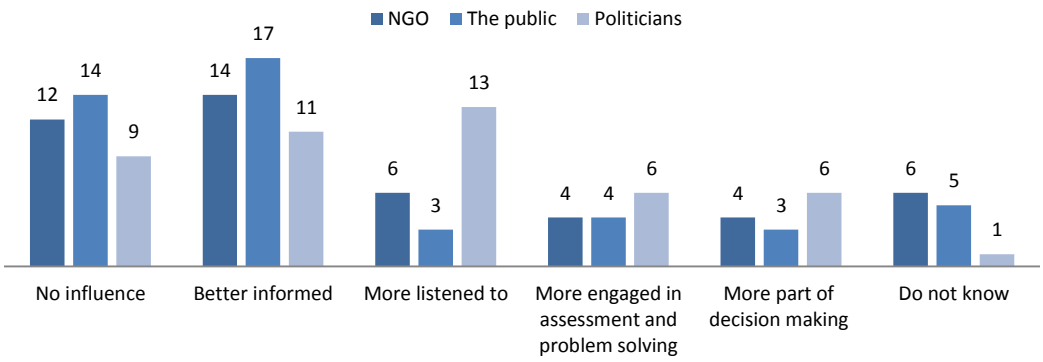

Fig. 4. Survey: How participation is influenced by using indicators.

Survey result shows that using indicators is perceived useful or very useful in increasing SEAs influence on plan making (87%). In influencing the plan making, indicators' role as a tool to coordinate with upper level plans is considered as the most useful. Then come its roles in initialising communication and involving plan makers, understanding the issues plan maker concerns by developing indicators together and clarifying the mitigation or adaption (Figure 5). In addition to integrating SEA in plan making, output implementation and follow up are also discussed in the survey. 76% of the respondents experienced that using indicators is useful or very useful in implementing output of SEA.

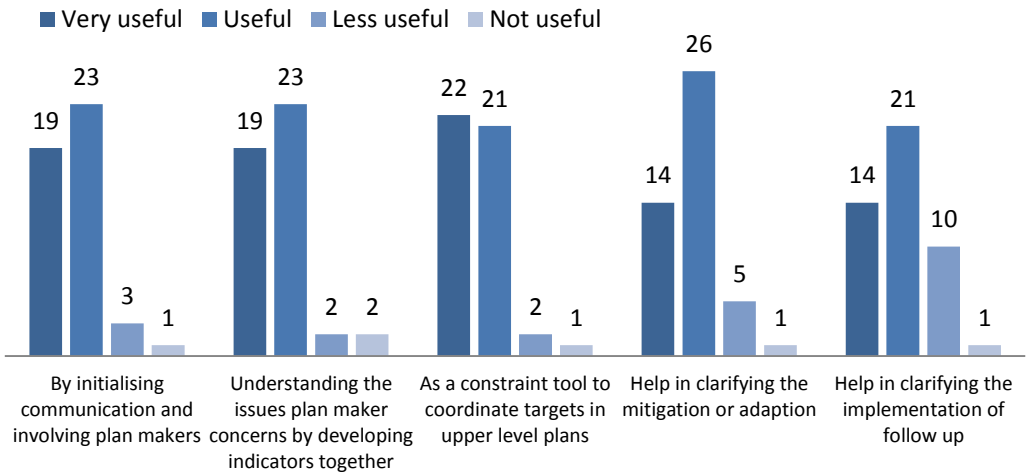

Fig. 5. Survey: How indicators increase SEA's influence on plan making.

The survey results have also been reflected in the interviews based on the case experiences. During the interviews, one interviewee (D01, 2011) points out that the current challenge for a more effective SEA in China is not from the technical aspect, since methodologies of SEA have been well developed and discussed and the consideration of efficient procedure has been well addressed. The real challenge is more institutional, especially lacking better understanding of effective communication between stakeholders in relation to planning and decision making.

One international SEA expert (D02, 2012) involved in the Dali case in this study also comments on the way Chinese SEA practitioners use indicators in SEA that "*…instead of using indicators as a mean to assess the impact of the plan and to communicate and cooperate with stakeholders, in many cases indicators are used as an end to be used directly by the planners and decision makers with information pieces other than a whole story*", because he thinks "*a whole story is something SEA practitioners should provide to decision making instead of pieces of information, because the former type of information is more helpful in making planning/decision*". According to whom, practitioners should go further to draw a more comprehensive picture based on the information provided by indicators, but in many cases, due to the "*low sense of responsibility*" of the practitioners, no more comprehensive information was generated. According to the theoretical basis we summarised above, it is not so difficult to find a basis on which a "rational" assessment process "technical or calculation based" seem to be the standard form of information, and within a standard procedure. It is also believed that the scientific information could explain everything, even in the case that many causations based on which those information is gained does not necessarily exist in reality.

Conclusion

Based on developing more experience, SEA studies have developed quickly during the last two decades. Discussion on whether SEA should continue with the same methodology and paradigm of EIA has attracted many researchers' attention. One focus in this debate is the "rational-communicative" dilemma in SEA. By qualifying assessments, indicators provide useful

assistance in the "calculation-based assessment". Likewise it is discussed whether indicators should be applied in SEA in the same way as in EIA. To answer this question, it deserves more careful and detailed study to find out what role indicators possibly could play in SEA. Aiming at exploring the influence of applying indicators in SEA, this study theoretically analyses the influence of indicators through the structure of SEA and likewise through the influence of actors.

The study is conducted at two levels. On the general level, based on an online survey, this article investigates the experiences of Chinese SEA practitioners in using indicators in SEA with the purpose to determine how the structure and actors of SEA are addressed in practice, and what role indicators play in influencing plan and decision making through the structure and actors of SEA. On the case level, two urban plan SEA cases are selected to provide a closer foundation to look at the detailed experience. At this level, the investigation is based on documentary studies and individual interviews with SEA practitioners and one planner. On one hand the analysis indicates that except in public participation, indicators are experienced as very useful at all SEA stages, in terms of giving a better overview of complex impacts and a boundary for the assessment, guiding data collection, identifying the important objectives and targets, quantifying the impact and making the assessment easier and clearer.

On the other hand, actors' influence through SEA is tested in terms of stakeholder cooperation and integration of SEA into planning and decision making. For cooperation with stakeholders, the survey result shows that using indicators has increased the engagement of individuals, NGOs and politicians in the SEA, by keeping them informed and listening to their perspectives. However, the result shows that more politicians are being listened to, compared to NGOs and the public. Moreover, the response shows that the use of indicators has increased the communication between authorities and the public/NGO. For integrating SEA into planning and decision making, the survey result shows that using indicators helps in increasing the SEA's impact on plan making by coordinating with upper level plans, initialising communication and involving plan makers, understanding the issues plan maker concerns by developing indicators together and clarifying the mitigation or adaption.

