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Comparative study of SEA experiences between EU and China: the use of indicators

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Abstract

Strategic Environmental Assessment (SEA) can be a useful tool in the pursuit of achieving sustainable development. It is used to assess the environmental consequences of proposed policies, plans and programmes (PPP) and also ensures that environmental knowledge is integrated at an early stage into the decision-making process. The use of indicators in the SEA process can facilitate a more simple presentation of the complex impacts and relationships that arise from development. However, designing indicators for SEA raises questions concerning general public participation, expert consultation and decision making, such as: How inclusive will the system be in relation to environmental, economic and social indicators? And how can the appropriate aggregation level for indicators be found?
This paper makes a comparative study of the experiences of using indicators in SEA in two European countries and China, in order to investigate the following questions: Are indicators used when performing an assessment? How are they used? Do indicators lead to opportunities or limitations in an evaluation process? And, are they positive or negative in providing information for decision making? Through a review of national SEA legislation and guidelines, this paper evaluates the different requirements related to indicator use within SEA in different national contexts. Furthermore, technical questions of how to design and use indicators in SEA are investigated. Finally, it is explored, from a political perspective, how the use of indicators influences communication during the SEA process.

Introduction

SEA is used to ensure both that potential environmental impacts are identified and considered in a strategic decision-making process, and that this integration of environmental consequences occurs at theh earliest possible stage of the decision-making process (Partidario, 1999, Lee & Walsh, 1992; Therivel et al., 1992; Sadler and Verheem, 1996). One way of aiding this process is the use of indicators as a tool for measuring and representing environmental conditions, and predicting and measuring impacts.

The benefit of using indicators is that they facilitate a more simple measurement and presentation of the often complex impacts and relationships which arise from a policy, plan or programme (PPP). It can then be asked, how inclusive will the system be in relation to environmental, economic and social indicators, and how can the appropriate aggregation level for indicators be found? Indicator design can also have implications for the level of participation, not only from the general public but also from experts and decision makers.

The criteria for selecting indicators deserves careful consideration as 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…" (Therivel, 2004). With the quantity of SEAs being performed increasing worldwide, there is a growing need to establish a common ground for formulating indicators that are in alignment with the SEA at hand, leading to improved decision-making regarding PPPs.

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Developing an indicator system is the first step toward simplifying the SEA process; the next step is to communicate how the indicator system should be integrated into the planning and decision-making process. An indicator system that is well-developed and well-communicated should facilitate a smoother implementation process by providing practitioners, the public and decision-makers with a yardstick against which the impacts of PPPs can be assessed. Due to the current lack of studies related to indicator use in the SEA process, little is known of how indicators influence the implementation of SEA and what potential there exists for improving planning and decision-making.

This paper focuses on Chinese experiences of applying indicators and identifying what opportunities and limitations this brings to the SEA process. Firstly the indicators used in SEA are presented and discussed. Secondly a comparative analysis of the national SEA legislation and guidelines in China, the United Kingdom and Denmark is conducted. This analysis is used to describe the different indicator systems and the experiences of the three countries with their use of SEA.

Indicators, decision-making and SEA

According to EEA (2005) communication is the main function of indicators. Communication demands simplicity while indicators always simplify a complex reality by providing information about phenomena that are typical or critical.

Through identifying phenomena that are typical or critical, indicators provide the simplicity which is necessary to communicate the complex reality of a situation. This ability to aid communication is considered by the EEA (2005) to be the most important function performed by SEA indicators. However, indicators have also been shown to lead to improvements in other aspects of SEA, such as better political steering in the environmental field (Kørnøv & Hvidtfeldt, 2003).

The relationship between information and indicators can be shown as an information pyramid. Indicators and highly aggregated indices are at the top of the pyramid, and the basis is primary data and analyzed data (See Fig. 1). "*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)

Indicators are suitable for communicating with both decision-makers and the public due to the quantitative nature of presented information. They provide information in a "simpler; more readily understood form than complex statistics or scientific data" (Hammond et al, 1995). Therefore, there are two distinct ways in which the use of indicators can improve communication in an SEA process: 1) it quantifies information making its significance more readily apparent; 2) it simplifies information about complex phenomena.

