Strategic Environmental Assessment Effectiveness: Learning from Experience in China and the Netherlands

Published by:
Appraisal Center for Environment and Engineering, Ministry of Environmental Protection of China
Netherlands Commission for Environmental Assessment

Contributions by:
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Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences
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Supported by:
Ministry of Environmental Protection of China
Ministry of Infrastructure and the Environment of the Netherlands

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ISBN 978-90-421-4041-7

Preface

In the 1970s, the U.S. began the implementation of the *"National Environmental Policy Act"*. This Act introduced the instrument of environmental impact assessment (EIA). Since then EIA has been adopted in many countries, and it has become one of the most important legally required tools for environmental management. The concept of EIA was introduced to China in the first National Environmental Protection Conference in 1973. The *"Environmental Protection Law (Trial)"* issued in 1979 formally established the environmental impact assessment system for project construction in China. On September 1st 2003, the implementation of *"The Environmental Impact Assessment Law"* expanded the application of environmental impact assessment from project construction to the planning level, and thus laid the institutional foundation for strategic environmental assessment (SEA) in China. This expansion greatly promoted the development of SEA in China, both the theory and the practice.

In 2012, the Chinese Ministry of Environmental Protection and the Netherlands Ministry of Housing, Spatial Planning and the Environment (now reconfigured into the Ministry of Infrastructure and the Environment) jointly signed an Annex to the *"Memorandum of Understanding on Environment Cooperation between China and the Netherlands"*. This Annex concerned a Strategic Environmental Assessment Working Agreement, and started a long-term cooperation on SEA between the two countries. It was agreed under this Annex to exchange experience and information, and to jointly organize training and research in the field of SEA. Each country has its unique and distinguishing SEA features, due to the differences in the two national systems. At the same time, the two countries generally follow similar principles for SEA, and share some of the same steps in the SEA process, which provides a good basis for comparison. Summarizing and sharing practices and experience is beneficial to the bilateral cooperation on SEA, and can also make an important contribution to the development of SEA internationally.

This book documents cases and experience in SEA from China and from the Netherlands, and compares the two. The Chinese contribution concentrates on the experience with SEA for regional strategic environmental assessment (Regional SEA). Regional SEA represents a new dimension of China's SEA practice that has emerged in recent years. In 2007, the Ministry of Environmental Protection has launched several pilots of mega-regional SEA. Five regions were selected for the first pilot: the Bohai Sea coastal areas, the Economic Zone on the west side of Taiwan Strait, the coastal areas of Beibu Gulf Economic Zone, the Chengyu Economic Zone and the Energy and the Chemical Industrial Zones in the upper and middle Reaches of the Yellow River. Each of these regions has played an important role in China's economic and strategic industrial layout and has an outstanding position in the overall ecological security pattern in China. In the regional SEA, the pilots comprehensively analyzed the present situation, the trends in development of industry and the key constraints in available resources and the existing environment, assessed the potential impacts and risks to the environment caused by industrial development in these five regions, and put forward suggestions for optimizing the development of key industries as well as strategic countermeasures for environmental protection. The SEA was undertaken in view of the goals and positioning of key industry development, and in reference to the three core issues of layout, structure and the constraining carrying capacity of regional resources and the environment.

The resulting SEA of the key industrial developments in these five regions has become an important reference for national and major regional strategies, an essential supporting experience for developing major planning and local policies and the key basis for organizing industries such as thermal power, chemistry, petro-chemistry, steel, etc. A series of Chinese treatises about SEA for the development of key industries in these five regions has been published, and the SEA pilot won the First Grade Prize of Environmental Protection Science and Technology Awards in 2013.

After concluding the SEA for these five mega-regions, the Ministry of Environmental Protection organized and completed an SEA for the planning of the key areas of China's Western Regions Development and its industries in 2011-2012, and for the planning of the Central Region of China in 2013-2014. A third series of mega-regional SEAs will be launched for the Beijing-Tianjin-Hebei Region, the Yangtze River Delta and the Pearl River Delta in 2015. These series of assessments have helped to build a national-scale dynamic monitoring

and warning platform on resource and environmental carrying capacity of national development, based on the geographical integration of natural ecosystems, watersheds and economic factors.

The comparison of Dutch and Chinese SEA experiences in this book not only serves to document achievements made on both sides, but it also lays the foundation for a deepening of SEA cooperation between the two countries, as well as between China and Europe. The Chinese case study of SEA on key industrial developments for the five regions was completed by experts from Appraisal Center for Environment and Engineering, Tsinghua University, Institute of Geographic Sciences and Natural Resources Research, Nankai University and Beijing Normal University. The Netherlands Ministry of Infrastructure and the Environment, the Netherlands Commission for Environmental Assessment and the University of Groningen contributed the section on SEA experience and cases in the Netherlands as well as providing input into the publication overall.

It can be anticipated that, with the continuing and deepening cooperation between China and the Netherlands, more and more achievements of bilateral cooperation on SEA will be presented to readers.These achievements would be continually enriching the contents and enhancing the mutual cooperation of Strategic Environmental Assessment between China and the Netherlands.

Mr. Wu Xiaoqing
Vice Minister
Ministry of Environmental Protection of China

Preface

I am proud to present this publication, which is the product of an ongoing exchange between China and the Netherlands on the topic of strategic environmental assessment (SEA).

This publication has been developed under a Memorandum of Understanding between the Chinese Ministry of Environmental Protection and the Dutch Ministry of Infrastructure and the Environment (IenM). The Dutch contribution to this text has benefitted from a Government-to-Government project funded by the Ministry of IenM and organized by the Netherlands Enterprise Agency (RVO).

In the Netherlands, SEA has been integrated into planning since the 1980s. For this reason, the Netherlands has had a head start in applying SEA compared to other countries who introduced SEA at a later stage. Specific characteristics of Dutch practice that the Chinese partners are interested in include public participation in SEA, and the administrative arrangements for SEA, in which different (governmental) agencies work together to integrate assessment into complex planning processes. The instrument of SEA is newer to China, but application is expanding at remarkable speed and scale. The Netherlands can learn from the methodological advances that China has made in SEA, and the application at the more strategic policy level. For example, China has pioneered SEA for the planning of mega regions: areas allocated for accelerated development. This ground breaking case has generated internationally relevant lessons on SEA.

The first part of this book sets out the Chinese experience with (mega) regional SEA. The second part of the book looks at the SEA experience in the Netherlands in a more general sense. First the outcomes of various studies into the effectiveness of SEA in the Netherlands are described. These studies are summarised by Professor Jos Arts of the University of Groningen. This chapter is followed by a collection of lessons learned from SEA practice, by various

authors of the Netherlands Commission for Environmental Assessment (NCEA). In the next chapters Rob Verheem, director of international cooperation at the NCEA, compares the insights from research and practice, and between China and the Netherlands. We then look towards the future, at how SEA may be viewed as a system operating at the level of a country or a region. The NCEAs recently developed systems approach to SEA effectiveness is outlined. The Dutch section of this publication closes with two practice illustrations: SEA for long term spatial planning in the Netherlands, and SEA for Dutch water plans.

This publication does not mark the end of the exchange. The Memorandum of Understanding between the environmental ministries of both countries is about to be renewed, an Annex on SEA is included in the new arrangements. We look forward to continuing the debate on how to make SEA work better for sustainable development in China and the Netherlands, and worldwide.

Siebe Riedstra
Secretary-general
Ministry of Infrastructure and the Environment

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25 Years of SEA in the Netherlands: learning from research and practice

Part Ⅰ

The Practices and Experiences of Strategic Environmental Assessment on the Key Industries' Development in the Five-mega Regions

1 Introduction

LI Tianwei, REN Jingming, LIU Xiaoli, WANG Zhanchao, ZHU Yuan (*Appraisal Center for Environment and Engineering, Ministry of Environmental Protection of China*)

China has experienced a rapid economic growth with real annual gross domestic product (GDP) averaging more than 10% for more than 30 years. It was widely accepted that industrialization as the major driver of the remarkable economic growth in China, with the secondary industry accounting for nearly 50% of total GDP.

However, the rapid economic growth in China over the past several decades has cost tremendously on the country's environment, in terms of resource shortage, environmental pollution and ecological degradation. The end of China's industrialization was expected by the year of 2030, which meant the environmental pressure would continue for 20 years. Heavy industries would be further and considerably intensified according to the developing strategies among the central and local governments.

It was crucial to mitigate the environmental pressure in order to reconcile economy and environment. Generally speaking, there were four major measures to mitigate the environmental pressure: end-of-pipe measures, improvement of technology, optimization of spatial distribution, and environment-friendly industrial policy. In industrialized countries, their industrial structures and spatial distributions were almost fixed, with few newly-built industrial enterprises, and the existing point sources were the major pollution source. In these cases, environmental impact assessment (EIA) for project or programs was efficient to evaluate these relatively certain and direct environmental impacts. End-of-pipe and technology improvement were effective to mitigate negative environmental impacts. In contrast, in China, with unique fast growth of economy and

extending spatial distribution of industry, only the first two measures were far from sufficient. Therefore, as an instrument to cure the environmental pollution and ecological degradation at the beginnings, strategic environmental assessment (SEA) plays an effective role in evaluating uncertainty resulted from changing situation and indirect & accumulative environmental impacts resulted from inter-sectoral and inter-regional sources.

From 2007 to 2010, Ministry of Environmental Protection of China initiated 5 SEA pilots involving 15 provinces, named as the SEA for the Long-Term Industrial Development of Five Mega-Regions in China (we refer to "the SEA project" here). Although environmental impacts on programs and plans developed fast and widely in recent China, this project was the first trial in a broader perspective to aggregate regional, provincial and municipal policies rather than programs or projects.

1.1 Background

The five mega-regions include the Bohai Sea Rim Area, the West-Straits Economic Zone, the Beibu Gulf Economic Zone, the Chengdu-Chongqing Economic Zone and the Yellow River Upper and Middle Stream Area (Figure 1.1). These five regions cover 1.1 million km^2 area, involve 15 provinces, contain 90 cities, and have a population of about 300 million (Table 1.1). These regions constitute about 22% of the national GDP and undergo rapid growth, in which the heavy industries accounts for 70% their secondary industry output. Capacity of crude oil production and processing both exceed 1/3 of the national total. Volume of steel production reaches to more than 100 million tons, accounting for 20% of the national total. Energy production including coal, natural gas and hydropower production plays a vital role due to their large shares of national reserves. In addition, the regions were important vehicles of China's national development strategies. All provincial and municipal governments involved have a strong tendency to accelerate industrialization that relies heavily on massive investment on heavy industries. For instance, the production quantity of the refinement of crude oil, ethylene, steel and installed electricity capacity would at least increase to 0.38 billion tons, 17 million tons, 0.21 billion tons and 420 million kWh, respectively. According to plans and strategies related to these regions at national and local levels, the total GDP in the five regions was expected to grow up to 12.5 trillion RMB Yuan by 2015, accounting for 25% of

the national GDP. By 2020, these two figures were expected to be 20.0% and 28.5% respectively. The five regions were convinced of the most economically active areas in the foreseeable future.

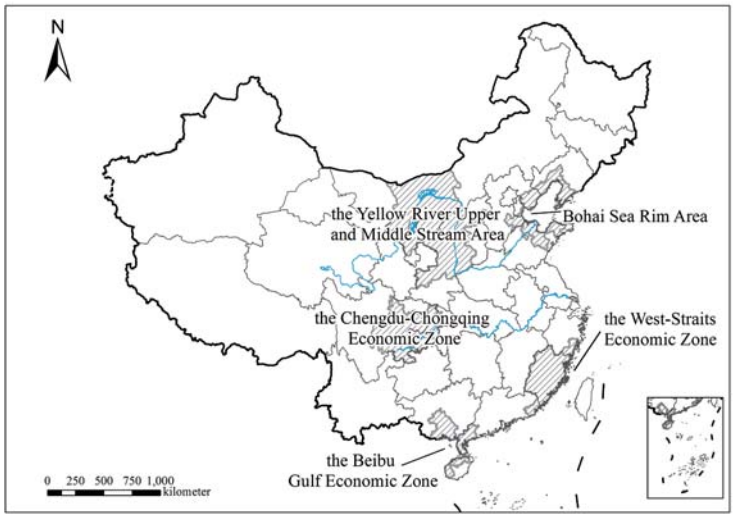

Figure 1.1 *Locations of the five mega-regions in China*

Table 1.1 *The five mega-regions and their economic and social characteristics*

Region	Municipality covered	Dominant industries	Area (10,000 km^2)	Population (10,000)
Bohai Sea Rim Area	Dalian, Yingkou, Panjin, Jinzhou, Huludao, Qinhuangdao, Tangshan, Tianjin Binhai New District, Cangzhou, Binzhou, Dongying, Weifang, Yantai	Petroleum, Chemical, Metallurgy, Equipment Manufacturing, Energy, Building Materials, Food, Paper, Textile	12.9	5,516
West-Straits Economic Zone	Fuzhou, Xiamen, Putian, Sanming, Quanzhou, Zhangzhou, Nanping, Longyan, Ningde, Shantou, Chaozhou, Jieyang, Wenzhou	Petrochemical, Equipment Manufacturing, Electronic Information, Energy, Metallurgy, Forestry-Pulp-Paper	16.1	5,725

Region	Municipality covered	Dominant industries	Area (10,000 km^2)	Population (10,000)
Beibu Gulf Economic Zone	Nanning, Fangchenggang, Qinzhou, Beihai, Zhanjiang, Maoming, Haikou, Chengmai Lingao, Danzhou, Changjiang, Dongfang, Ledong	Petrochemical, Metallurgy, Chemical Industry, Forestry-Pulp-Paper(Paper), Energy, Food, Pharmaceutical, Building Materials, Ship building	8.2	3,209
Chengdu-Chongqing Economic Zone	the 9 Districts of Chongqing main city, Tongnan, Tongliang, Dazu, Shuangqiao, Rongchang, Yongchuan, Hechuan, Jiangjin, Qijiang, Changshou, Fuling, Nanchuan, Wansheng, Bishan, Wanzhou, Liangping, Fengdu, Dianjiang, Zhongxian, Kaixian, Yunyang, Shizhu, Chengdu, Mianyang, Deyang, Neijiang, Ziyang, Suining, Zigong, Luzhou, Yibin, Nanchong, Guang'an, Dazhou, Meishan, Leshan, Ya'an	Agricultural and Sideline Products Processing, Chemical, Equipment Manufacturing, Energy, High-Tech Electronic Technology	20.6	9,237
Yellow River Upper and Middle Stream Area	Wuzhong, Yinchuan, Shizuishan, Zhongwei, Ordos, Wuhai, Alxa Left Banner, Bayannur, Baotou, Yulin, Yan'an, Weinan, Tongchuan, Xianyang, Baoji, Xinzhou, Lvliang, Linfen,Yuncheng	Coal Mining, Electricity, Coal Chemical, Metallurgy	52.0	4,600
Total			109.8	28,287

In addition to their economic importance, the regions were rich in biodiversity, ecologically and environmentally significant. These regions overlap several important watersheds in China: Yellow River basin, Yangtze River basin, Pearl River basin, Liaohe River basin and Haihe River basin. There were three coastal regions with intensified human activities: Bohai Sea, Taiwan Strait and Beibu Gulf. All natural reserves cover 97,000 km^2, accounting for 6.5% of the area of national natural reserves. Hundreds of national protected animals and plants live within there. Moreover, requirement of multi-pollutant emission reduction in the regions accounts for more than 2/3 of the national total.

The serious conflict has arisen between rapid heavy industry development and the environment in the Five-mega Regions. Firstly, spatial conflict between industry development and environmentally sensitive areas was inevitable because of the high intensity of economic development and urbanization and lack of effective coordination. Industry zones have been established near to rivers. For example, in Chengdu-Chongqing Economic Zone, nearly 90% chemical factories were located along the main stream of Yangtze River and its branches, i.e. Minjiang River and Tuojiang River. Moreover, a large number of industry zones were extended to coastal areas. Considerable wetland disappeared consequently. During the period of 1996-2007, area of the coastal wetland decreased with an annual rate of 1% in Bohai Sea Rim Area. Secondly, a sizable quantity of pollutant emission due to large scale of industry leads to serious water and air pollution. For example, 80% cities in Chengdu-Chongqing Economic Zone suffer from acid rain where dense power plants and chemical factories located.

By 2030 China would be in the middle to late stages of industrialization. Heavy industries would be further and considerably intensified through national and local development strategies, and very likely extend to environmentally sensitive areas. It was believed that the regional environmental consequences would significantly worsen along this sort of development, even if each individual facility would comply with the strictest environmental requirements. Therefore it was particularly important to seek long-term balanced and harmony solution.

1.2 Objective

The SEA project was expected to propose environmental insights for the 12th Five-Year Plan from 2011-2015, both at the national and local level, and aimed to provide the governments with a clear scientific view of what was happening and would happen to the environments under intensive development. This SEA project was not directly integrated into simultaneous planning processes at provincial and local level. Instead, by interviewing local officials, making field surveys on industrial development baseline and reviewing existing reports, the SEA project tried to indentify the local developing trends in terms of economic size, industrial structure and spatial pattern (3S), and predicted and assessed their environmental impacts. The focus was not only on environmental impacts, but also on the environmental constraints for development in terms of quantity and

spatial pattern. And the project gives a series of recommendations on how the SEA project contributes to environmental and ecological challenges which the Five-mega Regions was facing towards sustainable development.

1.3 Technical Framework

"Three-'S' model" was employed in the SEA project. The first "S" relates to the scale—the total industrial capacity; the second "S" was the structure—the composition of the industrial sectors; and the third "S" was the space—where they would be likely located. The three-S focused on the interaction between industrial development and the environments. The alternatives and recommendations were also proposed to solve the negative environmental impacts from the perspective of this model. The SEA project includes the following three stages (Figure 1.2).

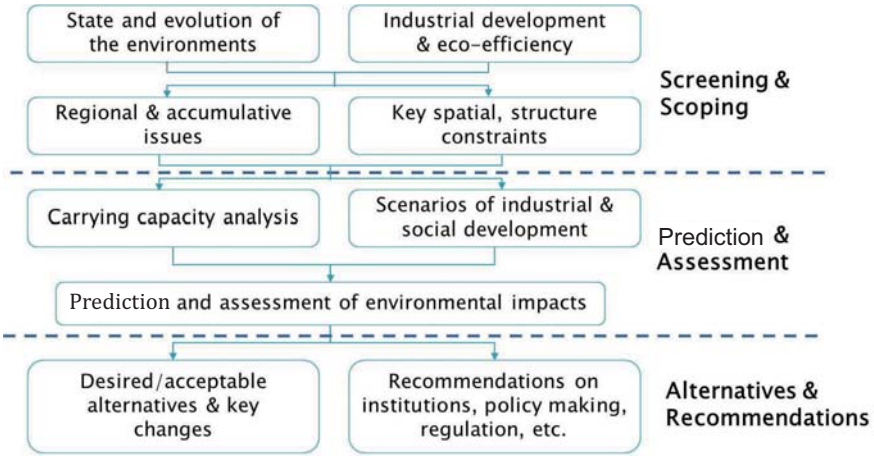

Figure 1.2 *The technical framework for the SEA project*

Stage A: Screening and scoping

In stage A, we established the baselines of environments and industrial development. The base year was 2007, a detailed retrospect on environment and industrial development has been reviewed back from 2001 and 2007, and projections of future changes for year 2015 and 2020 was conducted, because major industrial development plans were proposed for 2015-2020. There were

two major tasks: (1) assessment on the state and evolution of the environments; (2) assessment on the state and evolution of industrial development as well as their eco-efficiency. The first task aims to an overall understanding of environmental problems, focusing the key issues. Regional environmental problems were paid more attention, such like trans-boundary air and water pollution, occupation of ecological space, etc. The second task aims to gain a full perspective of regional and municipal economies and their industries, and to explore the relationship between human-activities and the environments.

Stage B: Prediction and assessment

In stage B, we conduct the prediction of the future environmental issues, based on the current trends and the relationship between human-activities and the environment. Industrial development scenarios were established by summarizing the considerations of national, provincial and municipal governments. Environmental carrying capacity was evaluated and ranked. The current and likely future environmental issues were compared with each other to give decision makers a full view of the trends of the environmental impacts of industrial development. Both were also compared with the targets and the thresholds, including environmental standards and environmental carrying capacity, in order to understand environmental constraints against the economic size and spatial patterns.

Stage C: Alternatives and recommendations

In stage C, we provide the alternatives and recommendations. The alternatives give mitigations for avoiding worst environmental consequence. They were proposed for regions, including a better economic rate of development and allocations in terms of spatial pattern and industrial structure.