Overall, the analysis shows that indicators are assessed to be a useful tool in SEA in China. As investigated in this study, the use of indicators has been proved to have more influence through the structure of SEA in terms of improving and simplifying procedures of SEA than it has through the actors of SEA. Indicators have also been proved more useful in influencing the output through political actors as it can engage planners and decision makers better than through technical actors in terms of suggesting and implementing mitigation or adaption.

Reference

Allmendinger, P (2002). *Planning theory*. Hampshire: Palgrave.

Arendt, H(1970). *On Violence*. San Diego, California: Harcourt, Brace & World.

Bao, C, Y Lu and J Shang (2004). Framework and operational procedure for implementing Strategic Environmental Assessment in China. *Environmental Impact Assessment Review,* 24(1), 27–46.

Bina, O (2008). Context and Systems: Thinking More Broadly About Effectiveness in Strategic

Environmental Assessment in China. *Environmental Management*, 42(4), 717–733.

Brown, AL and R Thérivel (2000). Principles to guide the development of strategic environmental assessment methodology. *Impact Assessment and Project Appraisal*, 18(3), 183–189.

Che, X, J Shang and J Wang (2002). Strategic environmental assessment and its development in China. *Environmental Impact Assessment Review*, 22(2), 101–109.

Donnelly, A, MB Jones, T O'Mahony and G Byrne (2006). Decision support framework for establishing objectives, targets and indicators for use in SEA. *Impact Assessment and Project Appraisal*, 24(2), 151–157.

Donnelly, A, MB Jones, T O'Mahony and G Byrne (2007). Selecting environmental indicator for use in strategic environmental assessment. *Environmental Impact Assessment Review*, 27(2), 161–175.

Faludi, A (1984). *Planning Theory*. 2nd. Oxford: Pergamon.

Fischer, TB (2003). Strategic environmental assessment in post-modern times. *Environmental Impact Assessment Review*, 23(2), 155–70.

Forester, JF (1999). *The Deliberative Practitioner: Encouraging Participatory Planning Processes*. London: MIT Press.

Foucault, M (1980). *Power/knowledge: selected interviews and other writings, 1972-1977*, edited by Colin Gordon. London: Harvester.

Gao, J, L Kørnøv and P Christensen (2012a). Do indicators influence communication in Chinese SEA processes. *Environmental Impact Assessment Review*, submitted.

Gao, J, L Kørnøv and P Christensen (2012b). The politics of SEA indicators: Weak recognition found in Chinese guidelines. *Impact Assessment and Project Appraisal*, submitted.

Giddens, A (1984). *The Constitution of Society: Outline of the Theory of Structuration*. Berkeley and Los Angeles: University of California Press.

Hammond, A, A Adriaanse, E Rodenburg, D Bryant and R Woodward (1995). *Environmental indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development*. Washington D.C.: World Resource Institute.

Healey, P (1992). Planning through Debate: The Communicative Turn in Planning Theory. *The Town Planning Review*, 63(2),143-62.

Innes, JE (1998). Information in Communicative Planning. *Journal of the American Planning Association*, 64(1), 52-63.

Kørnøv, L and H Hvidtfeldt (2003). The Danish experience of Strategic Environment Assessment. In *Environmental Assessment of Plans and Programs: Nordic experiences in relation to the implementation of the EU directive 2001/42/EC* (Tuija Hilding-Rydevik), p. 33. Stockholm: Nordregio.

Kørnøv, L and WAH Thissen (2000). Rationality in decision- and policy-making: implications for strategic environmental assessment. *Impact Assessment and Project Appraisal*, 18(3), 191–200.

March, JG and C Heath (1994). *A Primer on Decision Making: how decisions happen*. Oxford: Simon and Schuster.

Ministry of Environmental Protection of China (2009). *Technical Guidelines for Plan Environmental Impact Assessment - Coal Industry Mining Area Plan*.

Ministry of Environmental Protection of China (2009). *Technical Guidelines for Plan Environmental Impact Assessment - Forestry Planning (draft)*.

Ministry of Environmental Protection of China (2009). *Technical Guidelines for Plan Environmental Impact Assessment - General principles (draft)*.

Ministry of Environmental Protection of China (2009). *Technical Guidelines for Plan Environmental Impact Assessment - Land Use Plan (draft)*.

Ministry of Environmental Protection of China (2009). *Technical Guidelines for Plan Environmental Impact Assessment - Onshore Oil and Natural Gas Field General Exploitation and Development Plan*

(draft).

Ministry of Environmental Protection of China (2009). *Technical Guidelines for Plan Environmental Impact Assessment - Urban Master Plan (draft)*.

Ministry of Environmental Protection of China (2009). *The explanation for Technical Guidelines for Plan Environmental Impact Assessment - General principles (draft)*.

Partidario, MR (2000). Elements of an SEA framework - improving the added-value of SEA. *Environmental Impact Assessment Review*, 20(6), 647–63.

Sager, T (1994). *Communicative Planning Theory*. Aldershot, England: Avebury.

Tang, T, T Zhu and H Xu (2007). Integrating environment into land-use planning through strategic environmental assessment in China: towards legal frameworks and operational procedures. *Environmental Impact Assessment Review*, 27(3), 243–65.

The State Council of the People's Republic of China (2009). *The Chinese Plan Environmental Impact Assessment Regulations*.

The State Environmental Protection Administration of China (now named Ministry of Environmental Protection of China) (2003). *Technical Guidelines for Plan Environmental Impact Assessment (on trial)*.

Thérivel, R (2004). *Strategic Environmental Assessment in Action*. London: Earthscan Publications.

Vicente, G and MR Partidário (2006). SEA-Enhancing communication for better environmental decisions. *Environmental Impact Assessment Review*, 26(8), 696–706.

Wrong, DH (1979). *Power. Its forms, bases and uses*. New York: Harper & Row.

Zhu, D and J Ru (2008). Strategic environmental assessment in China: Motivations, politics, and effectiveness. *Journal of Environmental Management*, 88(4), 615–626.

APPENDIXES

Appendix A: Interview Framework

General Level

Interview Framework

Manner: Guide with structured framework and open questions

G01

Date: Jan. 14, 2011

Place: Beijing Normal University, Beijing, China

Interviewee: Wei Li, Professor, School of Environment, Beijing Normal University, Beijing, China

1) Starting

1. A brief introduction of myself and the PhD project
2. The interviewee's background and work experience in general

2) Related to the Technical Guideline (2003) revision

3. Can you give a brief evaluation in China's SEA development today?
4. How do you think this version in the instruction of indicators based on different sectors' plan instead of in a general level?
5. Do you think the detailed methods in indicator choosing are still missing in the revised version or not?
6. What do you think is the reason for this miss?
7. Who are the target groups for the guidance? What is their interest in the guidance?
8. Who are the implementers? And what are the incitements for the implementers to use the guidance?
9. Who was involved in the formulation and development of the guidance?
10. Were stakeholders invited to participate?
11. If any opposition- what was the opposition about and who oppose?
12. How do you assess the implementation of the guidance? Is it correct implemented?