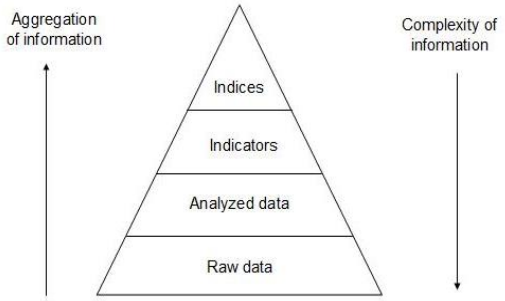

Figure 1 The information Pyramid (Hammond, *et al*, 1995)

The relationship between information and indicators can be shown as an information pyramid, with indicators and highly aggregated indices at the top of the pyramid, and primary data at the base (See Fig. 1).

Indicators and decision-making

Indicators are helpful to decision makers as they provide aid in both a direct and indirect way. According to European Environmental Agency (EEA, 1999), the following are the three purposes of indicators in the the policy-making process: "*1) to supply information on environmental problems, in order to enable policy-makers to value their seriousness; 2) to support policy development and priority setting, by identifying key factors that cause pressure on the environment; 3) to monitor the effects of policy responses.*".

When determining the level of aggregation that is appropriate for an indicator, it should be taken into account who the decision-makers are in the process. A general distinction can be made between three groups, all of which contribute to the decision-making process, each of which requires a different level of aggregation, as illustrated in Figure 2. The relevance of this classification has been recognised within the SEA community (Therivel, 1996). The three groups are:

- ***Scientists and researchers*** who require raw data which can be subjected to statistical analysis (high information load per indicator/low level of aggregation);
- ***Politicians*** who require data in a format which represents policy objectives, evaluation criteria and target and threshold values (low information load per indicator/moderate level of aggregation)
- ***The public*** who require a simplified and unambiguous representation of data as a single piece of information (low information load per indicator/high level of aggregation). (Braat, 1991)

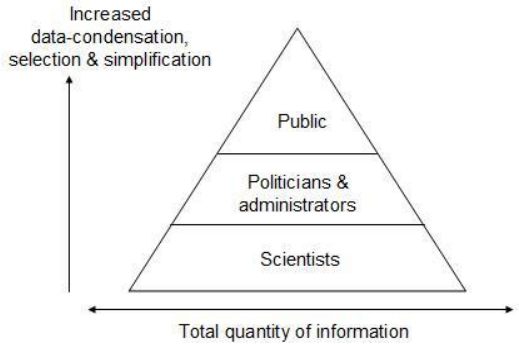

Figure 2 Relationship between aggregation level of indicators and the user hereof (Braat. 1991)

The different requirements of the different groups create a challenge when designing indicators. Hammond et al (1995) argue that indicators should be designed with the user in mind: the information presented to the user must be both in an understandable form and convey meaningful information. The challenge is to design indicators which both reflect the goals of the policy, and in their highly aggregated form provide all the necessary technical information in a message that is understood and accepted by politicians and the public.

A profusion of indicator systems - relevance for SEA?

To date many indicator systems have been developed, however each set is based on different criteria or designed to cover different geographical areas. One of the main actors over the past 15 years has been the OECD, having developed a core set of environmental indicators which reflect the main environmental issues in the OECD countries (Donnelly et al, 2007). Similar activity in the EU started in the 1990s and were accelerated after the European Council activities with Environmental Policy Integration (EPI) in Cardiff in 1998 (EEA, 2005). A set of core environmental indicators has also been developed by the EEA which have been also been utilised in other European and global indicator initiatives (EEA, 2005). Table 1 lists a selection of relevant international environmental indicator sets.

Table 1 International environmental indicator sets Overview (EEA, 2005)

Targets	Indicators
UN Commission on Sustainable Development (UNCSD)	A list of 134 SDI related to Agenda 21 including economic, environmental, social and institutional was launched in 1996. A core set consisting of 57 indicators was proposed in 2001.
WHO Environment and Health (EH) Indicators	A set of indicators for EH monitoring in EU countries was identified in 2003. A Pilot study was started in 2004 on the feasibility of 45 indicators in EU Member States.
OECD's different sets of environmental indicators	OECD key environmental indicators (KEI) OECD core environmental indicators (CEI) OECD agriculture-environment indicators OECD energy-environment indicators OECD transport-environment indicators OECD sustainable household consumption indicators
European Common Indicators	A European common set of 10 local sustainability indicators comes from a joint initiative between the EC (Environment DG) and EEA.
Eurostat's Sustainable Development Indicators (SDI), 2002	A set of sustainable development indicators related to the EU sustainable development strategy.