2 Project Procedure

LIU Yi, LIN Lv (*Tsinghua University*)

2.1 Organization

The SEA project was a set of SEA studies including the synthetical project, the five sub-projects, 15 provincial projects and specific themes. The synthetic project comprises the Bohai Sea Rim Area sub-project, the West-Straits Economic Zone sub-project, the Beibu Gulf Economic Zone sub-project, the Chengdu-Chongqing Economic Zone sub-project and the Yellow River Upper and Middle Stream Area sub-project. Each sub-project was consisted of relevant provincial projects and specific themes including industry, air quality, water quality, water resource, land resource, terrestrial ecosystem and marine ecosystem in the three coastal areas. To implement the SEA project, a hierarchical organization with three tiers was established with different functions. The three tiers were Steering Group, Management Office and Technical Group (Figure 1.3).

2.1.1 Steering Group

The Steering Group was to facilitate communication among technical groups, national and local officials, and implementation of the SEA project. It was consisted of administrative representatives in MEP and led by a minister-level official in MEP. The Steering Group was in charge of determining the overall objective and implementation principles, examining working plan, management principles and annual working plans, supervising the implementation. The Steering Group organizes provincial and municipal Bureau of Environmental Protection (BEP) to support the SEA project by financial support, assisting data collection and purpose-designed monitories and providing local feedbacks.

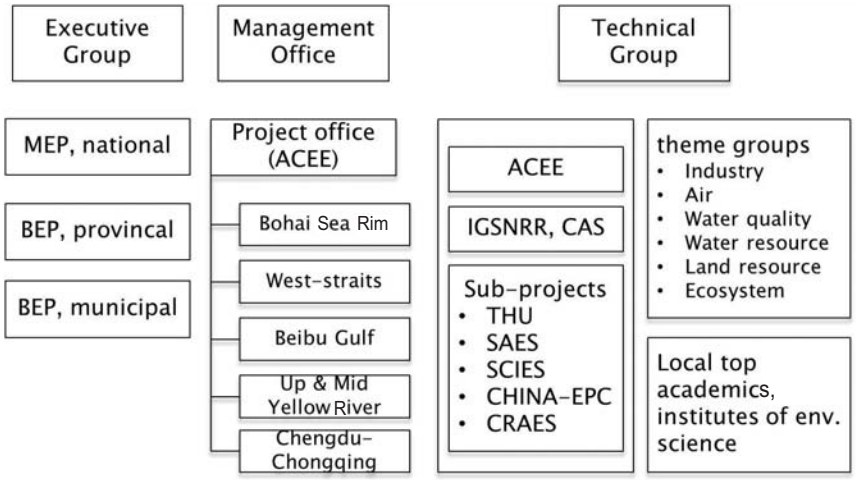

Figure 1.3 *The three-tier organization &management structure*

2.1.2 Management Office

The Management Office was under the direction of the Steering Group. It was consisted of officials and technical persons in ACEE. Its mission was to handle management affairs. It was in charge of supervising working progress of the five sub-projects and the 15 provincial projects, organizing experts to examine and evaluate the work of technical groups, facilitating communication between the five sub-projects on methodologies, working experiences and report writing.

In addition, the five sub-projects have their own management offices under the direction of the Management Office. They were in charge of implementation of sub-projects.

2.1.3 Technical Group

The technical group was the biggest group in the SEA project. As illustrated in Figure 1.3, the technical group comprises three parts. The first part was consisted of technical personals from ACEE and academic staffs mainly from six organizations. Experts from Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences and its cooperators Beijing Normal University and Academy of Macroeconomic Research of NDRC were responsible for studying economic and industrial development status and

developing scenarios of possible future development, which were the foundation of the following studies. The other five organizations were management offices of the five sub-projects, who were charge of conducting the research of the sub-projects, including Tsinghua University, Shanghai Academy of Environmental Sciences, South China Institute of Environmental Sciences of MEP, Chinese Research Academy of Environmental Sciences and Environmental Development Center of MEP. In addition, there were more than 20 institutes with sufficient experience on studying industry, environments, resources and ecosystem had been involved. They have provided their professional knowledge.

2.1.4 Expert Panel

More than 50 experts on regional economics, environmental science, marine science, environmental law study, heavy industry study and other relevant studies were involved, including 15 academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering. The role of these experts was to provide their professional suggestions, to review the progress reports and to determine the effectiveness of the project, including management offices and technical groups.

2.2 Process

The Five-mega Region SEA project was proposed in late 2007. After one year preparation and preliminary surveys, the project was officially launched by Ministry of Environmental Protection (MEP) and Appraisal Center for Environment & Engineering (ACEE) in February 2009. In the following two years, with the close cooperation with administrative officials, management office, technical groups and experts, the final report was released in late 2010. The process of the SEA project includes the following three phases.

2.2.1 November, 2007—December, 2008

The SEA studies of the Five-mega Regions were first proposed in late November. Field surveys were conducted in the five regions to make a preliminary view of historical evolution and current status of environment, economic and social systems and their relations. A three-tier management framework was established, including Steering Group, Management Office and Technical Group. An expert

panel was consisted of more than 50 experts whose research interest include regional economics, environmental science, marine science, environmental law study, heavy industry study and local acknowledges. Technical groups were set up involving nearly 100 institutes and universities. Technical proposal was developed to define principles and procedures. Methodologies included data collection, index system for evaluation, quantitative models for simulating water quality, air quality and marine dynamic, scenario development, have been prepared.

2.2.2 February, 2009—January, 2010

The major tasks of the SEA project were carried out in this phase. They were field survey, data collection, purpose-designed monitory, consultation with local officials and experts, and symposiums.

We took the Bohai Sea Rim Area sub-project as an example. The technical group conducted field survey in all 13 municipalities, industrial zones and key enterprises, with total transporting distance of more than 20 thousand km. More than 10 consultation meetings with local people were carried out organized by provincial departments of environmental protection. In consultation meetings, local officials (including local Development and Reform Commission, Department of Construction, Bureau of Statistics, Department of Land and Resource, Bureau of Oceanic Administration, Department of Environmental Protection) and local experts from research institutes and universities were engaged. The purposes of the consultation meetings were to hear strategies and plans of local industries and environmental protection, and to hear the voices of local stakeholders. In this phase, data and material collection was of difficulty but fortunately fruitful. More than 150 local plans and strategies related to economic development, industrial development, environmental plans, ecological protection plans, industrial zone plans and existing reports on environmental impact assessment were collected. Remote sensing images, environmental monitoring data, survey of pollution sources and ecological monitoring data from 2001-2007 were collected as fundamental materials to assess local environmental and ecological status. With helps of local technical people, there were total more than 100 sites for purpose-designed monitories of surface water quality, air quality, and marine water quality, pollutant concentration in animals and plants and ecological water requirement. In August, November and December 2009, there were three symposiums held to

exchange experiences among sub-projects, to open discussion with local officials and local technicians and to evaluate progress of the five sub-projects by the expert panel. A set of primary reports was generated, consisted of five sub-project reports, 15 provincial reports and some theme reports.

2.2.3 February, 2010—December, 2010

The primary reports were delivered to national ministries and relevant provincial governments for comments. Take the Bohai Sea Rim Area sub-project as an example, there were total 200 comments on the sub-project report. The comments from local people included updating local information after benchmark year to reflect the latest and better environmental status. The comments from local people also gave the consideration on local industrial development after 2009 when the first phase of consultation was conducted. Opposite opinions on the findings and recommendations were also appeared in the comments. Local governments requested the technical groups to visit the study areas in order to incorporate the latest changes. Therefore, in March, April and May 2010, the technical group visited the four provincial governments and eight municipal governments to discuss with local officials and exchange of views on local development plans and the latest environmental protection progress. Based on the comments and the latest information, the primary reports were revised. In September 2010, the second version of the project reports was approved by an expert panel consisted of 13 academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering. In December 2010, the final version of the project reports was released, including a synthesis report, 5 sub-project reports, 15 provincial reports and some theme reports. The release implied that local governments have accepted the findings of the SEA project.

2.2.4 July, 2011

According to results of the Five-mega Regions SEA, Ministry of Environmental Protection formally issued five Guidance for the Five-mega Regions in July, 2011. The Guidance was used to help local authorities to break the confliction of economic development and environmental/ecological protection. Measures including industrial upgrading, industrial proposed locations' adjustment, regional environmental protection strategies, regional environmental limitation and carrying capacity, etc., were incorporated in the guidance.

3 Methodology

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LI Wei, ZHAO Yang (*Beijing Normal University*)

3.1 Data Collection

The data quality determines the effectiveness of assessment, therefore the data collection should be comprehensive and accurate. Firstly, the data collected from the perspectives of space, time, and content. Secondly, approaches of data collection should be selected properly according to the actual situations. Finally, according to time series of data and authority of the data releasing unit, the collected data need to be properly filtered. The first and second steps of collection were shown in Table 1.2 and Table 1.3.

Table 1.2 *Data scope*

	Specific range
Location	The coastal areas of the Bohai Sea, West Coastal Economic Zone, the Beibu Gulf Economic Zone, the Chengdu-Chongqing Economic Zone and the Energy and Chemical industrial areas of the Upper and Middle Reaches of the Yellow River.
Period	2006-2020
Content	The status and evolution trend of regional ecological environment. The status of regional industrial development and efficiency of environmental resources.

Table 1.3 *Data Collection Approaches*

Collection Approaches	Date Types	Data Source
Official Channels	① Monitoring data of environmental quality ② Relevant standards, regulations and policies ③ Satellite images	① Data release platforms of Environmental Monitoring Centers ② Information release platforms of departments formulating standards, regulations and policies ③ Google map, Baidu map, etc. online maps
Purchasing Data	①Monitoring data of environmental quality ② Statistical yearbook ③ GIS database ④ Electronic documents	① Local environmental quality monitoring centers and EM Companies ② National, local Bureaus of Statistics and local people's governments ③ Ground stations of Chinese Academy of Sciences and concerned data companies ④ Information Release Platforms such as CNKI Net and Wanfang Data Platform, etc.
Site Study	Non-documented site information	Acquired through observation, discussion and questionnaire
Concerned achievements on Environmental Assessment and City Planning	① Regional EIA report and Project EIA report ② City Planning of cities and counties in the Five-mega Regions	National and local institutes of environmental assessment and city planning
Relevant documents	① Archived and books ② Confidential data	① Libraries and Archive departments ② Local environmental protection departments

3.2 Regional Development Scenario Design

3.2.1 Socio-economic Development Scenario Design

(1) Total Economic Scenario

The recent development scenario was based on the national economic development planning of regional governments at all levels, while the long-

term development scenario was mainly based on trend extrapolation, and representative forecasts for all local cities. In practice, it combines the possible evolution under external environmental conditions to correct the trend extrapolation. It was primarily revised according to the growth rate changes of municipalities in the last five years, national industrial policies and the economic growth rate.

(2) Population Size Scenario

This scenario used trend extrapolation as main method, and the city population of the Five-mega Regions in 2007 as baseline data. Population growth rate was based on the average population growth rate in the past five years. Per capita growth rate in most cities of the Five-mega Regions was generally around 6%, while in economically rapid growing cities, the population growth remained above 10%. Based on the current level of population growth, it set the Expected Population Growth Speed of the Five-mega Regions' major cities at about 5%. At the same time, taking into account urban population mechanical factors in economically rapid growing cities, some of the cities' Expected Population Growth Speed was about 9%.

(3) Urbanization Scenario

This scenario used Trend Extrapolation Method to estimate the expected population scale of all cities and towns in the Five-mega Regions, and used the results of the predicted total population size to calculate the urbanization level of each city. Bases was the urban population in 2007 and the current growth rate of the urban population of each city, as well as the inherent demand of regional accelerated urbanization, the Expected Growth Speed of urban population in all cities of Five-mega Regions was estimated between 15% ～ 40% in 2010-2020. Using this expected growth rate of the urban population, the evolution trend of the urbanization level in each city was estimated.

(4) Economic Structure Scenario

The economic structure in the year 2010 was determined by analyzing each city's development plans, following which predictions for 2015 and 2020 were made by Trend Extrapolation.

3.2.2 Scenario Design for Key Industrial Development

(1) Selection Criteria for "Key Industries"

To determine key industries to be studies in the SEA, industrial development trends were analyzed in contrast to regional ecological security. Criteria were the Pollutant Contribution Rate, the Economic Contribution Rate and future development trends. Key industries were those industries that regarding GDP and ecological environmental impact either contributed 5% (single industry) or 90% (cumulative contribution). Added to these were those industries that were planned in regional future planning, or those that currently were small scale but had huge potential in future development.

(2) Development Scenarios of Key Industries Output

Trend Extrapolation was used to predict the 11 key industries in all cities of the Five-mega Regions. In practice, trend extrapolation was corrected on the basis of the "internal" rules of industrial development and the possible evolution of external environmental conditions.

3.2.3 Scenario Design for Key Industries' Capacity Development

This scenario was designed on basis of a combination of plan analyses and Trend Extrapolation Methods, including plans and guidance at national, provincial and municipal level in the Five-mega Regions, and key industrial development scenarios in the evaluation regions.

In the construction of medium-and-long term scenarios, other than applying to the above, it also required adjustments based on expected future trends in industrial development.

3.3 Indicator Selection

For the assessment of the 12th Five-Year Plans of the economic development in the Five-mega Regions, the DPSIR model was established. This model was based on a list of the environmental risks on the middle and long term of key industries. On basis of the model, both "sustainable development" and

"optimization of the layout and scale of the key industries" would be determined. The aim was to assess the relationship among environment, population and resources in the development of the key industries in the Five-mega Regions. This should help policy-makers, evaluators and the public to understand the impact of the development strategies of key industries. The model covered five fields: economic and social development, pressure on ecology and resources, status of ecology and resources, impact on the ecology and human health and responses by government, polluters and affected public. The flow chart was as below:

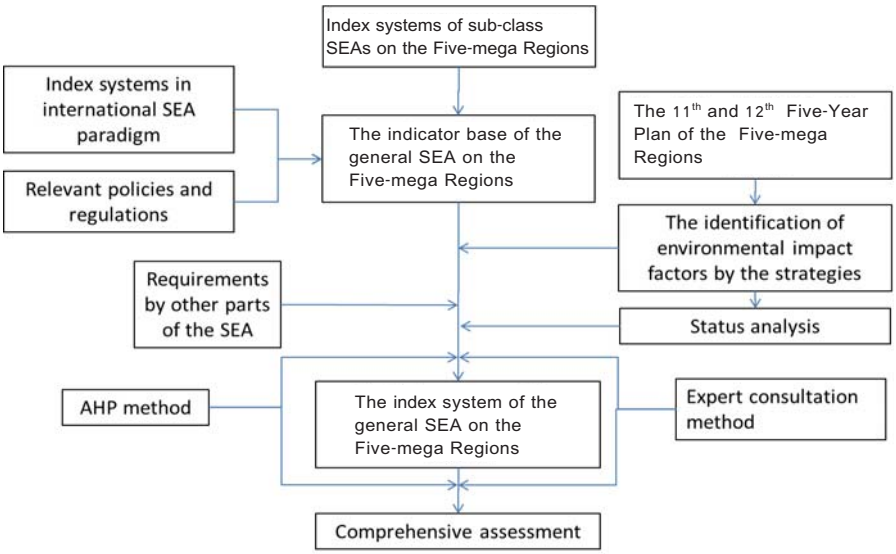

Figure 1.4 *Flow Chart*

Remark: "index systems in international SEA paradigm" refers to "the index systems or indicators used in SEA literature and case analysis" and "the environmental indicators of OECD and EEA";

"relevant policies and regulations" refers to "key industry development policies of the five regions", "the environment objectives policies or regulations of the local government or the country" etc;

"other parts of the SEA" stand for "scenario analysis" and "public participation".

3.3.1 The Alternative Index Database of the Five-mega Regions

Construction of this database was based on a desk study of the special topics reports of the Five-mega Regions, the "Environmental Indicators" publication by the OECD, the "Sustainable Development Indicators" published by the EU, the

"Ecological County, City and Province Construction Index (Trial)" by China's MEP, and SEA reports in other countries. In selecting the indicators use was made of the Frequency Statistics method. The indicators in the database include five fields, twelve topics and twenty five sub-fields. Total number of indicators (Appendix 1) was 134: 10 "drive" indicators, 40 "pressure"indicators, 28 "status"indicators, 24 "impact" indicators and 32 "regulation" indicators.

Data on indices mainly came from statistical data, such as the regional statistical yearbook and the report of environment quality. Data also were acquired from field survey, GIS data and monitoring reports. In the selection of indicators, the following criteria were used: policy relevance, operability, measurable and data availability.

3.3.2 Environmental Impact Identification

Environmental impacts that deserved most attention were identified using the matrix method, disclosing the relationship between regional key industries and environmental impacts. E.g. it was concluded that the pressure, state and impact index should cover "atmosphere", "water environment", "land and soil", "water resource" and "ecosystem" (Table 1.4). It became clear that the key industries with major impacts were all heavy industries, so the driving force index should include a set of indicators to indicate "industrial structure". This crucial breakthrough may be achieved to enhance the environment efficiency of heavy industries in China.

The "list" method was used to determine the existing and potential environmental impacts in the short and long periods caused by industrial layout and development policy of key industries. Further analysis of strategies and characterization of the impacts helps to identify potential problems in the strategies and find suitable indicators. E.g. in Table 1.5 it was shown that air pollution was becoming worse and worse, and had already reached the highest level in history. As a result of this, a set of "atmospheric environment" indicators was selected, as well as a "health impact" indicator related to diseases caused by atmospheric pollution. The phenomenon of "red tide" was serious in the economic zones by the sea as shown in Table 1.5, so we select a set of seawater eutrophication indicators, such as a set of marine ecosystem diversity indicators, etc.

Table 1.4 *The identification matrix of the environmental impact factors of the key industries*

Factor \ Impact		Atmosphere	Water Environment	Land and Soil	Water Resource	Energy Resource	Ecosystem
Bohai	Petroleum production and processing	-3L	-3L	-2L	-2S	-3L	-4L
	Chemical industry	-2L	-3L	-2L	-3S	-2L	-3L
	Ferrous metallurgy	-2L	-3L	-2L	-2S	-3L	-3L
	Equipment manufacturing	-3L	-2L	-1L	-1S	-3L	-3L
Yellow River	Coal mining and processing	-3L	-3L	-1L	-2L	-3L	-4L
	Metallurgy	-2L	-1S	-1L	-2L	-3L	-3L
	Agriculture	0	-1S	-1L	-2L	-1S	-2L
Western Straits	Petroleum and chemical industry	-3L	-3L	-2L	-2S	-3L	-4L
	Equipment manufacturing	-3L	-2L	-1L	-1S	-3L	-3L
	Electronic information	-1S	-2L	-1L	-1S	-1L	-2L
	Energy and power	-3L	-2L	-2L	-2L	-3L	-3L
	Metallurgy	-2L	-1S	-1L	-2L	-3L	-3L
	Forest-Pulp- Paper	-1L	-3L	-1L	-2L	-1L	-2L

Factor	Impact	Atmosphere	Water Environment	Land and Soil	Water Resource	Energy Resource	Ecosystem
Beibu Gulf	Petroleum processing	-3L	-3L	-2L	-2S	-3L	-4L
	Nuclear fuel processing	-1L	-2L	-2L	-1L	-1L	-2L
	Agricultural and sideline products processing	0	-1S	-0	-1L	-1S	-1S
	Electric power	-3L	-2L	-2L	-2L	-3L	-3L
	Chemical industry	-2L	-3L	-2L	-3S	-2L	-3L
Chengdu-Chongqing	Energy	-3L	-2L	-2L	-2L	-3L	-3L
	Equipment manufacturing	-3L	-2L	-1L	-1S	-3L	-3L
	Agricultural and sideline products processing	0	-1S	-0	-1L	-1S	-1S
	Pharmaceutical chemistry industry	-1L	-2L	-1L	-2S	-1L	-2L
	Electronic information	-1S	-2L	-1L	-1S	-1L	-2L

Remark:“+”, “-”represent the “positive” and “negative” effects respectively, and “0”,“1”,“2”,“3”and“4” represent respectively “no influence”, “low influence”, “medium influence” and “high influence”, and “S”, “L” represent respectively “short-term reversible impact” and “long-term and irreversible impact”.

Table 1.5 *The impacts on the ecological environment by the development strategy for key industries*

Economic Region	Main Item	Strategies and Corresponding Environmental Impacts
The Bohai Economic Zone	Key Industries	(a) One of the most important chemical industries was China's primary production of petroleum, iron, steel, chemicals, heavy machinery and metals.
		(b) Petrochemical production was of key importance at national level, while equipment manufacturing was a regional pillar industry.
	Short and long term environmental impacts	(a) Sea water pollution was caused mainly by ammonia nitrogen and COD etc., damaging the ecological buffer function of estuaries, and causing sea water intrusion.
		(b) Reduced surface runoff, increased water shortage, growing groundwater overexploitation, increased surface water organic pollution.
		(c) Continued atmospheric pollution mainly because of coal consumption, increased number of dust haze days, dry deposition continues to be the highest level in China, frequent occurrence of photochemical pollution.
	Short and long term ecosystem impact	(a) Increased frequency of red tide and oil spills in the Bohai Gulf, increased risk of seawater intrusion. Continuation of the spatial conflict between ecological red line areas and industrial areas, increased vulnerability of terrestrial ecosystems.
		(b) High risk of pollution because of heavy metals, benzopyrene, DDTs etc. High risk of accumulative effect on marine sediments and shellfish. Same for the sediments of rivers. High risk of pollution by Cd, Cr, Hg, lead, oil etc. nearby industrial agglomerations.
The Economic Zone in the Upper-Middle Reaches of the Yellow River	Key Industries	The upper and middle reaches of the Yellow River was a national energy resources export base. Industry consists of heavy chemical industry based on coal production and processing. In some areas, economic development also relies on the traditional agriculture and metallurgical industry.