G02

Date: Jan. 15, 2011

Place: Appraisal Center for Environment & Engineering, Ministry of Environmental Protection, Beijing, China

Interviewee: Jingming Ren, Professor. Vice General Engineer, Appraisal Center for Environment & Engineering, Ministry of Environmental Protection, China

1) Starting

1. A brief introduction of myself and the PhD project
2. The interviewee's background and work experience in general

2) Related to the Technical Guideline (2003) revision

3. Can you give a brief evaluation in China's SEA development today?
4. Who are the target groups for the guidance? What is their interest in the guidance?
5. What is the reason do you think for this useless for authority?
6. How will you evaluate the "SEA for Dali Urban Development Master Plan (2008)" generally?
7. How do you think the indicators used in this case reflect the actual most important impact of the Plan?
8. How do you evaluate the size of the indicators list used in this case?
9. How do you think the indicators play its role in the SEA process?
10. Who has been involved in the indicator selection process in this case?
11. How do you evaluate the indicator selection process?
12. What do you think is the best part/point in this SEA process? And Why?
13. Any other comments regarding how SEA could be more effective by using indicator smartly?
14. Any other comments on SEA in China?

G03

Date: Feb. 11, 2011

Place: Appraisal Center for Environment & Engineering, Ministry of Environmental Protection, Beijing, China

Interviewee: Fan Chen, Vice General Director, Appraisal Center for Environment & Engineering, Ministry of Environmental Protection, China

1) Starting

1. A brief introduction of myself and the PhD project
2. The interviewee's background and work experience in general

2) Related to the Technical Guideline (2003) revision

3. Can you give a brief evaluation in China's SEA development today?
4. What is the background for this revision?
5. Do you think it is better or not that this version provides instruction of indicators based on different sectors' plan instead of in a general level?
6. Do you think that the revised version provides more specific guide in using of indicator in SEA in China or not?
7. Who are the target groups for the guidance? What is their interest in the guidance?
8. What are the incitements for the implementers to use the guidance?
9. Who are involved in the formulation and development of the guidance?
10. Were stakeholders invited to participate? And when?
11. Any other comments on Chinese SEA?

G04

Date: Feb. 11, 2011

Place: Ministry of Environmental Protection, Beijing, China

Interviewee: Tianwei Li, Director, Department of Strategic Environmental Assessment, Division of Environmental Assessment, Ministry of Environmental Protection, China

1) Starting

1. A brief introduction of myself and the PhD project
2. The interviewee's background and work experience in general

2) Related to the Technical Guideline (2003) revision

3. Can you give a brief evaluation in China's SEA development today?
4. How will you evaluate the new version of the technical guideline?
5. (Why?)
6. (Like what?)
7. (What is the reason for the inefficient guideline?)
8. Who was involved in the formulation and development of the new guideline?
9. How much do you think indicator provide support to the planning process and policy/decision making process?
10. (What is the aim do you think for a SEA?)
11. How will you evaluate the current indictors using in SEA in China?
12. How do you think indicators should be decided then?
13. (But how would these compulsory and self-chosen one be decided?)
14. What do you think need to done for more efficient indicators?
15. Any comments on Chinese SEA?
16. (Do we actually have any SEA on policy level?)

Case Level

Interview Framework for Shenzhen Case (Part 1: SEA practitioner)

Manner: Guide with structured framework and open questions

S01

Date: March. 30 2011

Place: Shenzhen Institute of Environmental Science, Shenzhen, China

Interviewee: Xiuzhen Che, Senior Engineer, Director, Division of Planning and Policy, Shenzhen Institute of Environmental Science

The interview structure:

1) Starting

1. A brief introduction of myself and the PhD project
2. The interviewee's background and work experience in general
3. Brief introduction of the procedure and process of this case

2) Related to the Implementation (focus on the communication and interaction)

a) On the Street-Level: Factors affecting street-level bureaucratic behavior:

4. What is the size of the indicators list used in this case?
5. How many dimensions the lists cover?
6. Did the indicators used in this case reflect the actual most important impact of Shenzhen's Master Urban Planning (2007-2020)?
7. Can you describe the process in which how your team decide the indicator list used in this case?
8. Which departments and organizations have been involved in the selecting of the indicators?
9. Were stakeholders invited to participate? Who are they?
10. When did stakeholders participate and how?
11. How was the interaction of stakeholders in indicators using?
12. Active cooperation or
13. Passive cooperation (neither hinder nor stimulate)
14. Opposition
15. If any opposition – what was the opposition about and who oppose?
16. How was the indicator selection process? How do you think this process? Did your judgement influence the actual selection?
17. Could you please describe the cooperation between your team and the other sectors in this case? When did these cooperation happen?
18. Did you use indicators to communicate with the cooperated departments?
19. Why didn't the SEA use the same indicators recommendation in guideline? What is your consideration of changing part of them to some new ones? For easier communication? According to the specific need in this case?

20. For example, why the indicator “GDP Growth” or “Income per capita” were not used? And you used “Percentage of renewable energy” and “Farmland area”? What is the consideration?
21. In which themes did you change the most of indicators?
22. How do you find with using indicators during these cooperation?
23. More easier, clearer and condensed information, or
24. More confused and limited information
25. What is the improvement of this SEA by developing your own indicators list comparing using the recommendation list?
26. Did you use indicators during the communication with the stakeholders?
27. If yes, then how do you find that? If know, so what is your consideration for not using it?
28. What role does the indicator play in this SEA process?
29. Is there any impact from your SEA team influencing your way of indicators using, like your own style of doing SEA? If yes, so what are they?
30. Did the outside environment of your SEA team have any influence in indicators using? If yes, so what are they?
31. Implementation on the general level: Factors influencing implementation process
32. Is the guideline clear and operative enough in guiding your team doing SEA, especially in indicators using?
33. During this project, how much flexibility you had in using indicator?
34. If your SEA team did this case in a flexibly, not following the procedure suggested in the guideline, especially the indicators using, so what is your consideration?
35. Is there any authority managing the using of indicators in this SEA? If yes, so who are they? And how did they do? If no, do you think should there is one?
36. How do you think the authority should do to ensure the quality of SEA, especially the correct using of indicators?
37. General Comments
38. How will you evaluate the “SEA of Shenzhen’s Master Urban Planning (2007-2020)” generally?
39. What do you think is the best part/point in this SEA process? And why?
40. Any other comments regarding this case and its indicators using?