The majority of these indicator sets are based on the Driving force-Pressure-State-Impact-Response (DPSIR) model developed by the Dutch National Institute of Public Health and the Environment (RIVM) in the late 1980s. This indicator set has its base in describing cause-effect relationships of environmental problems and has been adopted by the EEA as a general reporting method, such as in the State of the Environment Reports (Kristensen, 2004). In the 1990s the OECD developed its own model based on cause-effect relationships as a structure for environmental policies and reporting. This model is called the Pressure-State-Response (PSR) model and was used by the UNCSD in the development of their SDI.

The existence of this large number of indicator sets is not stopping new and local indicator from being developed. In relation to SEA most countries prefer to develop their own approaches or sets of indicators instead of adopting one of those already globally accepted. In their study of how to select environmental indicators for SEA Donnelly et al. (2006) found that the existing sets of indicators at EU, national and local levels would in theory be useful in providing important data sources and methodologies for indicator set development. However, they find that not all sectors or environmental receptors required in the SEA Directive, are covered by existing indicator sets. To what extent SEA practice can use indicators sets already in place in other kinds of planning is questionable – but the review by Donnelly et al. (2006) indicates it might be hard to simply transfer current available information to SEA. In the meantime SEA practitioners should be encouraged to develop or compose their own indicator sets that are specific to proposed PPPs by concentrating on relevant and significant issues targeted in the scoping phase of SEA (Donnelly et al., 2006).

Appropriateness of indicators for SEA

Due to the complex nature of the environment and society, SEA practitioners face a number of difficulties when designing appropriate indicators (Scholes & Biggs, 2005). These difficulties are expanded 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, impact assessment indicators should be accepted by all decision-makers and stakeholders in the earliest stages of an SEA. This also helps to ensure a high

level of objectivity in the SEA.

Kurtz et al (2001) evaluated the role of indicators in the monitoring programmes of the US EPA (Environmental Protection Agency). While their study was not specifically related to SEA, their organisation of the US EPA technical guidelines into four phases could also be applied to SEA guidelines. The four phases identified by Kurtz et al (2001) are: 1) conceptual relevance; 2) feasibility of implementation; 3) response variability and; 4) interpretation and utility. However, the effectiveness of an indicator set is not solely dependent on guidelines, but also on the decision makers. As discussed earlier, indicator sets should be designed specifically according to the objectives and resources of each PPP.

After reviewing the current studies addressing the relation between indicators, SEA and decision making, the methodology for exploring opportunities and limitations of using indicators in SEA is presented in the next paragraph, including the analysis of national SEA guidelines of the three case countries.

Methodology

This paper makes a comparative study of China and two European countries, Denmark and the United Kingdom respectively, in order to identify the opportunities and challenges for SEA in China. All three countries have quite similar laws, regulations and guidelines in respect to SEA.

The comparison is based upon a documentary study of national guidelines of the three countries to analyses and discussions of the different requirements for using indicators in SEA from the perspective of legislation and technical guidance.

There is no specific guideline for the use of indicators in SEA in China. This paper analyses the *Technical Guidelines for Plan Environmental Impact Assessment* (2003; hereinafter referred to as the *Technical Guidelines (2003)*) which was launched on 1st September 2003 by the former State Environmental Protection Administration (now named Ministry of Environmental Protection of China) and its revised version (a draft was prepared by the Ministry of Environmental Protection of China in 2009, hereinafter referred to as the *Technical Guidelines (revised version, 2009)*). The majority of the discussion is based on the *Technical Guidelines (revised version, 2009)*. The *Chinese Plan Environmental Impact Assessment Regulations* launched on 1st Oct. 2009 by Ministry of Environmental Protection of China is also discussed. Plan-EIA is the term used in China to refer to SEA. The aim of this documentary study is to determine the official basis for using indicators in SEA on regulations level as well as the technical requirements as formulated in the guidelines.

Reason for comparison and cases

The reason for choosing Denmark and the United Kingdom (UK) as comparative case countries is to put the Chinese SEA system and experiences into perspective. UK is characterised by a centrally guided environmental assessment system, as is illustrated by the proactive role the central administration has taken in developing guidelines for SEA and the use of indicators. The characteristics of the UK system are: A comprehensive and stringent national guidance in relation to both SEA and sustainability appraisal, high aggregation level of indicators and a broad scope regarding sustainability.