Economic Region	Main Item	Strategies and Corresponding Environmental Impacts
The Economic Zone in the Upper-Middle Reaches of the Yellow River	Short and long term environmental impact	(a) Long term shortage of water resources. Water quality of branches and trunk of the Yellow River exceeds legal standards. Current serious water pollution would not improve. Decreasing ground water quality because of non-point source pollution.
		(b) Continued high energy consumption, continued air pollution by coal smoke, continued compound air pollution, very high level in some areas of specific pollutants.
	Short and long term ecosystem impacts	(a) In general the ecological quality of this region was weak. Frequent occurrence of the seasonal cutoff phenomenon of tributaries. Gradual shrinking of the natural wetlands, eventually even disappearing because of the slow increase of the groundwater funnel and the high risk of the land subsidence. Water shortage may threaten the ecological security corridor of the Yellow River. In some areas desertification, salinization and soil erosion may increase.
		(b) In certain area, drinking water safety may be threatened.
The Western Strait Economic Zone	Key Industries	The key industries mainly include petrochemical industry, equipment manufacturing, electronics industry, electric power generation, metallurgy and forest-pulp-paper.
	Short and long term environmental impacts	(a) Terrestrial pollution emission above legal standards, leading to regional deterioration of sea water quality.
		(b) In the long term, water quality of downstream of the river may be above legal standards because of high concentrations of COD, total phosphor and ammonia nitrogen etc. Rising eutrophication of parts of the lakes.
		(c) Regional SO_2 and PM_{10} concentrations may be above legal standards. Higher frequency of acid rain PM_{10} being the main pollutant in the long term.

Economic Region	Main Item	Strategies and Corresponding Environmental Impacts
The Western Strait Economic Zone	Short and long term ecosystem impacts	(a) Mono culture forestation by the forest-pulp-paper industry would reduce resilience of forests, including reduced soil fertility and increase of soil erosion. Human disturbance may lead to increased fragmentation of the landscape. The water diversion project would lead to increased seawater intrusion. Continued high risk of oil spills. Reclamation would increase the risk of red tide. Continued high risk of oil spills.
		(b) Toxic and harmful pollutants discharged from the large petrochemical, metallurgical industries could lead to cumulative adverse environmental impacts on the ecological sensitive gulf. Centralization of key industries may lead to serious pollution of offshore water through COD, ammonia nitrogen, petroleum pollution etc. The establishment of nuclear power and thermal power nearby the gulf may reduce sharply the number of phytoplankton and fish.
The Beibu Gulf Economic Zone	Key Industries	Key industries around the Beibu Gulf include petroleum processing, coking, nuclear fuel processing, agricultural and sideline products processing industry, power industry and chemical materials and chemical products manufacturing.
	Short and long term environmental impacts	(a) Increased air pollution by SO_2 in the large cities. Slow increase in the frequency of aid rain.
		(b) Because of agricultural pollution, the water quality of some parts of the river keeps decreasing. High concentrations of nutritive salts and organisms for a long period. Decreased water quality of part of the drinking water sources mainly by nitrogen and phosphorus nutrients. High concentrations of heavy metal in part of the river sediments.

Economic Region	Main Item	Strategies and Corresponding Environmental Impacts
The Beibu Gulf Economic Zone	Short and long term ecosystem impacts	(a) Increased risk of red tide and oil spills. Abuse of coastal wetlands may lead to serious degeneration of marine higher plant and wetlands. Key industries development may lead to the decreased health of marine ecosystems (mangroves and coral reefs and sea grass beds) and even a serious threat to endangered marine species. Risk of unsustainable fisheries.
		(b) Land occupation by forest-pulp-paper industry leads to the decrease of the species diversity, and the biomass energy industry lead to the decline of regional biodiversity, soil erosion and the decrease of soil fertility. Sugar industry leads to the decrease of biodiversity. Mine development makes the water retention capacity of lands decrease and soil and water loss worsen.
The Chengdu-Chongqing Economic Zone	Strategy of Key Industries	The key industries of the Chengdu-Chongqing Economic Zone were energy, equipment manufacturing, agricultural and sideline products processing industry, pharmaceutical industry and electronic information industry.
	Short and long term environmental impacts	(a) In Chengdu-Chongqing region, there would be a compound water shortage, and the impact on the water environment security would exist for a long period because of the defects of water pollution control system. The water quality of the Yangtze River would not be stable because of the concentration fluctuation of total nitrogen, total phosphorus, ammonia nitrogen, and lead etc. The main water problems of the region for a long period may be eutrophication, heavy metals and bacterial contamination.
		(b) The air pollution of SO_2 increasingly aggravates because of the thermal power, and the frequency of aid rain was slowly increasing.

Economic Region	Main Item	Strategies and Corresponding Environmental Impacts
The Chengdu-Chongqing Economic Zone	Short and long term ecosystem impacts	(a) Hydropower development in the upper reaches of the Yangtze River would threaten the survival of the rare and endemic fishes (white sturgeon etc.), and also causes the dry of some rivers, and correspondingly the seepage prevention measures of large area would not avoid the potential risk of polluting the underground water, but might have a long term impact on the groundwater feed. The effect of coal mining on the water conservation function would be partial and accumulative for long period, and the mining also aggravates the soil erosion and rock desertification problem. Some phosphate mines were near national nature reserves, which may influence the habitats of the rare and endangered species such as panda habitat.
		(b) Chemical industry built in a river basin with a relatively small flow would increase risks for water security, because of liquid chemicals leakage or wastewater emissions. Infiltration of rain in chemical industry waste could lead to accumulated impact on ground water.

3.3.3 Construction of an Index System for the SEA

Based on principles including “Policy Relevance”, “Comprehensiveness”, “Independence”, “Pertinence”, “Data Accessibility” and referring to the identification of environmental and ecological impacts, the AHP method was used to identify “core indicators” (Appendix 2) as well as the SEA index system of the DPSIR model, comprising five fields, twelve topics and twenty five sub-fields. Finally, 65 core indicators were selected, including 5 drive indicators, 18 pressure indicators, 10 status indicators, 7 impact indicators and 25 regulation indicators.

According to the regional and national pollution control plans, the regional and national industrial development strategies etc, it was then possible to present a well-founded target value of the index.

3.4 Environmental Carrying Capacity

Carrying capacity as used in ecological studies was typically defined as the maximum population size that can be supported by a given environment. Environmental carrying capacity was one of the essential indicators for measuring regional sustainability. In the SEA, the concept was defined as the maximum quantity of pollutant load that would not lead to a degradation of the environmental quality, of the amount of available resources supplied by a given environment and of the quantity of ecological space without ecological degradation. The concept contains two aspects: elementary environmental carrying capacity (EECC) and comprehensive environmental carrying capacity (CECC).

We took the application of the concept in the Bohai Sea Rim Area sub-project as an example. The Bohai Sea was the only semi-closed ocean of China, surrounding by thirteen municipalities in the Tianjin, Hebei, Liaoning and Shandong provinces. The Bohai Sea Rim Area covers 129, 224 km^2 and produced 2,700 billion Yuan of GDP in 2009 (roughly 7,127 US dollars per capita), accounting for 8% of the national total. It was home to 56.4 million people, amounting to 4% of the national population. Heavy industries dominate the regional economic development. Aggregation of heavy industries and rapid industrialization has resulted in severe environmental problems and shortage of water resources. The core industries, including energy industries, ferrous metal smelting, chemical industries, petroleum refinement and papermaking industries were responsible for 95% of the total industrial water consumption. Paper-making industries, food processing industries, chemical industries, petroleum refinement, textile industries and heavy-duty machine manufacturing were responsible for 96% of the total industrial pollutant emission in 2007. In addition, 80.2% of the monitoring sites did not comply with the state surface water quality standard, and only 52.5% of the offshore area met the requirement of the national sea water quality standard. Coal-burning air pollutants, such as SO_2, NO_x and PM_{10}, lead to regional air pollution. Energy industries, ferrous metal smelting, chemical industries, non-metallic mineral industries and petroleum refinement were responsible for 83.6% of coal-burning air pollutants.

According to those existing environmental problems, the sub-project selected available water resources and environmental self-cleaning capacity of surface

water, offshore marine water and air to evaluate EECC. Following this, the CMCC was constructed on the basis of a mathematical sum of the EECCs. EECCs were defined and computed as follows.

The available water resource was the largest exploitable water resource without negative impact on the environment. It was calculated as a sum of quantities of locally available surface water resources and ground water resources, trans-boundary water resources and non-traditional water resources, including recycled water and desalinated sea water.

The environmental carrying capacity(ECC) of surface water was defined as the amount of permitted pollution load that would not result in degradation of surface water bodies. Theoretically, the ECC of a river was determined by background concentration of pollutants, input with upstream inflows, local emission and ability of self-purification. The pollutants examined included chemical oxygen demand (COD) and ammonia nitrogen (NH_3-N).

The environmental carrying capacity of offshore areas was defined as the maximum of the offshore water bodies' ability of absorbing land source pollutant inputs without exceeding environmental standards. The ECC of an offshore area was highly dependent on marine dynamic conditions, background concentration of pollutant and marine water quality standard. A marine numerical model, ECOMSED, was employed to examine the pollutants including COD and total nitrogen (TN).

The environmental carrying capacity of air was defined as the maximum quantity of air pollutant load without degradation of air quality. The ECC of air was mainly determined by a series of complex processes involving the physical and chemical transformation of air pollutants. It was also heavily dependent on meteorological conditions at regional scale, atmospheric environmental functional requirements and the locations of pollution sources. The "Nested Air Quality Prediction Modeling System" (NAQPMS) was employed in this study. The input meteorological conditions were generated by using the "MM5 method", which was widely used to simulate hourly average wind speed and direction, humidity and temperature. The pollutants examined included sulfur dioxide (SO_2), nitrogen oxide (NO_x) and particulate matter (PM_{10}).

CMCC was calculated by the equal-weighted sum of EECCs. The value of EECCs was firstly standardized into an interval [0, 1] to deal with the different dimensions. An equal weighting method was applied, assuming that each EECC had an equal environmental significance.

The nature of the approach was that the absolute value of ECC revealed local endowment of environmental systems. The ranking of municipal CMCC was used to compare ECCs in different municipalities. Contemporary China was characterized by rapid expansion of heavy and chemical industries. These industries tend to aggregate, leading to severe environmental pollution, resource shortage and ecological degradation. Great attention has been given to develop the appropriate economic size and spatial allocation of the industries. The assessment of EECC and CMCC provides an approach to quantitatively identify key environmental constraints for a given region, and to provide a suggestion for decision makers in allocating industrial enterprises in relatively non-environmentally-sensitive places.

4 Public Participation

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SEA was a process to provide a scientific basis for governmental decision-making. During the process, paying attention to the views of relevant agencies and individuals enables the SEA to have a more comprehensive understanding of regional environmental issues and to improve the assessment. Furthermore, public participation also enables the interests and ideas from all parts of the society to be more fully considered in the decision-making process. To a certain extent, the validity of public participation would greatly affect the quality of the Strategic Environmental Assessment.

Due to the characteristics of the Five-mega Regions' key industrial development strategy such as the high intensity, uncertainties and specialization, there was a limitation as to knowledge and environmental awareness of the general public. Hence, it was very difficult to directly involve the general public. On the other hand, relevant experts, different departments, research institutes and experts were more able to realize the relationship between industry development and environmental protection. Therefore, the participation of the Five-mega Regions' SEA focused on relevant departments and experts.

Public participation of Five-mega Regions' SEA was, therefore, different from the general understanding of participation in SEA (which refers to participation with the potentially affected public, with civil society representative organizations including NGOs, and other stakeholders from government and the private sectors). Considering national conditions in China such as the confidentiality of planning and the uncertainty of macroscopic planning, it was assumed that the public would have a low motivation and limited knowledge and environmental

awareness for strategic level planning. However, some of the subprojects did include public participation in the SEA. For example, the SEA on key industrial development in Bohai Sea Rim Area conducted public participation by means of a planning exhibition (see further the last part of this chapter).

Public participation in the Mega-regions SEA included:

- public representatives involved in planning implementation;
- planning authorities and its preparation agencies;
- environmental authorities;
- governmental agencies representing the various public interests;
- relevant planning and strategic EIA experts;
- academia.

Public participation was mainly carried out by consulting expert advice, discussion among departments, issuing letters through internet, mails and so on.

4.1 The Purposes of Public Participation

To ensure scientific, efficient and fair evaluation, the Five-mega Regions' SEA public participation had the following primary objectives:

(1) Solicit public opinions, so that interests of all parties concerned in key areas can be taken into account as much as possible, and in particular give full consideration to environmental interests.

(2) Solicit relevant departments and experts advice to enable a diagnosis of the resources and environmental problems related to the Five-mega Regions' key-industrial development. Thus, an accurate identification of existing major problems, the resources and environmental problems that may be encountered in the industrial development process were recognized.

(3) Solicit relevant departments and experts opinions on ideas for the development strategy of the Five-mega Regions' key industries, and for feasible and effective measures to mitigate and prevent adverse environmental impacts of economic development.

4.2 Characteristics of the Public Participation Process

4.2.1 Overall Multi-level & Multi-sectoral Participation

The Project has formed a top-down multi-level public participation model (coordinated by government) led by MEP, with the following characteristics: wide range, multi-sectoral, multi-level (Central-Province-City), diverse and transparent (media and public participation) (Figure1.5).

A three-level project management system (Main Project-Sub-Projects-Sub-Items) covering 15 provinces (autonomous regions and municipalities) was set up. During all stages of the project, consultation and communication with the public, departments and experts were carried out in the form of consultation sessions and seminars at each level. The collaboration and exchanges of views between different project groups and the upper-lower levels were strengthening and ensuring timely and accurate project communication and feedback.

A coordination group was set up that was composed of the MEP, 15 Provincial Environmental Protection Bureaus, 90 cities and counties' EPA and 90 cities and counties' relevant sectoral departments. The coordination group members included department directors of the following sectors: Development and Reform, Land, Environmental Protection, Construction, Water Conservancy, Transportation, Forestry, and Marine departments in each province, autonomous region and municipalities, as well as the in-charge persons from relevant municipal People's Government. Through the establishment of the Coordination Group and the linkage between departments, the comments and recommendations from departments at all levels, experts and public were promptly and accurately fed back into the project. This ensured timely public participation. For example, during the SEA of the West Strait Economic Zone's key industrial development, a great number of governmental coordination meetings were held. Sectors and departments of every province and 13 cities-such as Environmental Protection Bureau, Development and Reform Bureau, Planning Bureau, etc.-collected feedbacks and comments to relevant superiors, such as Fujian province, Eastern area of Guangdong province and Wenzhou city. These superiors examined and summarized the comments, before reflecting it back to the local sectors. Then every SEA research team adjusted their reports according to those consultant results.

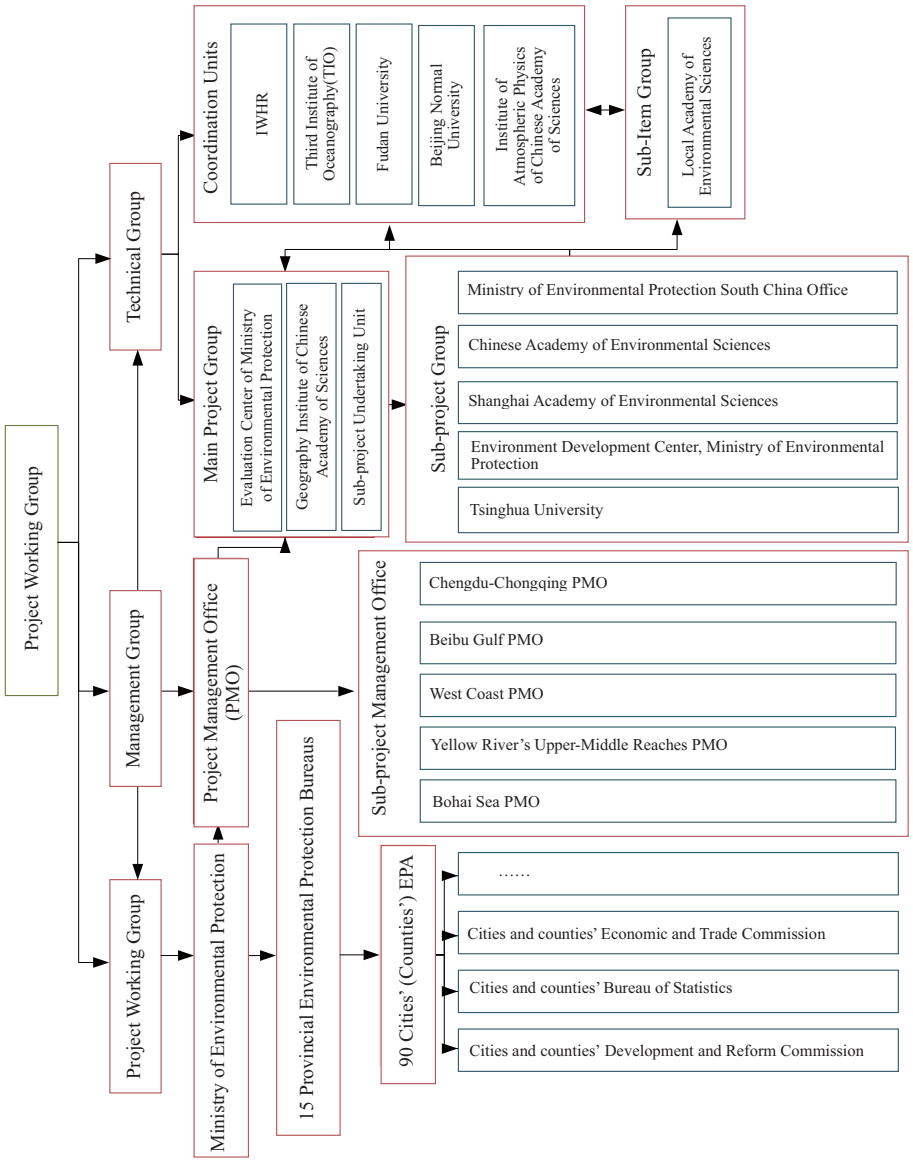

Figure 1.5 *Coordination Organization Structure of the project*

4.2.2 Expert Advice

All sub-projects together associated with more than 100 scientific research institutes and universities in the fields of economy, water, ocean, and weather, all participating in the Five-mega Regions' SEA. During the project, an expert team of more than 50 experts, led by 19 academicians was established, and each sub-item was widely consulted for the opinions and suggestions from local and foreign experts during evaluation. At different stages of technical programming, report preparation, and advice collection for the draft research report, different thematic conferences and seminars were held to consult views from relevant government departments, experts and the public on the Five-mega Regions' key industrial development. The objective was to extensively absorb the views on regional industrial development and ecological and environmental protection from the departments of Environmental Protection, Development and Reform, Land, Economy and Trade, Planning, Marine Fisheries, and Forestry in each province (autonomous regions and municipalities).

The SEA of West Straits Economic Zone's key industrial development was taken as an example:

(1) Public participation was organized through creating links with regional departments, experts, demonstration meetings, panel discussion on department reports, site investigations, consultation letters, etc. During the project, expert advisory and demonstration meetings were held more than ten times.

(2) At the technical program development stage, thematic sessions were held in 14 cities respectively seeking advice on key industrial development and ecological/environmental protection from the local Environmental Protection Bureau, Development and Reform Bureau, Planning Bureau, Oceanic Administration department, Economic and Trade Bureau, Bureau of Water Resources, Bureau of Forestry, Bureau of Construction and Management Committee of Industrial Zone.

(3) At the Research Report preparation stage, Key-industrial Layout and Development Planning Forums were held in Fujian province, Eastern area of Guangdong province and Wenzhou city. Consultation took place on opinions as to regional key-industrial layout and development with the Development and Reform Commission, the Economic and Trade Commission in Fujian

and Guangdong provinces as well as Wenzhou city. Aim was to create a comprehensive understanding of the strengths and weaknesses of the key industrial layout and development in different regions of the country, as well as develop the process and evaluate reasons for regional industrial development and planning.

(4) After the Report was drafted, a Results Debrief Meeting was held in Fujian, Guangdong Province and Wenzhou City, to consult views on the report from the government and the relevant departments of Fujian, Guangdong and Zhejiang Province (Wenzhou City). The provinces and 13 cities proposed written amendments for the draft, on the basis of which was revised.