Interview Framework for Shenzhen Case(Part 2: Planner)

Manner: Guide with structured framework and open questions

S02

Date: 1. April 2011

Place: Shenzhen Urban Planning & Research Center, Shenzhen, China

Interviewee: Bing Zou, Senior Planner, Director, Division of Developing, Shenzhen Urban Planning & Research Center

The interview structure:

1) Starting

1. A brief introduction of myself and the PhD project
2. The interviewee's background and work experience in general
3. Brief introduction of the procedure and process of this case

2) Related to the Implementation (focus on the planning/decision making stage)

4. Was your department involved in the SEA process? In which stage? And how?
5. What negotiation did you actually have with the SEA team? Any other departments participated in?
6. What information had you expected at the beginning of this SEA, to support your decision making?
7. What do you need for decision making from this SEA? And did you get it?
8. What information did this SEA actually provide you in your decision making?
9. Does that help or not in supporting you to make the decision? If yes, how does it help? If not, why do you think is the reason for the ineffectiveness?
10. How will you evaluate the indicators role in decision making?
    - More easier, clearer and condensed information, or
    - More confused and limited information
11. Why didn't the SEA follow exactly the guideline's recommendation in indicators using? What is the consideration that you (or the SEA team) change some of the indictors to those new ones? For more specific information or other consideration?
12. For example, why the indicator "GDP Growth" or "Income per capita" were not used? And you used "Percentage of renewable energy" and "Farmland area"? What is the consideration?
13. Did the indicators used in this case reflect the actual potential impact of your plan?
14. What is the improvement of this SEA by developing your own indicators list comparing using the recommendation list?
15. Have your department been involved indicators choosing in this case? If yes, when and how? If no, why?
16. Did your apartment ever have any different opinion upon the indicators they chose during the process? If yes, how did you deal with the conflict?
17. From the plan making department, do you have a need to be informed with

indicators in this case? Or you prefer to be informed with described and qualitative information? And why?

18. How your decision was made in this case, based upon the SEA output? Or combined with other consideration (like the political environment)? If there is other consideration, so what is it? And how did it influence you in this case?

3) General Comments

19. How will you evaluate the "SEA of Shenzhen's Master Urban Planning (2007-2020)" generally?
20. What support you most in decision making in this SEA? And why?
21. How do you think indicators should be used in SEA, from the perspectives of decision making?
22. Any other comments regarding this case and its indicators using?

Interview Framework for Dali Case (SEA practitioners)

Manner: Guide with structured framework and open questions

D01

Date: 6. April 2011

Place: Dali, Appraisal Center for Environment & Engineering (ACEE) of Yunnan Province, China

Interviewee: Yonghong Yang, Director, Appraisal Center for Environment Impact Assessment in Yunnan Province

The interview structure:

1) Starting

1. A brief introduction of myself and the PhD project
2. The interviewee's background and work experience in general
3. Brief introduction of the procedure and process of this case

2) Related to the Implementation (focus on the communication and interaction)

a) On the Street-Level: Factors affecting street-level bureaucratic behavior:

4. What is the size of the indicators list used in this case?
5. How many dimensions the lists cover?
6. Did the indicators used in this case reflect the actual most important impact of Dali Urban Development Master Plan (2008)?
7. Can you describe the process in which how your team decide the indicator list used in this case?
8. Which departments and organizations have been involved in the selecting of the indicators?
9. Were stakeholders invited to participate? Who are they?
10. When did stakeholders participate and how?
11. How was the interaction of stakeholders in indicators using?
    - Active cooperation or
    - Passive cooperation (neither hinder nor stimulate)
    - Opposition
12. If any opposition – what was the opposition about and who oppose?
13. How was the indicator selection process? How do you think this process? Did your judgement influence the actual selection?
14. Could you please describe the cooperation between your team and the other sectors in this case? When did these cooperation happen?
15. Did you use indicators to communicate with the cooperated departments?
16. Why didn't the SEA use the same indicators recommendation in guideline? What is your consideration of changing part of them to some new ones? For easier communication? According to the specific need in this case?
17. For example, why the indicator "GDP Growth" or "Industrial growth" were not used?

And you used "Tourist's stay duration", "Eutrophication in Er Hai Lake" and "Landscape pattern index"? What is the consideration?

18. In which themes did you change the most of indicators?
19. How do you find with using indicators during these cooperation?
    - More easier, clearer and condensed information, or
    - More confused and limited information
20. What is the improvement of this SEA by developing your own indicators list comparing using the recommendation list?
21. Did you use indicators during the communication with the stakeholders?
22. If yes, then how do you find that? If know, so what is your consideration for not using it?
23. What role does the indicator play in this SEA process?
24. Is there any impact from your SEA team influencing your way of indicators using, like your own style of doing SEA? If yes, so what are they?
25. Did the outside environment of your SEA team have any influence in indicators using? If yes, so what are they?

b) Implementation on the general level: Factors influencing the implementation process

26. Is the guideline clear and operative enough in guiding your team doing SEA, especially in indicators using?
27. During this project, how much flexibility you had in using indicator?
28. If your SEA team did this case in a flexibly, not following the procedure suggested in the guideline, especially the indicators using, so what is your consideration?
29. Is there any authority managing the using of indicators in this SEA? If yes, so who are they? And how did they do? If no, do you think should there is one?
30. How do you think the authority should do to ensure the quality of SEA, especially the correct using of indicators?

3) General Comments

31. How will you evaluate the "SEA for the Dali Urban Development Master Plan (2008)" generally?
32. What do you think is the best part/point in this SEA process? And why?
33. Any other comments regarding this case and its indicators using?

Interview Framework for Dali Case (SEA practitioners)

Manner: Guide with structured framework and open questions, Skype

D02

Date: June 20. 2012

Place: Aalborg, Denmark and Prague, Czech Republic (Skype)

Interviewee: Jiří Dusík, Integra Consulting Ltd. Worked as international expert for SEA for Dali Urban Plan

The interview structure:

1) Starting

1. A brief introduction of myself and the PhD project
2. The interviewee's background and work experience in general
3. Brief introduction of the procedure and process of this case

2) Communication, interaction and influence

a) How to choose

4. Have you been involved in selecting indicators in SEA cases?
5. When the indicators were selected?
6. Who has been involved in choosing indicators? Stakeholders participated? When? How?
7. Any challenges/different opinion/changes when choosing indicators in this case? and how to solve?
8. How do you perceive the process of selecting indicators? Pure scientific/technical based, or? And why?
9. What role did the Chinese national technical guideline play in indicators choosing and using?

b) How to use

10. In which stages did you use indicators?
11. Why did you use indicators?
12. Did you use indicators to communicate with the cooperated departments /stakeholders? How do you find with using indicators during cooperation?
13. What was indicators' primary role in this case, as a scientific instrument or a political/communicative tool?
14. Were indicators designed and used in a Top-down or Bottom-up way in this case?
15. Did the Chinese context have any influence in indicators using?

c) What is the indicators' influence?