In sharp contrast to the British system is the Danish SEA system. Denmark represents a case with the characteristics: Limited national guidance only involving examples of which indicators to use and how, low aggregation level and a narrow focus in relation to sustainability with a strong emphasis on the biophysical environment. China stands between these two approaches.

Chinese experience with use of indicators in SEA

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

In China, indicators are widely used as a tool for measuring the impact of implemented PPPs. The *Technical Guidelines (2003)* provides a suggested procedure to guide SEA practitioners in identifying indicators. The 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)* calls for reflection and improvement to keep pace with the SEA development in China. In 2007 the former State Environmental Protection Administration in China launched a committee board that should revise the *Technical Guidelines (2003)*. In 2009 the Ministry of Environmental Protection of Chin issued the revised version of the guidelines and it is presently still under the stage of calling for comments. Besides providing a guideline at a general level, the *Technical Guidelines (revised version, 2009)* consists of a series of guidelines focusing on different sectoral plans:

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

Compared with the *Technical Guidelines (2003)*, the *Technical Guidelines (revised version, 2009)* has mainly been improved regarding the following aspects:
1. It pays more attention to the principles and the process of how to choose indicators other than providing a list of indicators directly.
2. It emphasises the core role of environmental objectives and indicators in SEA which will influence the SEA's output significantly.
3. It identifies SEA as an assessment based on environmental objectives while EIA is an assessment based on environmental quality standards.
4. It deletes the old recommended indicator lists, but gives 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).

Several Chinese scholars have studied the Chinese SEA system, however most of the research on SEA in China has focused on the concepts and theory (Che et al., 2002), the legal requirements, and key elements and procedures (Zhu et al., 2001). No study on the use of indicators in the Chinese SEA has so far been published in English.

The principles for classifying and selecting indicators for SEA were discussed in Bao et al (2001) who proposed a method for indicator selection and for the weighing of indicators. In their case study on SEA of Chinese Energy development, the authors recommended an indicator list for the Chinese energy strategies. According to Zhao et al (2003) the current research on SEA focuses on the question "how to assess" while indicators are related to the question of "what is to be assessed".

In their case study of a Regional Plan, Guo et al (2003) also points to the DPSIR model as being very

useful in simplifying the complex relationship between human society and the environment system and thus providing a basic framework for indicator use. Contrary to this Fan and Zhou (2008) point out that the DPSIR framework is not perfect because of its oversimplification of cause-effect chains. They suggest that when choosing indicators based on the DPSIR model, they should be adjusted according to the context of the SEA to better reflect the complex reality of the situation and to improve the effectiveness of the indicators. An integrated assessment calls for more studies on the inter-relationships of indicators. Likewise the *Technical Guidelines (2003)* are too general to guide the practice as they do not provide enough guidance on indicators to be used for more specialized plans such as a Watershed Plan. Guo et al (2003) also points out that most indicator studies in SEA have been limited to a general level using a general framework without much guidance for the practice in China. Therefore foreign experience cannot presently be transferred directly to China due to the difference in contexts.

Comparative Study

The comparative study between China and two European countries (Denmark and UK), indicates the challenges for using indicators in the Chinese SEA system. The study analyses and discusses the different performance from the perspective of legislation, technical guidance and/or requirements for choice and use of indicators. Table 2 gives a brief overview of the comparison.

From the perspective of legislation and guidance, China issued the related laws and regulation almost in the same period as Denmark, while UK issued its Guidance on SEA as early as 1995.

The three countries have guidance in place for SEA, and in China and UK the guidance generally covers the use of indicators in SEA practice. The UK guidance, contrary to the Chinese, pays more attention to the process and communicative side of the use of indicators.

In the Danish and UK SEA systems indicators are not formally required. However, the two countries vary significantly in their use of indicators. The Danish system, through its limited use of indicators as an instrument in SEA and its limited reference to indicators, is in practise confining the use of indicators. Throughout the Danish guidance, indicators are mentioned just 5 times and only in relation to 'monitoring' and 'setting up local goals for environmental assessment':

> *"To make sure monitoring in itself will not be a very comprehensive task, it is important when setting the monitoring program to select as few and simple indicators as possible and preferable building upon information from already existing monitoring programs." (Ministry of Environment, 2006, 24)*

> *"For each environmental objective indicators can be selected, which are measures of an environmental issue over time and space. Indicators can typically be used when environmental baseline shall be described and monitored. Goals and indicators can be used, when environmental impacts are assessed." (Ministry of Environment, 2006, 30)*

The wording chosen emphasizes that the choice of indicators is optional, and recommends a minimalistic approach concerning which and how many indicators to select when used in SEA.