(5) After the Report Draft was modified, seminars were held in Fujian Province and 13 prefecture-level cities to consult views on the amendments. Furthermore, in-depth discussions on the regulation of regional key industries' optimization and development were conducted.

4.2.3 Transparency and Openness

The Five-mega Regions' SEA held press conferences at the stages of project launch and acceptance, inviting media to participate. During the project, television networks and periodical magazines had been tracking and reporting on the progress and main finding of SEA, so as to ensure the public's understanding of it. The public raised relevant recommendations and opinions about the SEA through internet messages and mails, ensuring the project's openness and transparency.

4.3 Public Participation Timing

Public participation of the Five-mega Regions' SEA was carried out throughout the whole working process: at technical program development stage, Research Report preparation stage, Research Report Draft Consultation stage, Consultation on Revised Research Report stage, and Research Completion stage. Extensive consultation took place of relevant departments, experts and public. This contributed to the credibility of the SEA.

4.4 Results of Public Participation

Relevant departments and experts were the principal participants of the public participation. Convening expert consultation meetings was the method. During the process of carrying out the SEA, the evaluation unit organized dozens of large-scale expert consultation meetings (Appendix 3), hundreds of special symposiums (on technical solutions, atmospheric themes, marine ecology topics, water environment topics, industry topics, terrestrial ecosystems, industry selection and development scenario design seminars and consultation meetings), through which over 1,000 expert advices and recommendations were collected, which playing a vital role in guiding the SEA. In addition, during the project launch, three Stage Assessment Meetings were held, as well as Outcome Assessment Meetings, to collect the views from relevant departments and experts. After completing the Results Report, views were sought from members of the National Environmental Advisory Committee, the Scientific and Technical Committee of MEP and various departments of the Ministry of Environmental Protection.

The project team fully integrated these views and recommendations into the evaluation.

For the interim outcome and final outcome of the study, the project team conducted several exchange meetings and discussions through a variety of media such as sending letters to the Environmental Protection Departments and relevant departments of all provinces and autonomous regions, as well as departmental group discussions.

The Five-mega Regions' SEA provided timely feedback on public's recommendations and requirements, clarified the adoption of public proposals, and explained proposals that were not adopted.

(1) Adopted proposals: Included "strengthening the protection of biodiversity", "strengthening the analysis of carrying capacity", "establishing a cross-regional project quality guarantee mechanism" (for example, for each sub-project, MEP organized the provincial government to establish project coordination groups. The Project Coordination Group Office was located at the Environmental Protection Departments of the concerned provinces), "strengthening the ecosystem surveys and environmental quality surveys", and infrastructure capacity building.

(2) Partially adopted proposals: Included "During economic structural adjustment, not only consider the adjustment of big heavy industrial structures, but also gradually increase the proportion of tertiary industry". Partial adoption meant that it was decided to include tertiary industry in further study.

(3) Proposals that were not adopted: For example, the proposal to "increase the evaluation of solid waste environmental management of the Five-mega Regions' key industrial development" was not adopted, because it was judged as not having significant impact on the scale, layout and structure of industrial development.

4.5 Case Example of Public Participation

4.5.1 Methods applied in Public Participation

In the sub-project "SEA of key industrial development in the Bohai Sea coastal areas" (Tianjin Binhai New Area), public participation was realized as follows:

(1) Planning exhibition: an exhibition gallery was a platform to show the public the history, planning achievement, and layout plan of Tianjin. The planning exhibition of Binhai New Area was located on the second floor. The public can access the exhibition for free. The exhibition of the Binhai New Area planning not only exhibited its planning history and development status, but also showed the layout plan using panels, models, and an illuminated map, explaining development goal, industrial structure, industrial distribution, key projects, and ecological and environmental protection measures. Also, it was possible at the exhibition to leave a written message and to organize a face-to-face consultation. Up to Nov. 30th, 2009, 890,000 people visited the exhibition; more than 60 opinions have been collected. The opinions focused on the following aspects: a) the development of the Binhai New Area should consider added value to common people, aimed at rising people's living standard; b) during the process of development, the government should pay attention to the protection of basic farmland, leave necessary development space for farmers; c) the development should settle the problem of traffic congestion.

(2) Expert consultation meetings: Up to Dec. 30th, 2009, more than 200 experts participated the consultation, and more than 150 suggestions have been collected.

(3) Solicit department advice: Solicited advice from different departments.

4.5.2 Results of the Public Participation

(1) Adopted proposals: Clarify the contradiction between the following two conclusions in the SEA: "Sulfur dioxide emissions reduction in 2008 and 2009 was effective, and annual average values meet the standard" disagreed with "sulfur dioxide emissions in Tangshan, Binhai New Area, and Dongying were far beyond their capacity". The SEA should make a comparison between the absolute and relative results of environmental investigations between Bohai coastal area and Seto inland sea area.

(2) Partially adopted proposals: Besides heavy chemical industries, also include electronics and equipment manufacturing industry as key industries for Binhai New Area.

(3) Proposals that were not adopted: Consider more ways to adjust and optimize industry than just "support", "restrict" and "eliminate".

The specific proposals were listed in Appendix 4.

5 Findings and Conclusions on Optimization of the Five-mega Regions' Development

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To avoid repeating the mistake of "polluting first, and curing later" and to ensure medium and long-term security of the nature and environment, it was important to apply the "Scientific Development Concept". This includes "stick firmly to one target", "resolve the two major contradictions", "adhere to the three priorities", "adhere to the four red lines", "follow the Five-mega Regions' differentiated regulation direction". Also it means optimizing economic development with environmental protection, promoting adequate adjustment of the industrial and spatial structure, and vigorously promoting a change of economic development patterns. Below these concepts would be explained in more detail.

5.1 Stick Firmly to One Target

The target was to realize the Five-mega Regions as demonstration models for an optimal combination of environmental protection and economic development.

To meet this target, taking the following measures was important:

- Implement a scientifically-based development;
- Greatly enhance the level of ecological civilization;
- Transform the environmental strategy from end-pipe controlling to

source prevention;

- Promote the natural and environmental protection to the strategic level;
- Strive to explore new environmental protection methods in accordance with the following preconditions: "Protecting 'red lines', strictly maintain standards, optimize layouts, and adjust structures and controlling scales";
- Speed up the adjustment of the Five-mega Regions' economic structure and spatial development layout;
- Promote the strategic transformation of the regional economic development model.

5.2 Resolve Two Major Contradictions

In order to build the Five-mega Regions into the demonstration models as mentioned above, two contradictions must be resolved: i.e. the contradiction between the spatial layout of industrial development and ecological security patterns on the one hand, and on the other hand, the contradiction between structural scale and resources and environmental carrying capacity.

Depending on the different stages of development in the Five-mega Regions and different natural endowments, the extent and the manifestation of the mentioned contradictions would also vary. However, they all share the fundamental problem that lies in the current deep-seated mechanisms and systems of environmental protection. Therefore, strong measures must be taken to ease and eventually solve these two prominent contradictions step by step, starting from major aspects such as innovation of environmental protection mechanisms, layout optimization, structural adjustment and ecological construction.

Also, more measurements were required in order to underpin the solutions to the contradictions, so as to:

- Establish a sound environmental protection mechanism to optimize economic development;
- Optimize the spatial layout of the industrial development;
- Accelerate the strategic adjustment of the economic structure of these Regions, such as upgrading of industries and elimination of outdated and excessive industrial capacity;
- Plan and implement major projects of regional natural and environmental protection.

5.3 Adhere to the Three Priorities

In order to solve the mentioned contradictions, three priorities must be considered:

- Prioritize implementation of the industrial upgrading policy;
- Prioritize the safeguarding of environmental investment;
- Prioritize the strengthening of the construction of environmental management capacity.

5.3.1 Prioritize Implementation of the Industrial Upgrading Policy

In order to ensure the elimination of redundant production capacity, to promote the development of competitive industries and strategically emerging industries, and to diversify industries, the direction of needed industrial upgrading must be clearly understood. And the financial support policy as well as related environmental and economic policies must be developed and implemented accordingly.

5.3.2 Prioritize the Safeguarding of Environmental Investment

Continuous growth of investment in environmental protection must be ensured. The priority of environmental infrastructure investment and the priority of developing a number of ecological and environmental protection projects were important to deal with large historical debts of the environmental investments, and the failure to meet sustainable economic and social development needs.

5.3.3 Prioritize the Strengthening of the Construction of Environmental Management Capacity

Weak environmental protection reduces the efficiency of environmental management. This means it would be difficult to ensure improvement of the ecological and environmental quality in the Five-mega Regions. Therefore, priority should be given to building environmental management capacity, including:

- Further improving and planning EIA support systems;
- Establishing a joint prevention and control mechanism for regions, watersheds, and atmospheric and water pollution;
- Strengthening capacity building for environmental risk warning and emergency response;
- Strengthening capacity building for environmental monitoring.

5.4 Adhere to Four Red Lines

In order to achieve the strategic goal of optimizing economic development with environmental protection, the Key Industrial Development must adhere to the Four Red Lines of: "'No Degradation of Ecological Functions', 'No Excessive Use of Land and Water Resources', 'Control Total Emissions within Environmental Limits' and 'No Deterioration below Current Environmental Quality'".

5.4.1 No Degradation of Ecological Functions

It should be ensured that the ecological functions were not degraded, the protection of main ecologically sensitive areas was not reduced, and no degradation takes place of the ecosystem's regulatory functions, production functions and habitat functions.

5.4.2 No Excessive Use of Land and Water Resources

The occupation of natural lands should be scientifically planning and verifying, especially according to intensive and efficient usage criteria, and the land requirements for ecological aims should be prioritized. Large-scale development of natural shoreline and wetlands should be limited, and ecosystems of major rivers, coastal areas and estuaries should be maintained. The ecological base flow of major rivers should be ensured, and there should be a gradual increase of the river water and fresh water that flows into the sea.

5.4.3 Control Total Emissions within Environmental Limits

It should be ensured that the atmospheric pollutant emissions (sulfur dioxide, nitrogen oxides) and the terrestrial and water environmental pollutants (total chemical oxygen demand, ammonia nitrogen) were controlled within a reasonable range. Major air pollutant emissions should below regional environmental capacity. For the Chengdu-Chongqing Economic Zone, in addition to controlling total emissions of conventional pollutants, there should also be strict control of regional organic waste gas emissions of nutrients, heavy metals and persistent organic pollutants.

5.4.4 No Deterioration below Current Environmental Quality

Environmental quality standards should be strictly enforced, emissions of major pollutants should be gradually reduced, inshore gulf water quality should be constantly improved and the trend of declining water quality of Beibu Gulf and West coastal waters should be stopped. The water quality of the Yangtze River, the Three Gorges Reservoir Area and the main stream of Yellow River's middle-upper reaches ought to be ensured. The regional atmospheric composite pollution should be controlled to reduce human health risks.

5.5 Strengthen the Five-mega Regions' Regulations

Considering the most important ecological and environmental problems and their economically developing stages in the Five-mega Regions, some regulatory measures should be strengthened, such as optimizing the layout, structure and size of the key industries, and gradually changing the development model of relying on heavy industries and disordered expansion scale, which leading to a fragmented spatial structure.

5.5.1 Bohai Sea Rim Zone

Following the general concept "upgrade north shore, intensify west shore, transform south shore", the Bohai Sea Coastal Area sub-project coordinated the development and construction of the three industrial zones. It strengthened

the spatial planning of key industrial development, aiming at achieving a rationally mutual complementary and beneficial pattern of development. It also accelerated the construction of new industrial systems, in which the expansion of resource-dependent industries was controlled, industrial structure and growth transformation was upgraded, the trend of deteriorating ecological and environmental quality was reversed.

5.5.2 West-Strait Economic Zone

The West-Strait Economic Zone sub project was based on the principles of "Focus development in coastal areas, optimize inland mountainous landscape, regulate carrying capacity and follow a tempered development pace". These principles guided the spatial layout and scale of key industrial development, balancing carrying capacity of resources and environment. A second benefit was that the quality of the nature and environment was continuously maintained, while the region's rapid economic growth was promoted. This built the zone into the new growth pole of China's regional economic development, a strategic base for cross-strait exchanges and cooperation, and an advanced and important manufacturing base on China's southeast coast.

5.5.3 Beibu Gulf Coastal Economic Zone

The Beibu Gulf Coastal Economic Zone sub-project was based on the following development concept: "the development of two wings, enhancing the northern area, while maintaining agglomerate development in the southern area, with protection of the central area". This concept guided the industrial layout, defined the direction and scale of industrial development, strictly controlled the expansion of resource-dependent industries and stimulated the development of low-input, high-output, recyclable and sustainable environment-friendly industries. The excellent coastal ecological environment of the Beibu Gulf Economic Zone was expected to be maintained.

5.5.4 Chengdu-Chongqing Economic Zone

The Chengdu-Chongqing Economic Zone sub-project accelerated the following processes:

- Upgrading of the regional chemical, paper-making, textile, metallurgical and other traditional industries;
- The growth of advanced equipment manufacture and modern service industries;
- New industries in the energy, new materials, energy saving and environmental protection sectors and other high-end industries;
- Spatial agglomeration of industrial development;
- Control of non-organized layout of traditional chemical industry.

All of these processes promoted the region to become the model area for coordinated development of the western area of China and safeguarding the ecological security of the middle-upper reaches of the Yangtze River.

5.5.5 Energy & Chemical Industrial Regions of the Yellow River's Upper-Middle Reaches

The Yellow River's Upper-Middle Reaches Energy & Chemical Industrial Regions sub-project has:

- Assembled the layout and constructed new-energy and heavy-chemical bases;
- Developed multiple industries simultaneously, and actively developed and cultivated non-resource-based industries;
- Defined production quotas for water usage and rationally defined the scale of key industrial development such as coal chemical industry;
- Developed and improved the efficiency of regional coal resource development.

Through promoting optimization of the spatial layout and upgrading the industrial structure, the sub-project enhanced the regional ecological and environmental quality and maintained the security of the regional ecology.

6 Conclusions for Future SEA Practice

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Based on a comprehensive analysis of the natural resources and carrying capacity, the Five-mega Regions' SEA systematically assessed the potential medium and long-term environmental impact of key industrial development and ecological risks. Regulatory proposals were suggested for optimizing the development of key industries, as well as an environmental protection strategy. The SEA provided a study of how a new layout could prevent environmental risks. It ensured new ideas and new mechanisms of regional ecological and environmental security. With this, the SEA can be considered as a successful practice for assisting decision-making, and as a new approach for environmental protection. This was specifically reflected in the following aspects:

6.1 SEA Expanded the Depth and Breadth of Environmental Protection Inclusion in Integrated Decision-making

The SEA expanded the breadth and depth of environmental protection's inclusion in major industrial development decisions through a focus on layout, structure and size of industrial development (Figure1.6) and by applying a number of core principles and policies (Figure1.7). During the SEA, the attention and support of city leaders and the active participation of provinces and cities' planning and decision-making departments has promoted environmental protection from "After-the-fact Governance" to "Decision-making at source", from "Element

Management" to "System Management", and from "Administrative Regional Management" to "Regional Integrated Management" (Figure1.8). It led to active participation of the environmental protection departments in decision-making, and explored ways of optimizing economic development with environmental protection.

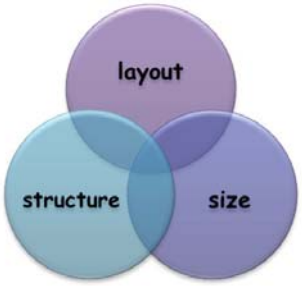

Figure 1.6 *Three core issues*

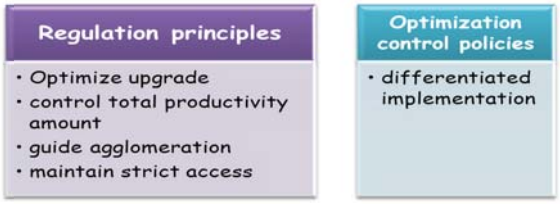

Figure 1.7 *Regulation principles and Optimization control policies*

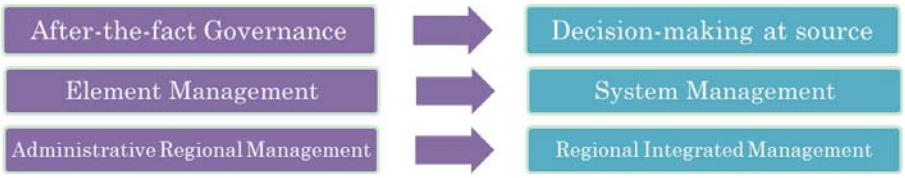

Figure 1.8 *Environmental protection transformation*

6.2 The SEA Built a Platform for Prevention at the Source of Environmental Risks Caused by a Wrong Lay Out

Through a comprehensive analysis of the potential risks and contradictions between regional industrial development and ecological safety, the project has proposed an approach to steer the regional key industrial development, as well as an optimization and adjustment program, which included the optimization of industrial layout, structural adjustment and control of scale.

The project also clarified the environmental objectives of a regional strategy for ecological and environmental protection, creating an ecological bottom line and

access standards. It also planned major ecological and environmental protection projects, pointed out the direction and means for maintaining regional ecological safety, and created a platform to prevent environmental risks from the beginning of the layout designing.

6.3 Provided Practical Support for the Scope of the Statutory Application of SEA

The SEA covers 67 prefecture-level cities and 37 counties (districts) of 15 provinces (autonomous regions and municipalities), with a land area of 1.11 million km^2, involving over 10 key industries such as petrochemicals, energy, metallurgy, equipment manufacturing, etc. This SEA broke through the statutory evaluation scope of SEA in China. Also, the SEA was carried out across-multiple administrative-regions, covering multiple industries, and it focused on high-level and large-scale regional strategies in China for the first time. The SEA not only broke the boundaries of different departments, administrative regions and districts, and also tried to ease the contradiction among natural resources, economic development and environmental protection, especially in a large scale. The successful experience of the SEA provided strong practical support for a gradual expansion of the statutory scope of SEA application in China.

6.4 The SEA Explored Effective Approaches to Manage Regional Resources and Environment

Based on the characteristics of industrial development, the SEA proposed a new SEA idea, based on the application of “One Model” (pressure-state- response), “One Target” (ecological environmental strategic protection target) and “Three Cores” (layout, structure and scale). Aim was to establish a “Main Line” (the evaluation index system) and ensure the “Four Bottom Lines” (the bottom lines of maintaining regional ecological safety).

Around the main goal of building the Five-mega Regions into model areas where environmental protection optimizing economic development, the project made efforts to break down the two major contradictions: between spatial layout of industrial development and ecological security patterns, and between structural scale and resources and environmental carrying capacity. It gave priority to:

- The implementation of industrial upgrading policy;
- Guaranteeing environmental investment;
- Strengthening the building of environmental management capacity.

The project has explored effective ways to further optimize the spatial pattern of land development, rationalize use of land, shore lines and water resources, gradually reverse the current development models, and eventually achieve a coordinated development for the region's economy, society and environment.

The ecological and environmental "Red Lines" developed by the study has allowed for effective decision-making and technical support for guiding and optimizing the spatial pattern of land development. This accelerated the transformation of the regional economy, and ensured regional ecological and environmental safety and protection during rapid economic development. Some areas already started following the requirements of the SEA Report when preparing their local "12th Five-Year Plan". When preparing the local economic development plan, and approving new heavy chemical projects, it was important to first develop the regional ecological protection "red line" indicator, based on the carrying capacity of resources within the region. Even if the planning has been approved, MEP can refuse the project if it does not match the guidelines issued at SEA level. Without such indicator this was not possible because at planning/SEA level, MEP only has reviewing rights, i.e. give proposals that the planning examination and approval authorities can accept or not (different from the EIA level where MEP has approval right).

6.5 The Five-mega Regions SEA Project Promoted the Perfection of a Theoretical Framework and Technical Methodology for SEA

The project proposed a large-scale theoretical framework for SEA and explored and validated many advanced evaluation techniques and methods, including:

- Medium and long-term environmental impact prediction techniques based on multi-nested environment numerical simulation models;
- Large-scale identification of ecological risks and biodiversity impact analysis techniques based on space units and landscape patterns;

- Evaluation of ecosystem risks and an integrated evaluation methodology of cumulative environmental effects based on “marine and terrestrial co-ordination” and “quality and functional integration”.

The project also established a guiding framework for development and regulation of technology for optimizing regional industrial development facing resource and environment constraints.

The project enriched and developed key SEA technologies and applications, and provided technical support and a reference source for the international promotion and application of SEA.

At the same time, and for the first time, technical evaluation methods were applied such as:

- Ambient Air Resource Evaluation Method;
- Ecosystem Health Assessment Method;
- Ecological Risk Assessment Method based on landscape ecology;
- Water Poverty Index Evaluation Method.

The major breakthrough in evaluation concepts, ideas and methods in the SEA has provided a reference for similar domestic SEA.