16. How the indicators help in improving the communication within SEA/ among stakeholders/between SEA and plan team?

17. How indicators influenced the participation of the public/NGO and the politicians? Resulted in more engagement (individuals/NGOs/ politicians) in the SEA?
18. How the indicators help SEA in influencing the plan making?

3) General Comments

19. What do you think indicators' primary role, as a scientific instrument or a political/communicative tool?
20. Do you think indicators should be designed and used in a Top-down or Bottom-up way?
21. How do you think the authority/guideline should do to ensure the correct using of indicators?
22. This was a donor project supported by SIDA, how did this influence the SEA process and the report?

Appendix B: Survey Report

Survey Report

surveyXact

Indicators using in Chinese SEA system

The survey takes around 10 minutes. If you are interrupted you can come back to the survey at any time before 23 August, 2012.

You can switch between English and Chinese by clicking the language icon.

You can always return to the survey by clicking on the link in the email message you received.

Thanks for your contribution! Your opinions are important for us!

DCEA | THE DANISH CENTRE FOR ENVIRONMENTAL ASSESSMENT

Previous 33% Next

1. What is your main education background?

	Respondents	Percent
Administration	3	6.5%
Nature science & Engineering	41	89.1%
Social science	2	4.3%
Economy	1	2.2%
Medical	2	4.3%
Others (please specify):	1	2.2%
Total	46	100.0%

2. You have education level with?

	Respondents	Percent
Below bachelor	0	0.0%
Bachelor	7	15.2%
Master	24	52.2%
PhD	15	32.6%
Others (please specify):	0	0.0%
Total	46	100.0%

3. Your main occupation is?

	Respondents	Percent
Government/Administration	2	4.3%
Evaluation Consulting	24	52.2%
Academic Institutes	18	39.1%
Environmental Organization	0	0.0%
Others (please specify):	2	4.3%
Total	46	100.0%

4. What is your current position?

	Respondents	Percent
CEO/General Director	7	15.2%
Department Manager/Middle Manager	14	30.4%
Employee	19	41.3%
Others (please specify):	6	13.0%
Total	46	100.0%

5. How long have you worked with SEA?

	Respondents	Percent
Less than 2 years	6	13.0%
2 to 5 years	23	50.0%
More than 5 years	17	37.0%
Total	46	100.0%

6. How many SEAs have you been involved in?

	Respondents	Percent
1-3 SEA's	15	32.6%
4-6 SEA's	13	28.3%
7-10 SEAs	3	6.5%
More than 10 SEAs	11	23.9%
No experience in doing assessment but have read /review SEA reports	4	8.7%
Total	46	100.0%

7. What kind of tasks within SEA do you work with (all that apply)?

	Respondents	Percent
I do 'full' screening of plans and programmes	30	65.2%
I contribute to screening	12	26.1%
I do assessments of impacts	13	28.3%
I do review of SEAs	19	41.3%
I do others (please specify):	1	2.2%
Total	46	100.0%

8. Which sector(s) are you involved in (all that apply)?

	Respondents	Percent
General administration	7	15.2%
Energy	20	43.5%
Agriculture	4	8.7%
Land use/infrastructure	29	63.0%
Transportation	10	21.7%
Water resource	9	19.6%
Forestry	2	4.3%
Fishery	1	2.2%
Tourism	4	8.7%
Waste	4	8.7%
Healthy	1	2.2%
Others (please specify):	8	17.4%
Total	46	100.0%

9. Have you read/used the new revised guideline draft in 2009?

	Respondents	Percent
Yes, I have read and used	25	54.3%
Yes, I have read but not used	12	26.1%
Yes, I know there is revision, but neither read nor use	5	10.9%
No, I don't know there is a new version	4	8.7%
Total	46	100.0%

10. If you choose the first two choices, then will you answer our survey based on the guidelines in 2003 and/or in 2009?

	Respondents	Percent
2003	8	17.4%
2009	15	32.6%
Both	20	43.5%
None	3	6.5%
Total	46	100.0%

11. If you have read/used the 2009 version of guideline, the which of the sectoral guidance do you use in your work with SEA (all that apply)?

	Respondents	Percent
General Principles	19	41.3%
Coal industry Mining Area Plan	11	23.9%
Urban Master Plan	22	47.8%
Forestry Planning	0	0.0%
Land Use Plan	14	30.4%
On-shore Oil and Natural Gas Field General Exploitation and Development Plan	1	2.2%
I have not read/used any of them.	10	21.7%
Total	46	100.0%

12. How important a role does guidance play in your practical SEA work?

	Respondents	Percent
Very important	14	30.4%
Important	27	58.7%
Less important	5	10.9%
Not important at all	0	0.0%
Total	46	100.0%

13. In what kind of situations do you primarily use guidance (up to 3 situations)?

	Respondents	Percent
To clarify legal issues	25	54.3%
To get a hold on terms (like e.g. screening, mitigation)	37	80.4%
To clarify who should be consulted in the SEA	10	21.7%
To choose indicators	24	52.2%
To get ideas for alternatives	6	13.0%
To get ideas for how to assess impacts	20	43.5%
To get ideas for mitigation	4	8.7%
To get ideas for monitoring	1	2.2%
Other (please specify):	2	4.3%
Total	46	100.0%

14. **How do you perceive the process of selecting indicators?**

	Respondents	Percent
It is a pure technical process	4	8.7%
It is a political process (involving political and personal values)	2	4.3%
It is both a technical and political process	40	87.0%
Total	46	100.0%

15. **To what extent do you think the SEA guidance address the political and value side of the selection and use of indicators?**

	Respondents	Percent
Fully or to a large extent	6	13.0%
Partly	18	39.1%
Limited	11	23.9%
Nearly not or not	8	17.4%
I do not know	3	6.5%
Total	46	100.0%

16. **The guidance from 2009 has more aggregated indicators (e.g. Sustainability) than the previous guidance. What do you think of this development?**

	Respondents	Percent
Aggregation of indicators is positive and I would like to see more aggregation	2	4.3%
More aggregation of indicators is positive but there is a limit to how much we should aggregate, because there is a risk we exclude environmental and social concerns which are not easy or possible to quantify	37	80.4%
Further aggregation of indicators is not positive	3	6.5%
I do not know	4	8.7%
Total	46	100.0%