Table 2. Brief review of legislation and guidance on indicators use for SEA in China, Denmark and United Kingdom

	China	*Denmark*	*United Kingdom*
Law/ Regulation	The EIA Law, 2003; Planning-EIA Regulation, 2009	Act on environmental assessment of plans and programmes. (No 936 2009) (The Ministry of Environment, 2009) Statute on environmental assessment of plans and programmes (No. 1102, 2009) (The Ministry of Environment, 2009)	Policy Appraisal and the Environment, 1991. (Department of the Environment, 1991)
Guidance /Guideline	Technical Guidelines for Plan EIA 2003; Technical Guidelines for Plan EIA Revised Version (Draft), 2009	Guidance on environmental assessment of plans and Programmes, 2006 (Ministry of Environment, 2006) Best Practice Collection, 2007 (Ministry of Environment, 2007)	Planning Policy Guidance Note 12 (PPG12), 1992 (The Department of the Environment,1992) Development Plans and Regional Guidance (DoE 1992) (The Department of the Environment,1992) Policy Guidance Note 95/1 Strategic Environmental Assessment (SNH 1995) (Scottish Natural Heritage, the Scottish authority for nature conservation, 1995)
Requirements concerning indicators	Formally required	No formal requirement - Informally confined	No formal requirement - Informally promoted
Number of indicators presented	4 sets for 5 sectors with numbers varying from 28-50	46 environmental objective examples	46 examples of SEA indicators
Indicator types	recommendation for specific sectors	diffuse examples	a large number of indicators
Aggregation of indicators	low aggregation; No comprehensive indicators on general level but specific for sectors	low aggregation	low aggregation
Guidance related to indicators' use Identification of indicators in the guideline	A procedure for indicator identification at a general level; Recommendation lists for sectors.	Indicators are presented as an option for baseline study, impact assessment and monitoring	Setting environmental targets and carrying capacity It suggests using response indicators to show the response to environmental problems rather than pressure or state.

The British guidance, 'A Practical Guide to the Strategic Environmental Assessment Directive', in contrast to the Danish case, informally promotes the use of indicators although their use is not mandatory. The guidance mentions indicators 69 times and gives extensive information on developing SEA objectives and related indicators. The information includes 46 examples of indicators related to the concept of environment as put forward in the EU Directive, but at the same time stating that "Responsible Authorities wishing to cover the full range of sustainable development issues in their assessments are free to broaden the scope of the assessment to include social and economic effects of their plans and programmes in addition to environmental effects." (Office of the Deputy Prime Minister: 2005, p. 20). The comprehensiveness in relation to sustainability and use of indicators is supported by an extensive list of sources for indicators and explicit guidance on how to develop and use indicators in the different stages of the SEA process.

In China, the technical guidelines are classified as a recommendation, which means it is not legally binding, but technically it is a formal requirement. It has thus been a standard criterion for Chinese SEA practice, and it is common that the expert committee evaluates SEA cases against this guideline x the evaluation stage by the expert committee. According to the technical guidelines, indicators are formally required to be used in the SEA process and thus must be described in the final report:

> *"…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)*

> *"According to the national and sectoral policy requirements, indicators should be selected to represent the environmental objectives quantitatively or semi-quantitatively…"(*The *Technical Guidelines (revised version, 2009), p. 8-9)*

> *"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 does not give any indicator list on a general level, but instead gives 4 different sets for specific sectors as an appendix to each guideline. There are no recommended lists provided in the Technical Guidelines for Plan EIA, i.e. for Onshore Oil and Natural Gas Field General Exploitation and Development Plan. Most of the rcemmonded indicators are at a low level of aggregation which can only provide limited information, while very few are comprehensive or integrated in nature (see Table 3).