6.6 SEA Led to an Optimized Regional Development Model and Regional Environmental Management Model

Integrating different environmental characteristics in different regions, the SEA proposed a number of important points of views on regional development strategy, and gave a direction for the control of the scale of regional key industries, for structural adjustment and for layout optimization.

For example, the SEA of Energy & Chemical Regions of the Yellow River’s Upper-Middle Reaches, proposed an innovative strategic concept: to protect ecological safety corridor functions in the Yellow River basin and build an ecological line of defense in North China. According to the distribution of the regional coal resources and natural resources, an industrial strategic development pattern was proposed consisting of “one body with four wings”. This pattern

aimed to provide a solution for the prominent contradictions between arid regions and water supply demand. Also, an Industrial Development Strategic principle was suggested to "Define production quotas according to water". This laid a scientific foundation for sustainable regional development.

The Five-mega Regions' SEA proposed various mechanisms such as the cross-regional, cross-sectoral Joint Prevention and Joint Control Mechanism, and the multi-sectoral linked comprehensive warning and emergency response mechanism. It also proposed an ecological compensation system within watersheds or regions, that would help solve the problem of administrative divisions of watersheds and regional development and departmentalization. This would contribute to a transition (Figure 1.8) from the current "environmental element management" to a "system management", and turning "administrative"management to "regional integrated management." This would profoundly affect the country's future regional environmental management model.

6.7 SEA Promoted the Organization and Cooperation between Different Sectors and Regions

The Five-mega Regions' SEA demonstrated a strong sectoral coordination and cooperation, that can be characterized by:

(1) Leadership Support

The governments of 15 provinces (autonomous regions and municipalities) have established a "Departments and Provinces Coordination Group", headed by each province's leaders, to safeguard smooth project implementation.

(2) Efficient Organization and Strong Coordination

The project took a bold step in exploring better project organization and management. It established a three-level management institute, a three-level project structure, and a three-level technical system. By establishing a series of scientific and standardized management systems, such as the Project-Leader System, the Significant Events Reporting System, the Key Technologies Seminar

System, the All-Outcomes-Evaluation System, and the Data-Sharing System, the project provided a reliable guarantee mechanism for a successful completion.

(3) Teamwork for Integrated Implementation

Each sub-project broadly associated with research institutes in various fields such as economy, water, ocean, weather and universities, with each utilizing their unique advantages.

For example, during the Strategic Environmental Assessment of the West-Strait Economic Zone's key industrial development, a great number of governmental coordination meetings were held. Sectors and departments of every province and 13 cities, such as the Environmental Protection Bureau, the Development and Reform Bureau, the Planning Bureau, etc. collected feedbacks and comments from Fujian province, Eastern area of Guangdong province and Wenzhou city. Superiors examined and summarized the comments before reflecting it back to the local units, who then undertook the necessary actions accordingly.

7 SEA Follow-up

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The MEP started investigating application of the SEA results in April, 2013. Two investigation methods were used. The first was by asking the 15 provinces (regions) to submit written materials on application of results; the second was organizing expert missions to Liaoning, Fujian, Guangxi, Sichuan and Inner Mongolia to carry out field investigation from July 15th to 20th 2013. The investigation results can be summarized as follows.

7.1 Application of the Guidance

First, the results of the SEA have been included in national and regional strategic decisions and have become important in making environmental protection policies. For example, results of the SEA have been used in planning formulation and policy design by national ministries and commissions, such as the National Development and Reform Commission (NDRC), Ministry of Land and Resources, Ministry of Transport, Development Research Center of the State Council, State Oceanic Administration, formulation of the "12th Five-Year" Plan and environmental protection policies of provinces (regions and cities) such as Tianjin, Liaoning, Shandong, Zhejiang, Guangdong, Guangxi, Sichuan, Chongqing, Inner Mongolia and Ningxia. Fujian Province made full use of results of the SEA of the Western Taiwan Strait Economic Zone while formulating the "12th Five-Year" Plan for national economic and social development, the "12th Five-Year" Plan for environmental protection and ecological construction, and the "12th Five-Year" Plan for the construction of

eco-provinces. SEA results were used in the formulation of guidance and policies on key industries, and in specifying and refining the development direction, spatial arrangement and environmental protection goals of key industries. The government of Inner Mongolia followed the principles of "water resource-oriented development, technological upgrading, optimizing layout and diversified development" while formulating the "12th Five-Year" Plan for national economic and social development. Guangxi used results of the SEA in strengthening industrial restructuring while formulating the "12th Five-Year" Plan for Industrial and Informatization Development of Guangxi Zhuang Autonomous Region. The provincial government selected over 1,500 projects from over 4,000 projects in the plan, gave full support to the construction of 12 key industrial parks and carried out differential development in the key industrial parks.

Second, results of the SEA have become an important base in instructing allocation of industries of key areas. In the SEA regional resources and environmental conditions were fully taken into account in the overall arrangement of industrial development. The production space, living space and ecological space were arranged in a coordinated way. A reasonable industrial and regional division of labor was formulated. Therefore, the assessment results have become an important reference to guide allocation of productivity of key regions and key industries. Following the results of the SEA for the development of the Western Taiwan Strait Economic Zone, Fujian province stated in its Study on the Spatial Layout Planning of Key Industries of Fujian Province that "in principle, large refining-chemical projects shall be carried out at the two key petrochemical bases on the south bank of Meizhou Bay and Gulei Peninsula instead of other coastal and inland areas". Moreover, and in line with the results of the SEA, the provincial government plans to move the megaton ethylene project of CNPC at Luoyuan Bay to Gulei Petrochemical Base.

Following the Guidance of Chengdu-Chongqing Economic Zone with regard to optimizing the distribution of key industries, in the "Planning for Development of the Petrochemical Industry and the Downstream Industries in Sichuan Province (2011-2020)" it was decided to optimize and adjust the distribution of petrochemical projects in the province. The establishment of the three petrochemical bases in Pengzhou, Pengshan and Nanchong was specified and an overall arrangement was made of the downstream industries of the petrochemical industry. Following the principle of "scientific planning and orderly hydropower development" in the Guidance, cascade development of the lower reach of

Minjiang River was modulated from 6 levels to 4 levels. Gubo and Xijiechang avionics was removed in favor of protecting the habitat of rare and valuable fish species in the upper reach of the Yangtze River.

Third, SEA results have become guidance in the formulation of regional environmental protection policies. For example, the Dalian government formulated 33 detailed environmental protection indicators while developing the overall planning for environmental protection of Dalian. The government of Hebei Province stated in the "12th Five-Year" Plan for Pollution Control in Offshore Area (Draft) that regulation of pollution sources in coastal areas should be strengthened; the amount of pollutant discharges should be reduced; ecological protection in offshore area should be intensified and ecosystem should be well protected. Based on the requirement on maintaining ecological red lines, the government of Hebei Province established 9 nature reserves in 3 coastal cities and ruled out exploitation and construction activities that would destroy the ecological red line areas. Based on the principles of the SEA Guidance, the government of Guangxi formulated plans for the protection of the marine ecosystem of Guangxi and plans for the construction of ecological projects. Currently the government was carrying out pilot work for the designation of ecological red lines in the coastal zone.

Fourth, results of the SEA have become an important basis for examination and approval of plan and project EIA. All key construction projects in the Five-mega Regions examined by the MEP must be consistent with the SEA Guidance and relevant requirements, otherwise the project cannot be approved. When investigating the environmental projects, the local environmental protection departments need to consider the Five-mega Regions SEA results. For example, when the government of Hebei Province examined the "Plan Environmental Impact Report of the Huanghua Ports", located in the Bohai Sea Coastal Area, the examining panel suggested that the measures indicated in the SEA Guidance of the Bohai Sea Coastal Area should be fully implemented, such as controlling the occupation of the coast line, maintaining the ecological red line area, reducing the length of coastal line for development, reserving the southern and northern estuaries, and coordinating the future development zone with marine functional zoning and offshore environmental functional district planning.

7.2 Problems in Carrying Out the SEA

Some problems have been affecting the SEA. First, in some cases there was insufficient awareness of the SEA results by some local governments. These governments put economic development in the first place and ignored the importance of environmental protection. Moreover, when the officers change, the SEA work was not passed on and the new leaders were not familiar with the SEA results, resulting in insufficient application of these results.

Second, the SEA application mechanism needs further adjustment. As the Guidance was formulated at regional level and the administrative management was carried out at district level, some requirements in the Guidance were too general, to operate. Moreover, due to the limited distribution of the Guidance, its range of application was also limited. As the Guidance was issued by MEP to local environmental protection department, other local government departments do not have access to the Guidance. Also, it has little binding force toward these other departments, and therefore rarely was used.

Third, there was a lack of guiding force. With the economic and social development, the regional development plans and the features of resources and environment have also changed. As a result, the SEA results lack pertinence in the implementation process.

7.3 Lessons Learned

In order to further promote the development and application of SEA results, the following work should be intensified.

First, it should intensify SEA training and enhance the administrative department's recognition on SEA results. Training on SEA results should be carried out periodically. Environmental, industrial and policy-making experts should be invited to give a series of training based on the SEA results. Understanding of the SEA results by the environmental protection departments and other relevant departments should be deepened. Local governments shall establish SEA working groups to guarantee continuity of the work.

Second, SEA results should be published and influence of the SEA should be enhanced. Local governments and the public should be supported in getting a comprehensive understanding of the technical background of the Guidance. Seminars should be held to discuss its application. An in-depth analysis should be made on case examples of the application of SEA results.

Third, the Guidance should be further refined and enhanced its operability. Application and implementation of the results should be tracked and investigated. According to the development characteristics of each province (region), rules for the implementation of the Guidance shall be formulated. Especially with regard to some restrictive indicators, appropriate adjustments shall be made based on the regional economic and social development in order to strengthen pertinence and operability of the Guidance.

Appendix

Appendix 1 *The alternative index database*

Field	Topic	Subfield	Alternative indicators
Drivers from Economic and Social Development	Developing Rate	Industrialization	(D_1) Total output value of key industries (D_2) GDP per unit of land area (D_3)Industrialization stage of the region
		Urbanization	(D_4) GDP per capita (D_5) Density of population (D_6) Urbanization rate
	Developing Quality	Industrial Structure	(D_7) Simplification degree of industrial structure (D_8) GDP proportion of tertiary industry (D_9) Output value proportion of strategic emerging industries in key industries (D_{10}) The number of enterprises above designated size in key industries
Pressure on Nature, Environment and Resource	Pollution Load	Water Pollution	(P_1) Annual COD discharged volume per unit of output value of key industries (P_2) Annual COD discharged volume per unit of industrial added value of key industries (P_3) Annual ammonia nitrogen discharged volume per unit of output value of key industries (P_4) Annual ammonia nitrogen discharged volume per unit of industrial added value of key industries (P_5) Total discharged volume of COD by key industries (P_6) Total discharged volume of ammonia nitrogen by key industries (P_7) Compliance rate of discharge of industrial wastewater

Field	Topic	Subfield	Alternative indicators
Pressure on Nature, Environment and Resource	Pollution Load	Atmospheric Pollution	(P_8) Annual SO_2 discharged volume per unit of output value of key industries (P_9) Annual SO_2 discharged volume per unit of industrial added value of key industries (P_{10}) Annual NO_x discharged volume per unit of output value of key industries (P_{11}) Annual NO_x discharged volume per unit of industrial added value of key industries (P_{12}) Annual pollution emission per unit of output value of key industries (SO_2, NO_x, Soot, dust,) (P_{13}) Annual CO_2 discharged volume per unit of output value of key industries (P_{14}) Annual CO_2 discharged volume per unit of industrial added value of key industries (P_{15}) Total annual SO_2 discharged volume by key industries (P_{16}) Total annual NO_x discharged volume by key industries (P_{17}) Total annual TSP discharged volume by key industries (P_{18}) Total annual CO_2 discharged volume by key industries
		Solid Pollution	(P_{19}) Annual produced volume of dangerous solid waste per unit of industrial added value by key industries (P_{20}) Annual produced volume of dangerous solid waste per unit of output value by key industries (P_{21}) Annual produced volume of industrial solid waste per unit of industrial added value by key industries (P_{22}) Annual produced volume of industrial solid waste per unit of output value by key industries (P_{23}) Total annual produced volume of industrial solid waste by key industries (P_{24}) Total annual produced volume of dangerous solid waste by key industries
	Resource Pressure	Water Resource	(P_{25}) Overexploitation ratio of the underground water resource (P_{26}) Ecological base flow of surface water (P_{27}) Annual water consumption per unit of industrial added value of key industries (P_{28})Annual water consumption per unit of output value of key industries

Field	Topic	Subfield	Alternative indicators
Pressure on Nature, Environment and Resource	Resource Pressure	Energy Resource	(P_{29}) Power generation proportion of renewable clean energy (P_{30}) Power generation proportion of combined heat and power (P_{31}) Consumption proportion of the non-fossil energy resource in primary resource (P_{32}) Consumption proportion of coal in primary resource (P_{33}) Annual energy resource consumption per unit of industrial added value of key industries (P_{34}) Input-output efficiency of energy consumption of key industries
		Land Resource	(P_{35}) Land use intensity(refer to "*Control indicators on the development of construction land of industrial project*") (P_{36}) Control or ban on key Industrial development within the areas of ecological yellow or red lines (P_{37}) The distance between the key industries and residential area(refer to "*health protection distance standards of different industries*") (P_{38}) Adjacent degree between industrial park and ecological nature reserve (p_{39}) Planting scale of production forest and crop on the sloping land with a bevel angle of more than 25° (P_{40}) Area of monoculture instant forest

Field	Topic	Subfield	Alternative indicators
Status of Nature, Environment and Resource	Status	Water Resource and Environment	(S_1) Annual runoff of Surface water (S_2) Annual total available amount of water resource (S_3) Compliance rate of drinking water quality (S_4) Compliance rate of surface water quality in cross sections under control of country or province (S_5) Compliance rate of groundwater quality (S_6) Eutrophication level of seawater, lakes and reservoirs (S_7) Concentrations of organic pollutants, heavy metals within main river basins (S_8) Concentrations of specific pollutants related to key industries (S_9) Surface water quality of water environment functional zone (S_{10}) Seawater quality of water environment functional zone (S_{11}) Trophic state index of seawater(NQI-index/E-index) (S_{12}) Concentration of chlorophylla of seawater (S_{13}) Annual frequency and cumulative area of algalbloom (S_{14}) Annual frequency and cumulative area of poisonous algalbloom (S_{15}) Marine sediment quality[refer to "*China's marine sediment quality*" (GB 18668-2002)] (S_{16}) River sediment quality
		Atmospheric Environment	(S_{17}) "Good and excellent" ratio of city air quality(API) (S_{18}) Annual average ratio between highest landing concentration and standard Concentration of major pollutants (S_{19}) $PM_{2.5}$ concentration (S_{20}) Annual total number of the days with II level air quality (S_{21}) Annual frequency of acid rain (S_{22}) Annual total number of days with dust haze (S_{23}) Concentrations of specific pollutants related to key industries

Field	Topic	Subfield	Alternative indicators
Status of Nature, Environment and Resource	Status	Land Resource and Soil Environment	(S_{24}) Area of available land in deposit (S_{25}) Area of Arable Land (S_{26}) Heavy metal concentration in the soil of crop lands [refer to "*environmental standards for soils*"(GB 15618-2008)] (S_{27}) Area of salinization Land and desertification land (S_{28}) Area of the land with soil and water loss
Impact on Nature, Environment and Human Health	Impact on Ecosystem	Ecological Diversity	(I_1) Number of species (I_2) Shannon-wiener index of plankton, zooplankton, benthic animal in coastal water (I_3) Fish density in coastal water (I_4) Health level of the marine ecosystem in coastal water(refer to "*Health assessment guidelines* of the marine ecosystem in coastal water HY/T 087 2005") (I_5) Biodiversity index[refer to *Regional biodiversity evaluation criteria* (HJ 623-2011)] (I_6) Biodiversity impact index of nature reserve(refer to "*technical specification of impact evaluation on biodiversity of nature reserve*") (I_7) Landscape index (I_8) Protection rate of typical ecosystem types and national key protected wild fauna & flora species (I_9) Biological Abundance Index of region
		Ecosystem Service	(I_{10}) Protection level and area of nature reserve (I_{11}) Protection status of ecological sensitive area (I_{12}) NDVI (I_{13}) Forest coverage (I_{14}) Area of the ecological forests (I_{15}) Vegetation net primary productivity (I_{16}) Annual total absorption volume of CO_2 by vegetation (I_{17}) Annual total absorption volume of air pollutants by vegetation (I_{18}) Forest ecosystem service function (refer to "*specifications for assessment for forest ecosystem services in China*")

Field	Topic	Subfield	Alternative indicators
Impact on Nature, Environment and Human Health	Impact on Human Health	Human Health	(I_{19}) Population size in the area with polluted drink water/ air (I_{20}) Incidence of the diseases by environmental pollution (respiratory disease, angiocardiopathy, lung cancer and liver cancer) (I_{21}) Economical loss of the damage on human health by drink water pollution (refer to "*China Environmental and economic accounting technological guide*") (I_{22}) Economical loss of the damage on human health by air pollution(refer to "*China environmental and economic accounting technological guide*") (I_{23}) Compliance rate of aquatic products and agriculture products (I_{24}) Annual average protection cost of anti-pollution per household
Regulation on Improving Sustainable Development	Pollution Control	Pollution Source Control	(R_1) The rate of elimination backward production capacity (R_2) The rate of industrial clean production process (R_3) Regulation rate of industrial raise dust source (R_4) The environmental entering standards of key industries (R_5) Regional composite Index of resource and environment (R_6) The proportion of environmental protection investment in GDP (R_7) The ratio between environmental protection investment growth and GDP growth (R_8) Special funds of industrial upgrading and transformation
		Pollution End Control	(R_9) The proportion of companies buying environmental pollution liability insurances in key industries (R_{10}) The rate of industrial wastewater treatment of key industries (R_{11}) The industrial waste gas treatment rate of key industries (R_{12}) The reuse rate of industrial wastewater of key industries (R_{13}) Desulfurization efficiency of thermal power plant (R_{14}) Disposal rate of industrial solid waste and hazardous waste

Field	Topic	Subfield	Alternative indicators
Regulation on Improving Sustainable Development	Ecosystem Restoration	Maintenance and Construction of Ecosystem Service Capacity	(R_{15}) Ecological protection land area ratio(nature reserve,forest park etc.) (R_{16}) Coverage rate of afforestation in built-up area (R_{17}) The public green area per capita (R_{18}) Area of water conservation forest (R_{19}) Investment and area of ecological forest (R_{20}) Ecological restoration ratio of the mining area (R_{21}) Landscape type and area of the new industrial land (R_{22}) Protection rate of natural wetland (R_{23}) Proportion of ecological protection shoreline (R_{24}) Compliance rate of offshore environment functional areas (R_{25}) Establish and implement ecological compensation fund mechanism (R_{26}) Establish and implement public compensation fund mechanism towards environmental pollution (R_{27}) Ecological base flow
	Adaption and Counterm Easures	Countermeasures on Pollution and Climate Change	(R_{28}) Anti-wave engineering standards (R_{29}) Layout of industrial parks and residential area in coastal and low-lying regions (R_{30}) The decreasing precipitation area of drought resistant crops planting area (R_{31}) Restoration status of mangrove ecosystem of intertidal wetland
	Public Participation	Public Satisfaction	(R_{32}) Public satisfaction index on the environment quality

Appendix 2 *The core index database*

Field	Topic	Sub-field	Core indicators	Target value
Drivers from Economic and Social Development	Develop Rate	Industrialization	(D_1) Total output value of key industries (D_2) Industrialization stage of the region	(D_1) Its growth rate keeps relatively stable, compared with the latest five years (D_2) Industrialization stage calculated by the "*Syrquin. M- H.B.Chenery*" model could keep steady, and generally show an uplifted trend, potential
		Urbanization	(D_3) Urbanization rate	(D_3) Regional urbanization rate calculated as the ratio between the urban population and total population should increase steadily and reach the average value of China until 2020, and the ratio between the urbanization rate and industrialization rate should keep stable or increase slowly
	Develop Quality	Industrial Structure	(D_4) Output value proportion of strategic emerging industries in key industries (D_5) The number of enterprises above designated size in key industries	(D_4) Output value proportion of strategic emerging industries in key industries could show an uplifted trend or be stable year after year, and should exceed 8% in 2015 (D_5) The number of enterprises above designated size in key industries should show an uplifted trend yearly
Pressure on Nature, Environment and Resource	Pollution Load	Water Pollution	(P_1) Total discharged volume of COD by key industries (P_2) Total discharged volume of ammonia nitrogen by key industries (P_3) Compliance rate of discharge of industrial wastewater	(P_1) Its decrease rate should reach 1.5% per year. From 2010 to 2015, it should decrease by 10%, as well as from 2015 to 2020 (P_2) Its decrease rate should exceed 1.5% per year. From 2010 to 2015, it should decrease by 15%, as well as from 2015 to 2020 (P_3) It should reach to 95% in 2015 and 100% in 2020