17. **Which part do you think is missing/ insufficient regarding the use of indicators in SEA practice (all that apply)?**

	Respondents	Percent
Lack of guideline	12	26.1%
Not enough time and financial input	10	21.7%
No appropriate methods	35	76.1%
Others (please specify):	6	13.0%
Total	46	100.0%

18. **What do you think is the reason for those missing (all that apply)?**

	Respondents	Percent
Lacking theory support by academic research	28	60.9%
Lacking regulation/law	15	32.6%
Lacking policy requirement	10	21.7%
No enough communication between SEA practitioners and decision makers	27	58.7%
Lacking political will	17	37.0%
Lacking competence of SEA practitioners	22	47.8%
Others (please specify):	3	6.5%
Total	46	100.0%

19. **Would you like to see more guidance on the process on how to select indicators?**

	Respondents	Percent
Yes	41	89.1%
No	4	8.7%
I don't know	1	2.2%
Total	46	100.0%

20. **If your answer is "Yes" for the above question, then which guide on indicators would you like to be provided by the guidelines?**

	Respondents	Percent
More specific recommended lists for sectors	34	81.0%
Clear procedure / methodology for designing and select indicators	28	66.7%
Who should be engaged in selecting	6	14.3%
Other (please specify):	1	2.4%
Total	42	100.0%

21. **Have you been involved in selecting indicators in SEA cases?**

	Respondents	Percent
Yes	38	82.6%
No	8	17.4%
Total	46	100.0%

22. What indicators have generally been chosen in the SEA's you have been involved in?

	Respondents	Percent
We normally use all the indicators suggested in the guidance for the specific kind of plan – and only these	2	4.3%
We normally select some of the indicators from the guidance – and only these	9	19.6%
We normally select some from the guidance and supplement with other indicators	35	76.1%
Total	46	100.0%

23. When choosing indicators, who has normally been involved in this process (all that apply)?

	Respondents	Percent
The team leader	40	87.0%
SEA team member(s)	36	78.3%
Consulting experts	40	87.0%
Plan sectors	29	63.0%
Other related sectors (besides plan sector)	9	19.6%
The public	16	34.8%
NGO's	3	6.5%
The politicians	21	45.7%
Researchers	14	30.4%
Others (please specify):	1	2.2%
Total	46	100.0%

24. How often has the public been part of choosing indicators in the SEA cases you have been involved in?

	Respondents	Percent
Always or almost always (100% - 70%)	4	8.7%
Often (70% - 40%)	3	6.5%
Sometimes (40% – 10%)	7	15.2%
Rarely or never (10% - 0%)	32	69.6%
Total	46	100.0%

25. How have NGO's been part of choosing indicators in the cases you have been involved?

	Respondents	Percent
Always or almost always (100% - 70%)	1	2.2%
Often (70% - 40%)	1	2.2%
Sometimes (40% – 10%)	8	17.4%
Rarely or never (10% - 0%)	36	78.3%
Total	46	100.0%

26. **How important do you find involvement of the public and/or NGO's is?**

	Respondents	Percent
Very important	10	21.7%
Important	25	54.3%
Less important	11	23.9%
Not important at all	0	0.0%
Total	46	100.0%

27. **Why do you think it is important to involve the public and/or NGO's (all that apply)?**

	Respondents	Percent
The public and NGOs bring in different values and priorities in the SEA process	33	71.7%
The public and NGOs bring knowledge and expertise into the SEA process	23	50.0%
The public and NGOs can learn about environmental concerns and the project	29	63.0%
It is democratic to involve	17	37.0%
Involvement limits opposition and eases the implementation afterwards	28	60.9%
I do not know	0	0.0%
Other (please specify):	0	0.0%
Total	46	100.0%

28. **What have you experienced as challenges when choosing indicators for SEA cases (all that apply)?**

	Respondents	Percent
There has been disagreement upon which indicators to choose among SEA experts	26	56.5%
There has been disagreement upon which indicators to choose between SEA experts and the planning team	27	58.7%
There has been disagreement upon which indicators to choose between SEA experts and the public and/or NGOs	10	21.7%
There has been disagreement upon which indicators to choose between SEA experts and the politicians	22	47.8%
There has been disagreement upon which indicators to choose between Politicians and the public and/or NGOs	9	19.6%
Limited time	27	58.7%
Limited financial support	14	30.4%
Limited knowledge (please specify):	6	13.0%
Total	46	100.0%

29. **What have you experienced when there are challenges (all that apply)?**

	Respondents	Percent
Taking SEA experts' opinion	25	54.3%
Taking planning team's opinion	5	10.9%
Taking the public and/or NGOs' opinion	4	8.7%
Taking the politicians' opinion	19	41.3%
Agree on the final list through negotiation	24	52.2%
Other options (please specify):	2	4.3%
Total	46	100.0%

30. **When do you experience indicators are selected in the SEA process?**

	Respondents	Percent
Indicators are selected early in the SEA process – and never or rarely changed later	12	26.1%
Indicators are selected early in the SEA process – and often changed later	20	43.5%
Selection of indicators is an on-going process	14	30.4%
Other stages (please specify):	0	0.0%
Total	46	100.0%

31. **What happen when there are changes in the SEA process (all that apply)?**

	Respondents	Percent
More indicators are chosen	19	41.3%
Indicators are scoped out	38	82.6%
No changes of indicators	4	8.7%
Total	46	100.0%

32. **From your experience what initiates the change of selection of indicators in the SEA process (all that apply)?**

	Respondents	Percent
Input from the planning team	27	58.7%
Input from the public and/or NGO's	10	21.7%
Input from politicians	28	60.9%
Request from Donors	1	2.2%
Others (please specify):	12	26.1%
Total	46	100.0%

33. **How do you think an effective indicator list should be selected (all that apply)?**

	Respondents	Percent
By technical guideline's guiding	35	76.1%
By SEA team member's own experience	35	76.1%

	Respondents	Percent
By Government (policy makers)'s demand	27	58.7%
By public participation	23	50.0%
By experts consulting	35	76.1%
By Stakeholders meeting	27	58.7%
By NGO's consulting	15	32.6%
Others (please specify):	0	0.0%
Total	46	100.0%

34. **In which stages do you use indicators (all that apply)? - Screening**

	Respondents	Percent
Very useful	19	42.2%
Useful	19	42.2%
Less useful	6	13.3%
Not useful	1	2.2%
Total	45	100.0%

35. **In which stages do you use indicators (all that apply)? - Scoping**

	Respondents	Percent
Very useful	15	32.6%
Useful	22	47.8%
Less useful	8	17.4%
Not useful	1	2.2%
Total	46	100.0%