Table 3. Number for environmental objectives and indicators recommended in Chinas "The Technical Guidelines (revised version, 2009)"

Sectors	Environmental objectives	Indicators	Aggregation level
Coal Industry Mining Area Plan	8	48	Low
Urban Master Plan	15	38	
Forestry Planning	5	50	
Onshore Oil and Natural Gas Field General Exploitation and Development Plan	/	/	
Land Use Plan	6	28	

The analysis of the Chinese Technical Guidelines also shows that indicators are seen as an essential part in the SEA process in China. The underlying reason may be that currently decision-making in planning strongly depends on the information included and even behind the indicators used in SEA:

> *"At least 10 parts (scoping, PPPs description, environment baseline, environmental objectives identifying, impact assessment, alternatives analysis, immigration, follow-up evaluation, public participation, results) should be included in the final SEA report, in which the environmental objectives identifying part should describe clearly the ….environmental objectives and assessment indictors…" (The Technical Guidelines (revised version, 2009), p. 14)*

A general analysis of the national guidance shows a lack of explicit reflection on how indicators influence the SEA process and its outcome. This is also related to the communication needs embedded in the use of indicators in SEA.

Discussion - The communicative role of indicators

Developing and using indicators is both a political and professional process. The professional process is related to the 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 either formal or informal. This relates to the question of whether to use indicators or not, which indicators to use, aggregation level and who is going to be involved in this part of the SEA process. The political process is based on personal and political values that can potentially influence the effectiveness of SEA, but also the use of SEA by different stakeholders is important not least when it comes to how indicators are communicated to the larger public.

One example from the three cases is the Danish guidance in which it is explicitly underlined that the use of indicators is not mandatory and if used they should be few, simple and based upon existing knowledge. From the political side it is emphasised that the central administration must economically compensate the local authorities for their work on SEA, and if indicators are required, compensation would be necessary, so formally the government does not demand indicators as a way to avoid expenses. The motive is never spoken in plain words but it has to do with saving money.

Another example of politics of indicators is the British guidance in which openness towards stakeholders is emphasised as important:

> *"It may be useful to develop SEA objectives, indicators and targets in consultation with the Consultation Bodies and relevant stakeholders, and review them in the light of baseline information and any problems identified." (Office of the Deputy Prime Minister, 2005, p. 29).*

The inclusiveness is also being supported by Cloquell-Ballester et al. (2006) and Kurtz et al. (2001) who argue that the complexity in choosing and using indicators requires different actors to be involved in the process. They hereby indirectly touch upon the politics of indicators.

The Technical Guidelines (revised version, 2009) also makes suggestions as to who should be involved in the designing and choosing of indicators. Besides the SEA team, the external experts and the public are encouraged to participate in the selection of indicators, however there is no description implying to what extent they will influence the final list:

> *"Based on the experts' consultation and public comments collection, indicators should be selected regarding to plans in different sectors …." (The explanation for The Technical Guidelines (revised version, 2009), p. 10)*

The Chinese and British SEA guidelines suggest an inclusive selection process and thereby indirectly recognise that knowledge production through indicators in SEA is also a political process. However a general note to the national SEA guidelines is that indicators are presented in such a way that they seem to be certain and objective. This lack of explicit discussion of norms and the implication related to indicators in assessments is also discussed by Rametsteiner et al. (2009) 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" (Rametsteiner et al, 2009). 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. Thereby they will not be fully recognised and appreciated as valuable inputs to the formulation of indicators for the SEA process.

Conclusion

As indicators become widely used in Chinese SEA, it is increasingly important to critically examine how they are produced and how the focus of knowledge they create is affecting decision-making. By comparing the Chinese experience in using indicators in SEA with two European countries, this paper explores the challenges and opportunities associated with the use of indicators. Through a documentary and comparative study, this paper analyses the use of indicators in SEA from both professional and political perspectives. Regarding the professional aspect, experience from UK with its intensive use of indicators in SEA encourages the inclusion of social and economic effects of PPPs in addition to environmental effects. From the political perspective, numerous indicator lists and the complex process of selecting them implies its lack of economic consideration. In contrast to this is the Danish example where a complex planning and SEA system is based on almost no indicators purely due to resource considerations. The Danish case is clearly exemplifying the politics involved in the process of selecting and using indicators in SEA.

When looking at 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. There are though several challenges related to this. Firstly, from the professional perspective, most of the recommended and currently used indicators reflect environmental concerns but are insufficient in identifying the social and economic issues. As a result of which, the conclusion provided by SEA hardly supports the original aim of integrating environment into development. Secondly, to a certain extent, SEA practitioners have discretion when it comes to the selection of indicators, so how the bias of experts be avoided? How should the practical difficulties due to a lack of available information and data be dealt with? To answer these questions, a criterion is needed to guide indicator selection and use in China and in many other countries as well. Lastly, from a societal perspective there is a need for guidance

on how to explicitly and transparently deal with both the 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.

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