Field	Topic	Sub-field	Core indicators	Target value
Pressure on Nature, Environment and Resource	Pollution Load	Atmospheric Pollution	(P_4) Annual pollution emission per unit of output value of key industries (SO_2, NO_x, Soot, dust) (P_5) Annual CO_2 discharged volume per unit of industrial added value of key industries (P_6) Total annual SO_2 discharged volume by key industries (P_7) Total annual NO_x discharged volume by key industries	(P_4) It must show a degressive trend yearly from 2006 to 2020 (P_5) From 2010 to 2015, it should decrease by 21% (P_6) Its decrease rate should reach 1.5% per year. From 2010 to 2015, it should decrease by 10% (P_7) Its decrease rate should reach 1.4% per year. From 2010 to 2015, it should decrease by 8%
		Solid Pollution	(P_8) Annual produced volume of industrial solid waste per unit of industrial added value by key industries (P_9) Annual produced volume of industrial solid waste per unit of output value by key industries	(P_8) It should show a down trend, potentially year after year (P_9) It should show a down trend, potentially year after year
	Resource Pressure	Water Resource	(P_{10}) Annual water consumption per unit of industrial added value of key industries	(P_{10}) It should decrease by 30%, from 2010 to 2015

Field	Topic	Sub-field	Core indicators	Target value
Pressure on Nature, Environment and Resource	Resource Pressure	Energy Resource	(P_{11}) Power generation proportion of renewable clean energy (P_{12}) Consumption proportion of the non-fossil energy resource in primary resource (P_{13}) Consumption proportion of coal in primary resource (P_{14}) Annual energy resource consumption per unit of industrial added value of key industries	(P_{11}) It could show an uplifted trend, and until 2015 it should exceed 25% (P_{12}) It could show an uplifted trend, and it would reach to 11.4% in 2015, while it reaches to 15% in 2020 (P_{13}) It could show a descending trend, and it would reduce to 66.7% until 2015 (P_{14}) It could show a descending trend, and it would decrease by 23.5% until 2015 compared with 2010
		Land Resource	(P_{15}) Land use intensity (P_{16}) Control or ban on key industrial development within the areas of ecological yellow or red lines (P_{17}) The distance between the key industries and residential area (P_{18}) Area of monoculture instant forest	(P_{15}) It must not exceed 30%, and the building coefficient of the industrial park must reach 30% (P_{16}) Within the red line, the industrial construction is forbidden all the time, and within the yellow line, the industrial construction is strictly under control (P_{17}) The distance between the key industries and residential area must reach health protection zone standards for industrial enterprises (P_{18}) Area of monoculture instant forest should be under control, and it can not increase largely from 2010 to 2015, and it can not increase any more from 2015 to 2020

Field	Topic	Sub-field	Core indicators	Target value
Status of Nature, Environment and Resource	Status	Water Resource and Environment	(S_1) Compliance rate of water quality of drinking water source (S_2) Compliance rate of surface water quality in cross sections under control of country or province (S_3) Eutrophication level of seawater, lakes and reservoirs	(S_1) Protection of water sources should strictly comply with "Regulations of Pollution Prevention in Drinking Water Protection Area" (Version in 1989), water quality of 95% centralized drinking water sources should meet the relevant standards in "*Surface Water Environment Quality Standards*" and "*Groundwater Quality Standards*" in 2015, and the compliance must rise to 100% in 2020 (S_2) Until 2020, 90% of surface water quality in cross sections under country-control and province-control should achieve or surpass the Class III standard of "*Surface Water Environmental Quality Standards*" (S_3) The concentrations of total nitrogen, total phosphorus, transparency, chlorophyll and permanganate index should keep stable or show a degressive trend yearly
		Atmospheric Environment	(S_4) Annual average ratio between highest landing concentration and standard concentration of main pollutants(SO_2, NO_2, PM_{10}) (S_5) $PM_{2.5}$ concentration (S_6) Annual total number of the days with II level air quality (S_7) Annual total number of days with dust haze	(S_4) It should show a degressive trend yearly, and should be lower than 75% until 2020 (S_5) The $PM_{2.5}$ concentration should have an obvious degressive trend in 2015, and accord with the concentration limits in transition period published by the WHO in 2020 (S_6) The number can show a continuous rise, while it should surpass 300 until 2020 in the Bohai economic zone and in the other mega regions it can reach 350 until 2020 (S_7) It must show a degressive trend yearly, and it can reduce to 30 annual until 2020

Field	Topic	Sub-field	Core indicators	Target value
Status of Nature, Environment and Resource	Status	Land Resource and Soil Environment	(S_8) Area of arable land (S_9) Heavy metal concentration in the soil of crop lands [Refer to "*environmental standards for soils*" (GB 15618-2008)] (S_{10}) Area of salinization land and desertification land	(S_8) It should not have a large fluctuation, and it should be maintained within local red lines of arable land (S_9) The heavy metal concentration in the soil of crop lands should not increase any more, and the crop lands should all reach the standard II of "*soil environmental quality standard*" until 2020 (S_{10}) The area should decrease yearly, and until 2020 it can have an obvious improvement
Impact on Nature, Environment and Human Health	Impact on Ecosystem	Marine Ecosystem	(I_1) Health level of the marine ecosystem in coastal water(refer to "*Health assessment guidelines* of the marine ecosystem in coastal water") (I_2) Fish density in coastal water	(I_1) It should obviously show an increase until 2020 compared with 2006 (I_2) It should keep stable or improve continuously from 2006 to 2020
		Terrestrial Ecosystem	(I_3) Forest coverage (I_4) Area of the ecological forests (I_5) Forest ecosystem service function (Refer to "*specifications for assessment for forest ecosystem services in China*")	(I_3) It should show a continuous increase from 2015 to 2020 (I_4) It should show a continuous increase from 2015 to 2020 (I_5) It should keep stable or improve continuously from 2015 to 2020

Field	Topic	Sub-field	Core indicators	Target value
Impact on Nature, Environment and Human Health	Impact on Human Health	Human Health	(I_6) Population size in the area with polluted drink water/air (I_7) Incidence of the diseases by environmental pollution (respiratory disease, angiocardiopathy, lung cancer and liver cancer)	(I_6) It should be under control from 2006 to 2020 (I_7) It can not increase sharply from 2006 to 2020
Regulation on Realize Sustainable Development	Pollution Control	Pollution Source Control	(R_1) The rate of elimination backward production capacity (R_2) The rate of industrial clean production process (R_3) Regulation rate of industrial dust source (R_4) The environmental entering standards of key industries (R_5) The proportion of environmental protection investment in GDP (R_6) The ratio between environmental protection investment growth and GDP growth (R_7) Special funds of industrial upgrading and transformation	(R_1) It must reach 100% until 2020 (R_2) It should show an uplifted trend, and can reach 70% until 2015 (R_3) It should be 100% until 2015 (R_4) It should be stricter in 2015 compared with 2006 (R_5) It should show an uplifted trend continuously, and reach 2%~3% until 2015 (R_6) The value should be greater than one until 2015, and should increase continuously from 2006 to 2020 (R_7) The special funds served for the upgrading and transformation of key industries should increase from 2006 to 2020

Field	Topic	Sub-field	Core indicators	Target value
Regulation on Realize Sustainable Development	Pollution Control	Pollution End Control	(R_8) The proportion of companies purchasing environmental pollution liability insurances in key industries (R_9) The reuse rate of industrial wastewater of key industries (R_{10}) Desulfurization efficiency of thermal power plant (R_{11}) Disposal rate of industrial solid waste and hazardous waste	(R_8) Government should encourage the industrial company to purchase the pollution liability insurances, and the proportion should rise from 2010 to 2020 (R_9) It should exceed 10% until 2015, and it should show an uplifted trend (R_{10}) It should exceed 80% in 2015 (R_{11}) It should increase yearly, and should increase to 100% in 2020

Field	Topic	Sub-field	Core indicators	Target value
Regulation on Realize Sustainable Development	Ecosystem Restoration	Maintenance and Construction of Ecosystem Service Capacity	(R_{12}) Ecological protection land area ratio（nature reserve, forest park etc.） (R_{13}) Coverage rate of afforestation in built-up area (R_{14}) Investment and area of ecological forest (R_{15}) Ecological restoration ratio of the mining area (R_{16}) Protection rate of natural wetland (R_{17}) Compliance rate of offshore environment functional areas (R_{18})Establish and implement ecological compensation fund mechanism (R_{19}) Base flow for biological requirement of surface river	(R_{12}) It should exceed 17% until 2015, and it should show an uplifted trend (R_{13}) By the end of 2015, city planning built-up area green coverage rate reached more than 42% (R_{14}) It should increase by 10% from 2006 to 2015, and would have a large rise by 15% from 2015 to 2020 (R_{15}) It should increase continuously, and it should exceed 15% until 2015 (R_{16}) Protection rate of natural wetland should not be lower than 90% till 2020 (R_{17}) Standard rate of offshore environmental function area should be no lower than 80% till 2020. Marine water quality of various functional areas should meet the corresponding water quality standards in "*Sea Water Quality Standards*" (R_{18}) The government combined with industrial enterprises should establish and implement public compensation fund mechanism towards environmental pollution in some in regions with a high environment risk (R_{19}) The flow should be guaranteed every year, it should be 10% of the annual average flow of a river

Field	Topic	Sub-field	Core indicators	Target value
Regulation on Realize Sustainable Development	Adaption and Countermeasures	Countermeasures on Pollution and Climate Change	(R_{20}) Anti-wave engineering standards (R_{21}) Layout of industrial parks and residential area in coastal and low-lying regions (R_{22}) The area with a decreasing precipitation of drought resistant crops planting area	(R_{20}) It should be raised to higher level according with the rise of sea level in the coming seventy years until 2015 (R_{21}) Eliminate the drown risk of the industrial parks and residential area before planning the layout of coastal and low-lying regions until 2015 (R_{22}) Government should lead the farmers to plant drought resistant crops in the area with a decreasing precipitation
	Public Participation	Public Satisfaction	(R_{23}) Public satisfaction index on the environment quality	(R_{23}) Since 2015, the PSI on the environment quality by the questionnaire survey method should be investigated every year, and its result could be published on the public release platform

Appendix 3 *Consultation Seminar of Leading Experts Departments on SEA of Five-mega Regions' Key Industrial Development*

Time	Meeting	Participating Units	Main Content
March 2009	Key Industrial Development Expert Consultation	Appraisal Center for Environment and Engineering, Ministry of Environmental Protection, the lead technical unit of the sub-project, participating unit representatives and invited consultants	Addressed the problems and deficiencies of technical solutions in respect of concepts, focus, topic setting, technology roadmap and technical methods involved in each sub-project. Proposed specific comments and suggestions
April 2009	Key Industrial Development Seminar	13 provinces, municipalities, autonomous regions with its related governing areas, Municipal Environmental Protection Bureau, Development and Reform Commission Ministry of Finance, Ministry of Ocean, Ministry of Water Resources and other government functional departments, project technical lead, representatives of participating units and 55 invited experts	Discussed and deliberated about the main content of technical program, and concluded review comments
	Cross-region Atmospheric Environment Impact Assessment Method	Sub-project's lead technical unit, overall design collaborative unit and technical directors from certain sub-items organizing units, representatives and invited experts	Discussed important technical issues in the cross-regional Atmospheric Environmental Impact Assessment, as well as the range, index and patterns involved in conducting Atmospheric Environmental Impact Assessment of each sub-project
	Selection of Key Industries and Development Scenario Design Symposium	Sub-project's lead technical unit, overall design collaborative unit and technical directors from certain sub-items organizing units, representatives and invited experts	Discussed related issues of Key Industries Scenario design, unified the principles, and ideas and methods which are used in selecting key industries and Development Scenarios Design

Time	Meeting	Participating Units	Main Content
May 2009	Sub-Project of Bohai Sea Coastal Zone Symposium	Sub-project's lead technical unit, Liaoning Province and Hebei Provinces' participating units, participating units of Tianjin sub-item and related experts	Consult suggestions and comments from experts by convening meetings, visiting forums and organizing seminars, etc
	Sub-project of Beibu Gulf Kick-off Meeting	Relevant departments of the two provinces (autonomous regions), local government leaders, and lead technical unit and experts from cooperative units	Main content of technical program
	Marine Ecosystem Impact Assessment Methods Symposium	Sub-project's lead technical unit, overall design collaborative unit and technical directors from certain sub-items' organizing units, representatives and invited experts	Discussion of important technical issues in Marine Ecosystem Impact Assessment, cleared the evaluation range of sub-projects evaluation index and prediction model, etc
	Water Environment Impact Assessment Methods Symposium	Sub-project's lead technical unit, overall design collaborative unit and technical directors from certain sub-items' organizing units, representatives and invited experts	Discussed the main content of Water Environmental Impact Assessment, evaluation methods, and the water environment capacity research, etc
August 2009	Strategic Environment Assessment of Key Industrial Development Assessment Meeting	In-charge persons from Environmental Protection Department (Bureau) EIA Department of 15 provinces (autonomous regions and municipalities), technical directors of sub-project's lead units and 5 invited experts	Solicited recommendations from experts and relevant departments regarding initial outcomes
September 2009	West Coast Economic Zone Sub-project Achievement Seminar	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Discussed the sub-projects in Fujian, Guangdong and Zhejiang, the preliminary results of each special topic, and further proposed the improvement requirements

Time	Meeting	Participating Units	Main Content
September 2009	SEA of Key Industrial Development of the Beibu Gulf Coastal Economic Zone Industry Topics	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Discussed the Scenario Design Report of Beibu Gulf Economic Zone Industrial Development, and reviewed Industrial Special Reports directory
October 2009	Bohai Sea Sub-project Consultation Sessions	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Reviewed the work of data collection and supplementary monitoring, as well as actively promoted the data collection work outside the environmental systems
	Bohai Sea Sub-project Group. Weekly Symposiums (one to two each week)	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Solved various problems arising during regular evaluation, and adjusted work plan according to the progress of sub-projects and thematic work
	Bohai Sea Sub-project Stage Evaluation Seminar	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Summarized and refined the important results of the second stage, supplemented and improved the important work content, and analysed work focus
	Upstream of the Yellow River Sub-project Stage Evaluation Seminar	Relevant economy departments and Environmental Protection Departments of Shanxi, Inner Mongolia, Ningxia, Shaanxi provinces	Solicit views and recommendations from relevant departments and experts on thematic outcomes
November 2009	SEA of Five-mega Regions' Key Industrial Development, Second-Stage Assessment	In-charge persons from Environmental Protection Department (Bureau) of 15 provinces (autonomous regions and municipalities), technical directors from sub-project's lead units and 5 invited experts	Discussed the work of sub-projects and sub-items after the first-stage evaluation meeting

Time	Meeting	Participating Units	Main Content
November 2009	Bohai Sea Sub-project Third-Stage Discussion Meeting	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Consulted suggestions from experts, and the Industry Thematic Group adjusted the regular Scenario Design based on feedback
December 2009	West Coast Sub-project Seminar	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical units and cooperative units	Supplemented, modified and improved the General Report
January 2010	Beibu Gulf Sub-project Terrestrial Ecosystems Symposium	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Explored relevant contents about ecological health, biodiversity, ecological risk assessment Revised Industrial Scenario Design and adjusted the intensity of pollution sources
November 2009	Chengdu-Chongqing Sub-project Water Environmental Carrying Capacity Analysis and Ecological Topics	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Solicited views and recommendations from relevant departments and experts on water environmental carrying capacity and water ecology
	Sub-project Group of Upstream of the Yellow River Work Consultation Meeting	Relevant departments of the province (autonomous region), local government leaders, and experts from lead technical unit and cooperative units	Focus on analysing the carrying capacity of regional water resources for industrial development. Summarized and refined the point of views from the Outcome Report, and aggregated and verified the relevant arguments and data

Time	Meeting	Participating Units	Main Content
November 2009	SEA of Five-mega Regions' Key Industrial development Third-stage Evaluation Meeting	In-charge persons from Environmental Protection Department (Bureau) of 15 provinces (autonomous regions and municipalities), technical directors of Project Management Office and lead units, representatives from the sub-item undertaking unit of each province (autonomous regions and municipalities), and 11 invited experts	Appraised the latest progress of sub-projects and sub-items
January 2010	Major Topics Consultation Meeting	In-charge persons of 15 provinces (autonomous regions and municipalities) and the Environmental Protection Department (Bureau), technical directors of Project Management Office and lead units, representatives from the sub-item undertaking unit of each province (autonomous regions and municipalities), and 11 invited experts	Supplemented, modified and improved the General Report
	Report Outline of Initial results	The Appraisal Center for Environment & Engineering, Ministry of Environmental Protection, technical directors of sub-project group and the main design group, invited experts and members of Project Management Office	Supplemented, modified and improved the General Report
	Achievement Consultation Seminar	Project Management Office, experts from Major Topic Group, the sub-item officials and relevant theme leaders	Discussed, further revised and improved the Outcome Reports

Appendix 4 *Case of public participation*

Feedback	Situation of Adoption
"Sulfur dioxide emissions reduction in 2008 and 2009 is effective, and annual average values met the standard" disagreed with "sulfur dioxide emissions in Tangshan, Binhai New Area, and Dongying far beyond their capacity" in the report.	Adopted proposal after verification. Pollutant emissions data used by the research group is the pollution source census data for 2007 (provided by the Tianjin subproject).
"Tianjin petrochemical industry base moved from Lingang Industrial Zone to the Nangang Industrial Zone", was not shown in this report. Oil refining and ethylene scale in the report were inconsistent with the planning. According to the first phase planning EIA of Nangang Industrial Zone, it suggested "15 million tons oil refining capacity and 1.2 million tons of ethylene production projects in Nangang industrial Zone" instead.	Adopted proposal.
The adjustment of key industries should not be simply classified as "one size fits all" model, but refined industry classification according to the actual situation; Binhai New Area was rich in energy industry, not only the general thermal power, but also cogeneration, renewable energy.	Partially adopted proposal. According to the situation of atmospheric pollution and relative carrying capacity of atmosphere, the research group proposed the general idea that optimizing energy power industry of the west coast of the Bohai Sea, carefully developing new power station, supporting cogeneration projects.
The report should make a comparison of the absolute and relative terms of environmental investigation between Bohai coastal area and Seto inland sea area.	Adopted proposal.
The research group should explain the hypotheses that SO_2 and NO_2 in Binhai New Area have far exceeded the standard, and the basis for calculating.	Adopted proposal after verification.
According to the marine environmental capacity, how much is the pollution contribution of Tianjin Binhai New Area; does the process of water exchange in surrounding provinces and cities cause adverse effects to the Binhai new area.	Adopted proposal.
From long time series, Tianjin rainfall did not significantly reduce, but runoff, due to development of upstream, declined. Therefore the conclusion such as "reduction of water resource" in the report should be verified.	Adopted proposal after verification.

Feedback	Situation of Adoption
Besides heavy chemical industries, electronics and equipment manufacturing industry were also the key industries for Binhai New Area.	Partially adopted proposal. Results modified will consider electronics industry development trend in recent years and its proportion.
Industry adjustment and optimization should be divided into more levels apart from support, restrict and eliminate, as some of the industries cannot be eliminated simply.	Not adopted proposals. According to the situation of atmospheric pollution and relative carrying capacity of atmosphere, the research group proposed that optimizing the west coast of the Bohai Sea carefully developing new power point, supporting cogeneration projects.
The concept of the proportion on page 70 of the report was not quite clear, which said “ferrous metal smelting and rolling processing industry output value increased in the proportion of the Bohai Sea coastal area, and the Binhai New Area and Tangshan highest increased by 3.8, and 2.5 percentage”.	Adopted proposal.
The designation of ecological control line is at odds with the actual situation of Binhai New Area. It should be verified according to Tianjin strategically spatial planning.	Adopted proposal.

Part Ⅱ

25 Years of SEA in the Netherlands: learning from research and practice

1 Introduction to SEA in the Netherlands

Jos Arts (*University of Groningen*) and Bobbi Schijf (*Netherlands Commission for Environmental Assessment*)

In the Netherlands, formal regulations on environmental impact assessment (EIA) were introduced in 1986 by inclusion of a chapter in *the Environmental Protection* (*General Provisions*) *Act* (now *the Environmental Management Act*). From the very outset, EIA was not solely required at project level, but also at the strategic level. Different policies, plans and programmes were subject to impact assessment from the 1980s onwards. For this reason, the Netherlands has had a head start on many countries in applying strategic environmental assessment (SEA).

In the past 25 years, SEA in the Netherlands has not been static (see for example Ten Holder, 2012a). There have been different developments in SEA regulation, some instigated from within the country and others influenced by changes taking place outside of it, particularly at the level of the European Union. Meanwhile SEA practice has also been building steadily into a mature body of experience, which is complemented by several studies into the effectiveness of SEA.