36. **In which stages do you use indicators (all that apply)? - Data collection**

	Respondents	Percent
Very useful	20	46.5%
Useful	17	39.5%
Less useful	6	14.0%
Not useful	0	0.0%
Total	43	100.0%

37. **In which stages do you use indicators (all that apply)? - Assessment**

	Respondents	Percent
Very useful	28	60.9%
Useful	16	34.8%
Less useful	2	4.3%
Not useful	0	0.0%
Total	46	100.0%

38. **In which stages do you use indicators (all that apply)? - Evaluation and approval**

	Respondents	Percent
Very useful	17	37.0%
Useful	21	45.7%
Less useful	8	17.4%
Not useful	0	0.0%
Total	46	100.0%

39. **In which stages do you use indicators (all that apply)? - Public participation**

	Respondents	Percent
Very useful	8	17.4%
Useful	23	50.0%
Less useful	13	28.3%
Not useful	2	4.3%
Total	46	100.0%

40. **In which stages do you use indicators (all that apply)? - Communicating with decision makers**

	Respondents	Percent
Very useful	20	43.5%
Useful	21	45.7%
Less useful	3	6.5%
Not useful	2	4.3%
Total	46	100.0%

41. **In which stages do you use indicators (all that apply)? - Follow up and monitoring**

	Respondents	Percent
Very useful	19	42.2%
Useful	20	44.4%
Less useful	5	11.1%
Not useful	1	2.2%
Total	45	100.0%

42. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators give a better overview of complex impacts**

	Respondents	Percent
Very useful	27	61.4%
Useful	15	34.1%
Less useful	2	4.5%
Not useful	0	0.0%
Total	44	100.0%

43. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators give a boundary for the assessment**

	Respondents	Percent
Very useful	23	52.3%
Useful	19	43.2%
Less useful	2	4.5%
Not useful	0	0.0%
Total	44	100.0%

44. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators identify the important objectives and targets**

	Respondents	Percent
Very useful	24	55.8%
Useful	18	41.9%
Less useful	1	2.3%
Not useful	0	0.0%
Total	43	100.0%

45. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators guide the data collection**

	Respondents	Percent
Very useful	21	46.7%
Useful	19	42.2%
Less useful	4	8.9%
Not useful	1	2.2%
Total	45	100.0%

46. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators coordinate the target of the plans or related upper lever plans**

	Respondents	Percent
Very useful	14	31.8%
Useful	22	50.0%
Less useful	8	18.2%
Not useful	0	0.0%
Total	44	100.0%

47. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators make assessment easier and clearer by quantifying the impact.**

	Respondents	Percent
Very useful	20	45.5%
Useful	18	40.9%
Less useful	6	13.6%
Not useful	0	0.0%
Total	44	100.0%

48. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators used to communicate internally within the SEA team**

	Respondents	Percent
Very useful	15	34.9%
Useful	20	46.5%
Less useful	6	14.0%
Not useful	2	4.7%
Total	43	100.0%

49. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators increase communication between authorities and the public/NGO**

	Respondents	Percent
Very useful	12	27.9%
Useful	18	41.9%
Less useful	12	27.9%
Not useful	1	2.3%
Total	43	100.0%

50. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators increase the participation of the public/NGO in the SEA process**

	Respondents	Percent
Very useful	11	25.6%
Useful	16	37.2%
Less useful	15	34.9%
Not useful	1	2.3%
Total	43	100.0%

51. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators increase the political involvement in the SEA process**

	Respondents	Percent
Very useful	15	34.1%
Useful	17	38.6%
Less useful	11	25.0%
Not useful	1	2.3%
Total	44	100.0%

52. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - The use of indicators increase the impact of the SEA on plan making**

	Respondents	Percent
Very useful	15	34.1%
Useful	21	47.7%
Less useful	7	15.9%
Not useful	1	2.3%
Total	44	100.0%

53. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - The use of indicators increase the impact of the SEA on decision-making**

	Respondents	Percent
Very useful	16	37.2%
Useful	18	41.9%
Less useful	9	20.9%
Not useful	0	0.0%
Total	43	100.0%

54. **What is your practical experience with the use of indicators in SEA in China (all that apply)? - Indicators improve outcome implementation and follow up**

	Respondents	Percent
Very useful	15	34.1%
Useful	23	52.3%
Less useful	6	13.6%
Not useful	0	0.0%
Total	44	100.0%

55. **Based upon your practical experience from being involved in specific SEA's, please describe your experience - Indicators eased the overview of complex impacts**

	Respondents	Percent
Yes	29	63.0%
Partly	14	30.4%
No	2	4.3%
I do not know	1	2.2%
Total	46	100.0%

56. **Based upon your practical experience from being involved in specific SEA's, please describe your experience - Indicators resulted in a smoother implementation**

	Respondents	Percent
Yes	28	60.9%
Partly	14	30.4%
No	3	6.5%
I do not know	1	2.2%
Total	46	100.0%

57. **Based upon your practical experience from being involved in specific SEA's, please describe your experience - Indicators increased the political involvement in the SEA process**

	Respondents	Percent
Yes	21	45.7%
Partly	14	30.4%
No	10	21.7%
I do not know	1	2.2%
Total	46	100.0%

58. **Based upon your practical experience from being involved in specific SEA's, please describe your experience - Indicators increased the communication between authorities and the public/NGO**

	Respondents	Percent
Yes	17	37.0%
Partly	14	30.4%
No	13	28.3%
I do not know	2	4.3%
Total	46	100.0%

59. **Based upon your practical experience from being involved in specific SEA's, please describe your experience - Indicators increased the participation of the public/NGO in the SEA process**

	Respondents	Percent
Yes	13	28.3%
Partly	15	32.6%
No	16	34.8%
I do not know	2	4.3%
Total	46	100.0%

60. **Based upon your practical experience from being involved in specific SEA's, please describe your experience - Indicators qualified the Impact assessment**

	Respondents	Percent
Yes	32	69.6%
Partly	12	26.1%
No	0	0.0%
I do not know	2	4.3%
Total	46	100.0%

61. **What is your experience with how indicators influenced the participation of the public/NGO and the politicians? - The public**

	Respondents	Percent
There were no influence on participation	14	30.4%
They were better informed	17	37.0%
They were more listened to	3	6.5%
They were more engaged in assessment and problem solving	4	8.7%
They were more part of decision making	3	6.5%
I do not know	5	10.9%
Total	46	100.0%

62. **What is your experience with how indicators influenced the participation of the public/NGO and the politicians? - NGOs**

	Respondents	Percent
There were no influence on participation	12	26.1%
They were better informed	14	30.4%

	Respondents	Percent
They were more listened to	6	13.0%
They were more engaged in assessment and problem solving	4	8.7%
They were more part of decision making	4	8.7%
I do not know	6	13.0%
Total	46	100.0%

63. **What is your experience with how indicators influenced the participation of the public/NGO and the politicians? - The politicians**

	Respondents	Percent
There were no influence on participation	9	19.6%
They were better informed	11	23.9%
They were more listened to	13	28.3%
They were more engaged in assessment and problem solving	6	13.0%
They were more part of decision making	6	13.0%
I do not know	1	2.2%
Total	46	100.0%

64. **Is your experience that indicators resulted in more engagement in the SEA? - More individuals engage in the SEA**

	Respondents	Percent
Yes	10	21.7%
Partly	20	43.5%
No	13	28.3%
I do not know	3	6.5%
Total	46	100.0%

65. **Is your experience that indicators resulted in more engagement in the SEA? - More NGO's engage in the SEA**

	Respondents	Percent
Yes	10	21.7%
Partly	18	39.1%
No	15	32.6%
I do not know	3	6.5%
Total	46	100.0%

66. **Is your experience that indicators resulted in more engagement in the SEA? - More politicians engage in the SEA**

	Respondents	Percent
Yes	24	52.2%
Partly	12	26.1%
No	9	19.6%
I do not know	1	2.2%
Total	46	100.0%

67. **If more engagement – what kind? - More written input to the authorities**

	Respondents	Percent
Yes	25	54.3%
Partly	15	32.6%
No	2	4.3%
I do not know	4	8.7%
Total	46	100.0%

68. **If more engagement – what kind? - More participants in public meetings**

	Respondents	Percent
Yes	33	71.7%
Partly	6	13.0%
No	5	10.9%
I do not know	2	4.3%
Total	46	100.0%

69. **If more engagement – what kind? - More informal communication with the authorities (e.g. telephone)**

	Respondents	Percent
Yes	20	43.5%
Partly	17	37.0%
No	8	17.4%
I do not know	1	2.2%
Total	46	100.0%

70. **What is your experience in relation to if indicators increased the SEA's influence on the plan making?**

	Respondents	Percent
Very useful	19	41.3%
Useful	21	45.7%
Less useful	5	10.9%
Not useful	1	2.2%
Total	46	100.0%

71. **Can you describe how the indicators help SEA in influencing the plan making? - By initialing communication and involving plan makers**

	Respondents	Percent
Very useful	19	41.3%
Useful	23	50.0%
Less useful	3	6.5%
Not useful	1	2.2%
Total	46	100.0%

72. **Can you describe how the indicators help SEA in influencing the plan making? - Understanding the issues plan maker concerns by developing indicators together**

	Respondents	Percent
Very useful	19	41.3%
Useful	23	50.0%
Less useful	2	4.3%
Not useful	2	4.3%
Total	46	100.0%

73. **Can you describe how the indicators help SEA in influencing the plan making? - As a constraint tool to coordinate targets in plan or upper level plans**

	Respondents	Percent
Very useful	22	47.8%
Useful	21	45.7%
Less useful	2	4.3%
Not useful	1	2.2%
Total	46	100.0%

74. **Can you describe how the indicators help SEA in influencing the plan making? - Help in clarifying the mitigation or adaption**

	Respondents	Percent
Very useful	14	30.4%
Useful	26	56.5%
Less useful	5	10.9%
Not useful	1	2.2%
Total	46	100.0%

75. **Can you describe how the indicators help SEA in influencing the plan making? - Help in clarifying the implementation of follow up**

	Respondents	Percent
Very useful	14	30.4%
Useful	21	45.7%
Less useful	10	21.7%
Not useful	1	2.2%
Total	46	100.0%

76. **What is your experience in relation to if indicators help in influencing decision making? - Indicators increased the SEA's influence on the decision making**

	Respondents	Percent
Very useful	14	30.4%
Useful	26	56.5%
Less useful	4	8.7%
Not useful	2	4.3%
Total	46	100.0%

77. **Can you describe how the indicators make SEA influence the decision making? - By initialing communication and involving decision makers with their administrative means**

	Respondents	Percent
Very useful	20	43.5%
Useful	22	47.8%
Less useful	2	4.3%
Not useful	2	4.3%
Total	46	100.0%

78. **Can you describe how the indicators make SEA influence the decision making? - Understanding the issues decision maker concerns by developing indicators together**

	Respondents	Percent
Very useful	16	34.8%
Useful	26	56.5%
Less useful	2	4.3%
Not useful	2	4.3%
Total	46	100.0%

79. **Can you describe how the indicators make SEA influence the decision making? - As a constraint tool to coordinate targets in related policies or upper level plans**

	Respondents	Percent
Very useful	15	32.6%
Useful	28	60.9%
Less useful	2	4.3%
Not useful	1	2.2%
Total	46	100.0%

80. **Can you describe how the indicators make SEA influence the decision making? - Help in clarifying the mitigation or adaption**

	Respondents	Percent
Very useful	15	32.6%
Useful	24	52.2%
Less useful	6	13.0%
Not useful	1	2.2%
Total	46	100.0%

81. **Can you describe how the indicators make SEA influence the decision making? - Help in clarifying the implementation of follow up**

	Respondents	Percent
Very useful	12	26.1%
Useful	25	54.3%
Less useful	8	17.4%
Not useful	1	2.2%
Total	46	100.0%

Thank you!

You have answered all the questions. Thank you for participating in the survey!

Your answers have been saved. You can use the **Print** icon to print your result.

Previous 100% Finish

Thesis title:

The Role of Indicators in Strategic Environmental Assessment

Experience from Chinese Practice

PhD student:

Jingjing Gao

Supervisors:

Professor Lone Kørnøv

Professor Per Christensen

List of papers:

- Paper 1: Jingjing Gao, Per Christensen and Lone Kørnøv. The changing Chinese SEA indicator guidelines: top-down or bottom-up? Environmental Impact Assessment Review (accepted with revision, 2013)

- Paper 2: Jingjing Gao, Lone Kørnøv and Per Christensen. The politics of SEA indicators: Weak recognition found in Chinese guidelines. Impact Assessment and Project Appraisal (accepted with revision, 2013)

- Paper 3: Jingjing Gao, Lone Kørnøv and Per Christensen. Do Indicators Influence Communication in SEA? - Experience from the Chinese practice. Environmental Impact Assessment Review (submitted, 2012)

- Paper 4: Jingjing Gao, Per Christensen and Lone Kørnøv. The role of indicators in sea in influencing plan making. Journal of Environmental Assessment Policy and Management (final draft to be submitted, 2013)