This section of this joint Chinese-Dutch publication on SEA is based on the 25 years of experience with SEA in the Netherlands. In this introduction Jos Arts and Bobbi Schijf will first give a brief overview of the current situation regarding SEA regulation and public debate in the Netherlands. In the next chapter, Jos Arts will describe three studies into SEA effectiveness that have been undertaken in the last few years. He will draw out the key conclusions from these studies. Next, a team of authors from the Netherlands Commission for Environmental Assessment (NCEA) will summarise recent lessons learned from Dutch SEA

practice. The NCEA has a unique position in the Dutch SEA system from which to reflect on practice. It is responsible for the review of the quality of SEA, and as such involved in practically every SEA undertaken in the Netherlands.

In Chapter 4 Rob Verheem, the director of international co-operation at the NCEA, compares the lessons learned from the NCEAs practice to those that have come forth from the effectiveness studies described by Jos Arts. This chapter discusses the difference and similarities in these conclusions, as well as the agenda for SEA in the Netherlands that practical experience and in-depth research seem to suggest. In this chapter, Rob Verheem also gives a short reflection on the Dutch lessons learned in comparison to the insights that have come from the application of SEA to Chinese mega-region planning. Then, in chapter 5, we look towards the future, at how SEA may be viewed as a system operating at the level of a country or region. The NCEA sets out an SEA systems approach that can be used to inventory and analyse the elements that make up an SEA system in a country. This analysis helps to identify the systems strengths and weaknesses, and decide on potential for improvement of SEA. In the final two chapters of this part of the book we present two Dutch practice illustrations: SEA for long term spatial planning, and SEA for water plans.

1.1 SEA Introduction into the Netherlands

Before EIA legislation was introduced in the Netherlands in the late 1980s, EIA had been under discussion for over a decade. From the mid 1970s until 1986, some experimenting with this new instrument took place. The Canadian EIA system had a great influence on the discussions in the Netherlands at that time and ended up influencing the final design of the Dutch system (Arts, 1998; Wood, 2003). The regulations that were developed came into force when the EIA Decree was issued in 1987. With this regulation the Netherlands also gave effect to the European EIA Directive (85/337/EEC). The regulations were not restricted to EIA at project level, under the Dutch EIA system, many strategic decisions such as the adoption of (spatial) plans were also subject to EIA (Sadler & Verheem, 1996; Arts, 1998; Fischer, 2002).

In 2006, the Dutch requirements for strategic level EIA for were amended in order to comply with the European Union SEA Directive (2001/42/EC). In 2010, there was a more fundamental revision of the Dutch EIA system. This was called

the "modernisation of EIA" and it focused on limiting the (administrative) costs associated with the procedure. Later in this text, when evaluations of the Dutch SEA/EIA system are described, studies from both before and after the 2010 modernisation will be addressed.

The formal goal of the Dutch EIA/SEA regulations is "*to ensure that environmental values are fully considered in decision-making*". This objective is in line with the EU Directives for EIA and SEA. In the Explanatory Memorandum to the EIA regulations, two other subsidiary goals were by the legislator. These are the internalisation of environmental awareness (improving environmental attitudes) and the streamlining of decision-making (coordination and transparency) (Arts, 1998). The EU EIA Directive notes an additional objective for EIA: increased environmental awareness overall. These goals are relevant to mention here, because the evaluation studies discussed later in this text analyse goal-achievement in the context of both the main objective as well as the subsidiary goals of the EIA/SEA system.

1.2 Outline of the Dutch EIA/SEA Regulations

The Dutch EIA/SEA regulations specify which initiatives are subject to EIA and SEA. Aside from various specific projects (e.g. application for a licence to build a factory), many strategic initiatives (plans and programmes) are also identified in the Dutch EIA Decree. Mandatory ingredients in the Dutch SEA/EIA procedure include the development of alternatives for the initiative, an assessment of environmental impacts of the initiative and its alternatives, and the development of measures to mitigate or compensate for negative impacts. Proponents of initiatives, who are either governmental agencies or private companies, are responsible for undertaking an SEA/EIA. However, the preparation of the EIA or SEA report is often outsourced to a consultancy. The competent authority decides how to use the EIA/SEA outcomes in its decisions, but has to justify its decision to grant or deny consent to the activity or adopt a plan with reference to the EIA/SEA. The competent authority can also decide on specific alternatives or sets of measures on the basis of the EIA/SEA. The EIA/SEA outcomes may also lead the proponents to adjust their initiatives voluntarily. Stakeholders have the opportunity to participate in the SEA/EIA process during two stages: in the scoping stage (where alternatives and assessment criteria are decided upon) and during the presentation of the assessment outcomes. The SEA/EIA regulations

also contain a requirement to evaluate the decision that is subject to an SEA/EIA while or after it is implemented. This is called EIA follow-up (e.g. Morrison-Saunders & Arts, 2004).

In the Dutch system the independent Netherlands Commission for Environmental Assessment (NCEA) is responsible for quality review. Dutch environmental law installed the NCEA in the late 1980s, and since then its review advice has been a mandatory component of the SEA procedure. The NCEA maintains a secretariat of core staff, and a database of approximately 300 experts who work at governmental agencies, consultancies, universities and other knowledge institutes. For each advisory report that the NCEA prepares, a working group is set up, whose members represent those disciplines relevant to the assessment under review. These experts have to be independent, meaning that they should not have any personal or organisational interest in the decision at hand (Hoevenaars, 2013). The NCEA issues an advice to the competent authority responsible for the planning decision, and its advisory reports are made public online.

1.3 Early EIA/SEA Evaluation Studies

The Dutch EIA/SEA system and the resulting practice have been subject to several evaluation studies, including ECW (1990, 1996), Ten Heuvelhof & Nauta (1996), Van Kessel et al. (2003) and more recently a study by the Universities of Utrecht and Groningen (2011), Berenschot (2012) and Van Doren et al. (2013). The first formal evaluation study of the Dutch EIA system concluded that "EIA is functioning reasonably well" as it contributes to providing substantial information for decision-making (ECW, 1990). In 1996 a second formal evaluation study was done for which an in-depth background study into the performance of EIA in some 100 cases was undertaken (ECW, 1996; Ten Heuvelhof & Nauta, 1996, 1997). This evaluation study concluded that in 79% of the cases the EIA studied had a direct impact-i.e. a change of actions or opinions of an actor-while 21% did not have such an effect. In 52% of the cases the initiative and/or the decision was adapted because of the EIA and in 68% there was an influence at the conceptual level-i.e. actors changed their opinion. The smaller, qualitative study of Van Kessel et al. in 2003 found similar results on the performance of EIA. The Dutch EIA/SEA system has also been included in international studies. Generally speaking, in the international

literature, the Dutch EIA system has been branded as extensive and advanced because of the number of elements that go beyond EU standards (Wathern, 1990; Glasson et al., 1994; Wood, 1995, 2003; Sadler, 1996; Fischer, 2002; Morrison-Saunders & Arts, 2004).

1.4 Effectiveness vs. Efficiency

Over the past 25 years, some 2,500 EIAs and SEAs have been carried out (NCEA, 2011; Universities of Utrecht and Groningen, 2011). Over this time, the formal policy discourse on EIA/SEA seems to have shifted. There has been a growing contribution to the debate on EIA and SEA by people who are concerned that EIA/SEA is delaying decision-making, raising administrative costs, often lacking quality and adding little value to decision-making. Such criticism was instrumental in the revision of the EIA regulations of 2010 which focused on meeting the basic quality standards set by the EU EIA Directive, rather than on exceeding these standards. However, even after modernisation the advanced and comprehensive nature of the Dutch EIA system continued to be called into question. More recently there has been a call for simplification of regulations and reduction of formal safeguards. Currently, the "Simpler and Better" programme of the Dutch government is preparing a major reform of Dutch environmental regulations. The aim is to develop an integrated law regulating all human activities affecting the physical environment. This integration concerns rules for land-use planning, infrastructure, environment, nature, water, cultural heritage, and mining as well as for SEA and EIA (Ministry I&M, 2013). The changes to the EIA and SEA system are perhaps surprising given that (inter)national studies have shown Dutch SEA/EIA to be rather effective. The *effectiveness* of EIA and SEA seems to have been a less decisive topic, in practice much debate has in fact concentrated on the *efficiency* of the system. Consequently, many changes of the Dutch SEA/EIA regulations in the past 25 years have especially focused on making the SEA/EIA system more efficient. At the same time there remains a steady interest in the results that EIA and SEA achieves as well, which has given rise to the recent research into EIA and SEA effectiveness described in the next chapter.

2 Research into SEA Effectiveness in the Netherlands

Jos Arts (*University of Groningen*)

2.1 Introduction

To mark the 25th anniversary of EIA/SEA regulation in the Netherlands, various evaluation studies have been carried out into the effectiveness of Dutch EIA and SEA practice. This section discusses three of these studies: "Evaluation of 25 years EIA in the Netherlands" (University Utrecht & University of Groningen, 2011; see also Arts et al., 2012; Runhaar et al., 2013); "Performance of EIA" (Berenschot, 2012); and a smaller study about "The effectiveness of SEA in the Netherlands" (Van Doren, 2011; see also Van Doren et al., 2013)-see Table 2.1. All three studies focus on the effectiveness of SEA/EIA, whereby effectiveness is defined as goal-achievement. The formal goal of the Dutch SEA/EIA regulations is: "to ensure that environmental considerations are taken into account in decision-making". Although all studies relate effectiveness to the achievement of the goals of the Dutch SEA (see also the text above), the three studies differ in their operationalization of effectiveness (Table 2.1). Also, the studies vary in their methodological approach. The Universities of Utrecht & Groningen study undertook a broad survey amongst EIA and SEA professionals and hence their study provides insight into the perceptions on the effectiveness of the EIA/SEA system and practice. The Berenschot study applies a case-study approach to determine the performance of EIA and SEA. Finally, the Van Doren study focuses on an in-depth analysis of a smaller set of SEA cases. As noted earlier, few studies into this topic have focused on effectiveness of SEA exclusively. The first two studies concentrate on both EIA and SEA practice, while only the

latter focuses solely on SEA. Although the three studies differ in their scope and set-up, the conclusions they draw about the effectiveness of the Dutch SEA/EIA system are consistent.

Table 2.1 *Comparison of the three evaluation studies*

Study	Scope	Approach	Focus	Time period study (pre/post modernisation of regulations in 2010)
"Evaluation of 25 years EIA in NL" (University Utrecht & Groningen University, 2011; see also Arts et al., 2012; Runhaar et al., 2013)	EIA, SEA	Survey (*n*=443) + Interviews (*n*=20) + Desk top research + Focus groups	Performance (perceptions about application and system)	Before 2010 + After 2010
"Performance of EIA" (Berenschot, 2012)	EIA, SEA	Case study (*n*=40) (a-select sample document analysis + add. tel. interviews)	Performance (application in practice)	After 2010
"The effectiveness of SEA in NL" (Van Doren, 2011; see also Van Doren et al., 2013)	SEA	Case study (*n*=3) [selected cases document analysis, interviews (*n*=23)]	Performance + Conformance (application)	Before 2010

The following sections will discuss the three studies in turn. It will look specifically at three elements: the approach for evaluating SEA effectiveness in each study, the main results and lessons learned. This section concludes with some overall lessons learned.

2.2 Evaluation Study on 25 Years of EIA in the Netherlands

2.2.1 Approach

The evaluation study of 25 years of EIA in the Netherlands by the Universities of Utrecht and Groningen (2011) focuses on the environmental governance of EIA/SEA. When EIA was introduced, it was seen as an innovation in environmental

governance (see Caldwell, 1983; Taylor, 1984; Sadler, 2004; Richardson & Cashmore, 2011). This is connected with various governance mechanisms embedded in EIA, including:

- The formal requirement to provide for environmental information for development alternatives prior to final decision-making;
- The responsibility of the proponent to prepare an EIA report;
- Formal public participation;
- The requirement to do follow-up.

Various systems also have provisions for conducting strategic level environmental assessment. The Netherlands is one of the few countries that has established an independent expert commission charged with quality review.

As discussed, SEA/EIA effectiveness can be described in terms of the extent to which it achieves its goals of incorporation of environmental considerations in decision-making and enhancement of environmental awareness among proponents and competent authorities-see Figure 2.1[1]. Effectiveness is connected with existing governance mechanisms (as discussed above) and contextual elements (see also Runhaar & Driessen, 2007). The latter influence the way SEA/EIA is applied in practice, thereby determining the performance. Contextual elements include the quality of the SEA/EIA report, the connections between SEA/EIA and decision-making processes, but also the extent to which proponents are open to considering environmental issues. Figure 2.1 depicts the conceptual model-Arts et al. (2012), and Runhaar et al. (2013) could give more information.

The study applied various methods: a literature review (which included documentation on opinions of experts), an online survey of EIA/SEA professionals (*n*=443), 20 semi-structured interviews (of which 17 took place after the survey) and focus group discussions with experts. Both indicators for effectiveness and explanatory factors were derived from the professional literature (Figure 2.1; for more detailed information see Arts et al. 2012).

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1 The issue of more environmentally sound ("greener") decisions is not included in the notion of SEA effectiveness in this study as it is not a formal goal of the Dutch SEA/EIA regulations, but it has been part of the study and will be discussed later on in relation to the "perceived effect on decision-making", see e.g. Figure 2.3.

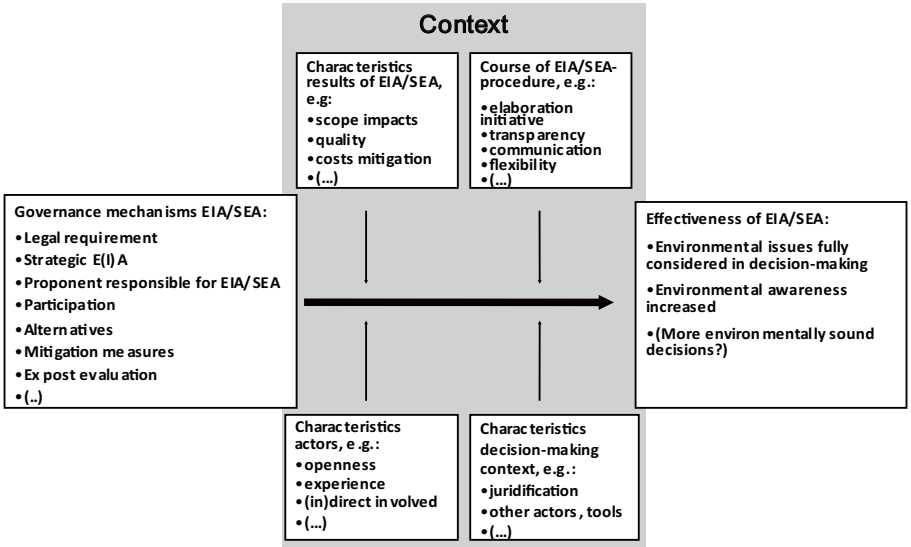

Figure 2.1 *Relationships between governance mechanisms, contextual factors and SEA/EIA effectiveness*

2.2.2 Results: performance of EIA/SEA

With respect to the performance of EIA/SEA, the respondents in the study indicate that EIA contributed to the environmental awareness of both authorities and proponents (Figure 2.2). There is, however, no overall consensus on the extent of this influence. Respondents representing competent authorities perceive this effect to be significantly lower than other respondents. Here there seems to be an *"experience effect"*: those with more experience in SEA/EIA are more positive.

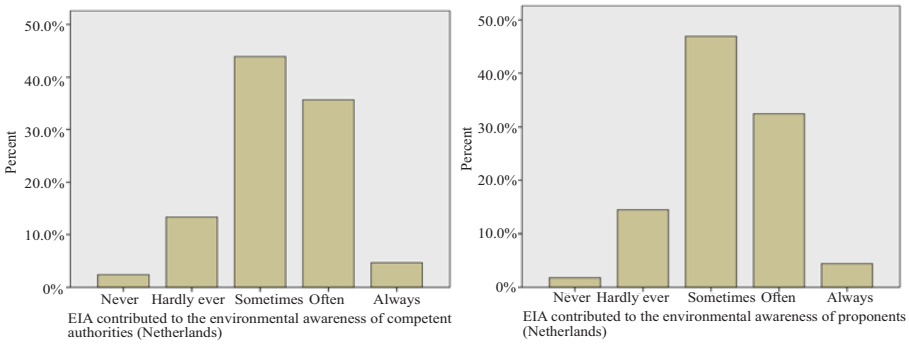

Figure 2.2 *Contribution to environmental awareness-of competent authorities* (*left*), *and proponents* (*right*)

Regarding the *impact of SEA and EIA on decision-making* the study reveals that SEA and EIA are perceived to have a modest "greening" impact on initiatives (Figure 2.3). The respondents thought that SEA and EIA chiefly resulted in small adjustments of the initiatives, not in the choice for other (more environmentally friendly) alternatives (Figure 2.3). In the literature it is suggested that doing an SEA may make EIA at project level easier or even redundant. However, the results of the study do not indicate that SEA makes EIA redundant, but rather that they complement each other.

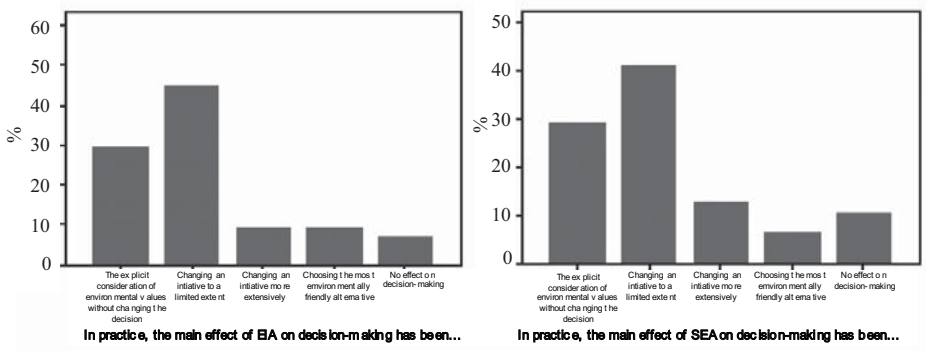

Figure 2.3 *Perceived effect on decision-making-EIA (left) and SEA (right)*

The greening impact on initiatives is correlated in particular with the so-called *"prevention effect"* (Figure 2.4). Proponents as well as authorities have put this down to the existence of formal EIA and other legal environmental requirements that they have to comply with (Figure 2.5). This prevention effect appears to be bigger than the impact EIA reports have on decisions directly (i.e. what could be called the *"correction effect"* during/after EIA; Figure 2.3). These findings correspond with earlier studies done in the Netherlands (e.g. Ten Heuvelhof & Nauta, 1996, 1997). It can therefore be concluded that EIA in the Netherlands is applied more so as an instrument for appraisal, and less as an instrument to support project design. Furthermore, the effectiveness of EIA appears to be stable over time. Regulation changes and changes to the overall context only have a minor effect.

The study also addresses some subsidiary objectives of Dutch EIA/SEA regulations. With respect to *streamlining of decision-making*, it is concluded that EIA and SEA are important for enhancing transparency of planning and decision-making. At the same time, the level of transparency in the planning

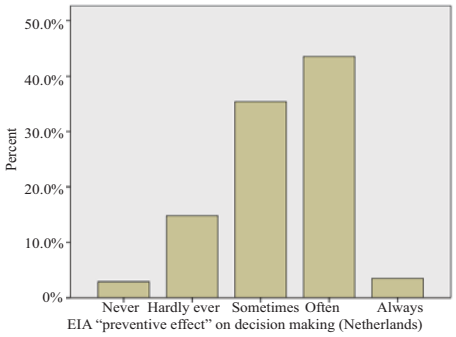

Figure 2.4 *Perceived occurrence of prevention effect*

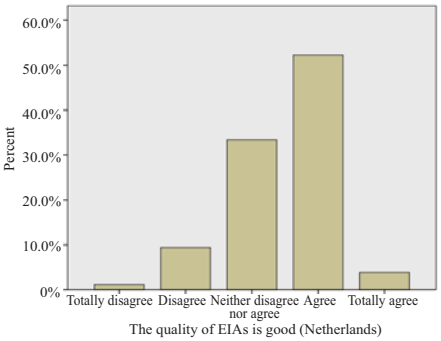

Figure 2.5 *Perceived quality of EIAs is good*

process is also important for the quality of EIA and SEA. Regarding the issue of *efficiency*, in practice there is often debate about the delays in decision-making (see discussion above). The study actually does not confirm this idea: the respondents indicate that EIA and SEA are only to a limited degree causing delay in decision-making. Moreover, respondents think that the revision of the EIA regulations in 2010 (the "modernisation of EIA" which focused much on efficiency issues) will be of little help to prevent delays. Actually, respondents think that doing SEA and EIA may help to make implementation of plans and projects easier. Similarly, the study concludes that only few think that SEA and EIA give rise to unacceptable costs for authorities or proponents.

2.2.3 Results: Governance Mechanisms

The "25 years of EIA in the Netherlands" study focused especially on the governance mechanisms in the Dutch EIA/SEA system. The majority of the respondents considered complying with legal requirements as the most important reason for environmentally responsible behaviour of proponents and authorities. However, often not much more is done than law requires. In other words, EIAs and SEAs are conducted and contribute to environmental awareness and revisions of plans primarily because EIA/SEA is mandatory, not (or less so) because actors want to achieve environmentally responsible outcomes with the help of EIA/SEA.

According to the study, other relevant factors for EIA/SEA performance prove to be: the quality of the EIA/SEA study, transparency of the planning process, an open attitude of the proponents and authorities to address environmental issues,

the costs of mitigation measures, careful communication and participation. According to the respondents of the study:

- SEA for plans has a limited effect, in the sense that it does not make EIA for projects redundant;
- Participation is important, especially for gaining public support for the SEA/EIA study. However the influence of the public on the quality of SEA/EIA is limited;
- The review of SEA/ EIA quality is considered as substantially important. The advice of the Netherlands Commission on Environmental Assessment (NCEA) is vital in this regard;
- The consideration of alternatives and of mitigation measures are both seen as fairly important;
- Ex post evaluation and monitoring (follow-up) is considered fairly important as well.

2.2.4 Results: Contextual Factors

Apart from the governance mechanisms in the Dutch SEA/EIA regulations, contextual factors are also important in determining the effectiveness of SEA/ EIA (Figure 2.1). Generally speaking, Dutch EIA practitioners consider the quality of EIA reports to be good (Figure 2.5) and consider this to be an important factor for overall effectiveness. However, the scope of EIAs/SEAs is perceived by many as often being too broad. Proponents in particular have this view, while the NCEA staff and more experienced respondents give this less weight. Furthermore, it is suggested that high costs of mitigation measures will limit the use of EIA/SEA results. Respondents state that transparency of EIA/ SEA procedures is good. They consider this an important factor for EIA/SEA effectiveness. Transparency can thus be considered as an important added value of EIA/SEA in decision-making. In addition, communication with authorities, proponents and stakeholders is seen as a relevant factor. However, this appears to be less important than what might be expected from suggestions made in professional literature on this topic.

Factors that are of lesser importance include the extent to which a proposal has been elaborated on. This may limit effectiveness (the issue of foreclosure) and the extent to which EIA/SEA is connected with decision-making. The

characteristics of the actors involved, such as the openness to environmental issues of the proponent and the authority, are seen as important. With respect to the decision-making context, the study does not suggest that other actors or instruments are currently replacing EIA/SEA or parts of it. Finally, many respondents indicate that more experience with EIA/SEA is an important factor for better EIAs/SEAs-the "learning by doing" effect.

2.2.5 Results: Controversy and Consensus

The study reveals that there is broad consensus amongst EIA professionals in the Netherlands about many issues. There are no significant differences with respect to the role of the respondents (authority, proponent, consultant, NCEA) or the sectors they work in (e.g. infrastructure, water management, industry etc.). There is some controversy about such issues as the clarity of the regulations, environmental awareness, delays, costs, and whether other instruments are taking over the task of EIA/SEA. The differences in opinion that do exist seem to be dependent on two factors in particular (for a discussion in more detail, see Runhaar et al., 2013):

- Experience with EIA/SEA: Actors with little experience are more negative-an "unknown, unloved" effect, while more experience actors have more positive opinions about EIA/SEA effectiveness-a "learning by doing" effect;
- How closely an actor is involved in the initiative: Actors who are more closely involved (such as proponents and competent authorities) are less optimistic about the performance of EIA/SEA than those who are less directly involved in the planning and decision-making (such as the NCEA). This might be related to benefit and burden distribution.

2.3 Study on the Performance of SEA and EIA

2.3.1 Approach

The study of Berenschot (2012) into the "Performance of EIA" focuses on the evaluation of the performance of EIA and SEA practices since the modernization of the Dutch regulations in July 2010. All initiatives (projects or plans) for which

the so-called "extended procedure" was followed under the new regulations and for which a consent decision had been taken, were considered in the study. From this population of cases (of 65), an a-select sample was drawn of 40 cases (95% confidence interval). For these 40 cases a document analysis was done. The researchers used a structured list of questions. Documents that were analysed include: the memo on the scope and level of detail of the assessment, the scoping advice of the Netherlands Commission for Environmental Assessment (NCEA), the EIA/SEA report, the review advice of the NCEA, and the consent decision. Additionally, for 28 cases, telephone interviews were held (28 competent authorities, 5 proponents). 70% of the cases studied concerned SEAs, 22.5% EIAs and 7.5% were combined EIA/SEA studies.

The study focused on the effectiveness of SEA/EIA in achieving its main goal-i.e., "ensuring that environmental considerations are taken into account in decision-making". To assess effectiveness two types of performance were studied (Figure 2.6):

- Does the SEA/EIA study influence (1) the final decision of the competent authority?
- Do the advices of the NCEA influence (2) the SEA/EIA study and/or (3) the final decision of the competent authority?

The assumption is that when there is performance, environmental considerations are indeed taken into account (Berenschot, 2012), which is similar to the analysis of the evaluation study into EIA performance by Ten Heuvelhof & Nauta (1996, 1997).

Figure 2.6 *Relationship between the performance of SEA/EIA* (1) *and the advice of the NCEA* (2 *and* 3).

In the analysis a distinction is made between actual performance and conceptual performance. The first relates to the direct application of analysis and advice in planning and decision-making. For instance, by using concrete recommendations in decision-making, such as including an alternative in the SEA report which has

been suggested in the NCEA scoping advice. The second type of performance (conceptual performance) relates to a situation in which the proponent or authority takes environmental issues into account in planning and decision-making as a result of enhanced awareness and learning.

2.3.2 Results: General Performance of EIA/SEA

The interviews reveal that the respondents are positive about the performance of SEA and EIA:

- The overall effectiveness in terms of taking the environment into account in decision-making is approximately 50% (ca. 40% is considered a little or not effective);
- 60% of the respondents have better insight into alternatives;
- 80% of the respondents have better insight into environmental impacts.

The respondents state that SEA and EIA performance is positive because it results in a more objective evaluation of impacts, streamlining of decision-making and in better participation of the affected public. Regarding conceptual performance, the study reveals that the behaviour of actors changed in ca. 50% (taking into account impacts, alternatives), especially because they were dealing with a legal requirement. These results are similar to the evaluation study of 25 years of EIA (University Utrecht & Groningen, 2011; see previous section) and are more positive than the 1996 performance study (Ten Heuvelhof & Nauta, 1996). The lowest level of performance is found for SEAs for revisions of (local) plans.

2.3.3 Results: Performance NCEA Advice

In this study the performance of the NCEA's advice regarding the scope of SEA/EIA studies and the review advice on the quality of the SEA/EIA report was analysed in a number of selected cases. The scoping advice of the NCEA has considerable influence on the EIA/SEA: in 61% of the cases the NCEA's scoping advice is fully implemented (meaning that all issues mentioned in the NCEA's advice are taken into account), in 39% of the cases is it partially implemented. The reason for this very high performance seems to be related to risk aversion on the side of proponents - not following the NCEA's advice is seen as a serious

risk for further progress of the planning and decision-making process. In this regard, it is interesting that in the cases for which an NCEA scoping advice was asked, some 60% of the cases led to a positive review advice by the NCEA, in contrast to only some 30% for the cases in which the proponent did not ask for a scoping advice of the NCEA. In most cases (60%) the SEA/EIA report contains a procedural description of how the NCEA's scoping advice has been dealt with (usually not content-wise). As a consequence of the NCEA's advice, issues have been dealt with more extensively in the EIA/SEA report. On the basis of the interviews it is concluded that the NCEA's scoping advice contributes to better quality SEA/EIA and also to risk management.

With respect to the review advice of the NCEA, it can be concluded that it is valued and taken seriously: in 63% of the cases influence in decision-making can be seen. However, it has to be noted that under the Dutch regulations it is a legal requirement that the consent decision is motivated, and that this motivation explains how the NCEA review advice has been dealt with. In 50% of the cases the NCEA advises positively about the quality of the SEA/EIA study. In 35% of the advices the NCEA concludes that there are serious flaws in the information. In case of the latter, the NCEA's review advice was followed-up in half of the cases. In the interviews there is also some criticism. The respondents consider the advice by Commission to be very detailed.

2.3.4 Results: Performance of SEA/EIA in the Decision

In 48% of the cases the performance in the decision is evaluated as high, in 33% as average. Only in 18.5% of the case was the performance appraised as low. The additional interviews provided a similar picture: 62.5% of the respondents consider that the SEA/EIA has performed well in decision-making (25% is the score for partially performance). The degree of influence varies: environmental information of the SEA/EIA may be used in the final decision by the competent authority, but in other cases another or adapted alternative may be chosen by the proponent. The reason for positive performance of the SEA/EIA report is that the information is useful, but also because of the legal risks of not considering the SEA/EIA. Other factors that influence the consent decision are-not surprisingly-financial, economic and political factors, which render rather less room for considering the EIA/SEA.

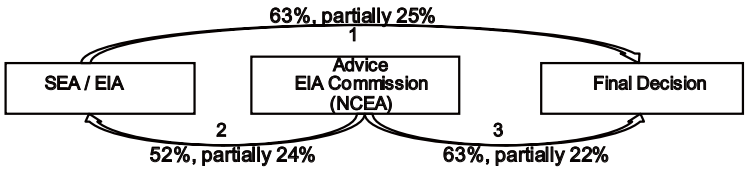

Figure 2.7 *Conclusions performance of EIA study*

The Berenschot study shows an overall positive picture of EIA/SEA performance, which is in line with earlier evaluation studies (Ten Heuvelhoff & Nauta, 1996; University Utrecht & Groningen, 2011)-see Figure 2.7. Also in this study, SEA/EIA seems to be effective because of it is a legal requirement, the quality of the NCEA's advice (although it is sometimes too detailed), and the risk associated with not following up advice and considering the EIA/SEA. However, respondents state that without EIA/SEA, environmental issues would also be considered in decision-making. Criticism concerning the efficiency EIA/SEA was also voiced: too complex, detailed, costly and lengthy.

2.4 Evaluation of Effectiveness of SEA in the Netherlands

2.4.1 Approach

In addition to the "Evaluation of 25 years of EIAs" and the "Performance of SEA and EIA" studies, Van Doren (2011) carried out a smaller but interesting study which is worth mentioning here. This study was part of a Master Thesis at the University Utrecht that was of sufficient quality to merit an article in EIA review (Van Doren et al., 2013). The focus of this study is on evaluating the effectiveness of SEA in the Netherlands. In contrast to the two evaluation studies discussed before, this is not a broad study, but an in-depth analysis of three SEA cases for Dutch national strategic plans (conducted before the new regulations of 2010). To this end, extensive literature/document research was done and 23 interviews were held with various actors in the SEA process (authority, proponent, SEA-maker, NCEA, stakeholders). The study discusses extensively the concept of effectiveness of SEA, and stresses the importance of contextual factors (see Runhaar & Driessen, 2007). It aims to assess not only procedural effectiveness and performance (contribution to decision-making)

but also the conformance and substantive effectiveness of SEA (contribution to environmental protection), which relates quite well to Sadler's (2004) discussion about the success of SEA (Figure 2.8).

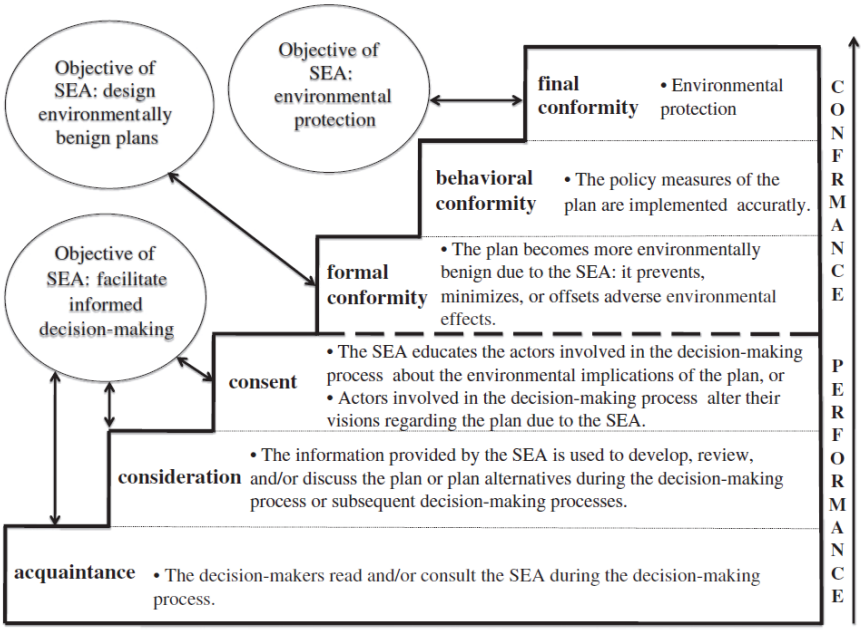

Figure 2.8 *SEA substantive effectiveness as an accumulation of conformance and performance (source Van Doren et al. 2013)*

2.4.2 Results of analysis of 3 SEA cases

Van Doren et al. conclude that higher levels of effectiveness (conformance, see Figure 2.8) only occur if lower level of effectiveness (performance) are achieved. In the three SEA cases studied elements of the various levels of SEA effectiveness were found, from performance to formal conformity. However, due to practical limitations of the research, the study has not found the highest levels of behavioural and final conformity.

Van Doren et al. found that the consideration of an SEA is better, if it is used as a pro-active policy development tool that influences the planning process. This is in accordance to the study of the Universities of Utrecht and Groningen (2011, see before) that concluded that SEA/EIA is regarded as a mandatory check prior to decision-making but that SEA/EIA is less often used to develop policy

as such. If SEA is used to actively develop the plan, the SEA will have more influence on the plan (SEA as a design tool). Accurate timing and integration of the SEA are interlinked and they are essential for SEA effectiveness. This relates also to good cooperation between SEA-makers and decision-makers. Similar to the study by the Universities of Utrecht and Groningen, Van Doren et al. (2013) conclude that the quality of SEA is important for its effectiveness. The quality is enhanced by independent review, experience, and (financial) capacity. Other important factors for effectiveness are: scoping, pragmatism, transparency, stakeholder participation and tiering (safeguarding that the SEA is well-linked to other SEAs/EIAs).

The study confirms that the impact of SEA on decision-making will be more significant if it is explicitly used as a tool to develop policy. When SEA is merely used to review predefined policy proposals it still has value, but its potential contribution to the planning process is significantly reduced.

2.5 Overall Conclusions about Effectiveness of SEA/EIA in the Netherlands

2.5.1 A Broad and Consistent Picture on SEA Effectiveness

The three recent evaluation studies into SEA/EIA effectiveness that are described above have applied very different approaches to evaluate effectiveness, although in each study the achievement of the formal goal of Dutch EIA/SEA ("to ensure that environmental values are fully considered in decision-making") was the central focus. Also the University Utrecht & Groningen study and the Van Doren et al. study both researches international literature extensively to inform their study approach. The three studies applied multiple methods, allowing for triangulation, which enhances the quality of the evaluations: surveys, interviews, focus groups, document analysis, and case studies. In addition, the studies used approaches similar to the evaluation studies into Dutch EIA/SEA effectiveness that have been done in the past (ECW, 1990, 1996; Ten Heuvelhof & Nauta, 1996) allowing for comparison with the results of these earlier studies. They differed with respect to providing a broad picture of Dutch practice vs. in-depth study of SEA examples. They also differed in whether they evaluated perceptions of practice or assessed the actual application in specific cases. Also

the three studies combined cover a long period of practice, before and after the modernisation of the EIA/SEA regulations of the Netherlands (Table 2.1). In short, with these evaluative studies in hand we have a rather firm, rigorous empirical base for drawing conclusions. Moreover, the three evaluation studies are remarkably consistent in their results.

2.5.2 Seven Conclusions

The three studies show clearly that SEA/EIA in the Netherlands is effective, although the efficiency is considered less positively-about efficiency there is more disagreement; some are rather positive others less so. This conclusion is not only consistent among the three studies but also with earlier evaluation research into Dutch SEA/EIA effectiveness-see ECW (1990), ECW (1996), Ten Heuvelhof & Nauta (1996, 1997), Van Kessel et al. (2003), Arts (1998) as well as international literature on Dutch SEA/EIA by Wathern (1990), Glasson et al.(1994), Sadler (1996), Sadler & Verheem (1996), and Wood (1995, 2003). As a consequence, we can conclude that SEA/EIA effectiveness is good in the Netherlands, and has been stable over the years.

On the basis of the evaluation studies discussed, seven main conclusions can be drawn:

(1) Regarding performance it can be concluded that SEA/EIA influences decision-making;
(2) The most important factors for SEA/EIA performance are the status of legal requirement of EIA/SEA and transparency of decision-making;
(3) The “prevention effect” (before SEA/EIA) is more important for SEA/EIA performance than the “correction effect,”which is adaptation of the initiative during SEA/EIA;
(4) SEA/EIA is seen as an obligation, in practice not much more is done than what is required (The question is whether this is bad or good);
(5) The quality of an SEA/EIA study is vital for performance, that the NCEA is instrumental with respect to this;
(6) SEA/EIA enhances environmental awareness;
(7) Regarding the side-effects of SEA/EIA (delays, and costs-relating to efficiency) it can be concluded that these are often heavily discussed and that there is disagreement, but in actually they seem of limited importance to effectiveness.

2.5.3 Seven Challenges

Although the effectiveness of SEA/EIA is high in the Netherlands, the evaluation studies make clear that important challenges for improving performance of Dutch SEA/EIA performance remain. These are:

(1) Complexity of current regulations, which hinders application in practice;
(2) Clearer screening, because screening is engaging significant capacity in practice (more focus on major decisions);
(3) Better scoping [leading to more inclusive (sustainability), but also more focused SEA/EIA];
(4) Prevention of too detailed information (related to a culture of juridification and risk aversion);
(5) Focus on environmental assessment for strategic decisions (plus careful tiering within the planning-cycle);
(6) More attention to later stages: follow-up, monitoring and evaluation of actual impacts;
(7) Improved image of SEA and EIA amongst "laymen", as a bad image might lead to more limited SEA/EIA application in the future.

The challenges mentioned above appear to be related in particular with the "perennial problems of EIA", as has been discussed in the professional literature for many years (see Ortolano &Shepherd, 1995; Sadler, 1996; Wood, 2003). In order to tackle these challenges, it might be necessary to become more innovative than has been the case until now– see the discussion below.

Although in the Netherlands the EIA/SEA regulations have been revised various times, there actually seems to be no need for new/different regulations. There seems to be a more urgent need to *better deal with* SEA/EIA in *practice*. This relates to such issues as: making SEA/EIA more tailor-made, a better focus on quality of studies, enhancing transparency, etc..

2.5.4 Seven Potential Issues

It can be concluded that after 25 years, EIA/SEA is just "part of life" in Dutch planning and decision-making. SEA and EIA do quite well in the Netherlands, but they are not well-loved in practice. The question is whether this is good or

bad. That SEA/EIA is not much loved is perhaps also a sign that the instrument is working. If the instrument was very popular in practice this could actually be a much more worrying sign with respect to its effectiveness. Changing behaviour and attitudes is never an easy thing. However, that SEA/EIA is not well-loved and predominantly seen as a legal requirement, which has to be done to prevent delays, legal risks further on in the planning process, is potentially detrimental to a healthy practice of SEA/EIA application. There is a danger of neglect, and too little investment in "maintenance" of the system. In this regard it is important to note that innovation in the of SEA/EIA seems to have subsided. For a viable SEA/EIA system, critical evaluating and frequent rethinking is essential.

To conclude, the most important challenge for SEA/EIA is connected with its primary functions, namely being an instrument for environmental appraisal and also an instrument for improving plan/project design and decision-making. True effectiveness requires a focus on both the environmental appraisal (for which the current instrument appears to work quite well) as well as the "greening" of plan and project design and decision-making. SEA/EIA currently does not appear to fully provide an effective platform for an open and creative discussion about plans, programmes and projects. The many formal and complex requirements do not appear to be conducive to this. Neither is the way in which public participation and the review by external advisors are currently organized. In practice, SEA/EIA only seems to fulfill the design function when the contextual factors are favourable, including an open attitude of proponents and authorities, and when there is still room for alternative designs. However, this doesn't appear to be caused by from the SEA/EIA system itself. To improve, this would most likely require other incentives as discussed below.

Potential issues for rethinking SEA and EIA are:

(1) Change the strong project focus in practice. This does not only relate to EIA but even SEA as currently applied in the Netherlands;
(2) Increase attention to environmental quality of regions, to network monitoring, to analysing trends in the state of the environment, and a less singular focus on the impact of initiatives (from an "inside-out" towards an "outside-in" approach);
(3) Shift focus from appraisal of impacts to developing plan/project (design);
(4) Link up better with the institutional setting (e.g. financial decision-making), contextual factors are essential for the performance of SEA/EIA;

(5) Increase capability of organisations and the professional network (experience, learning);
(6) Address those in society that are critical of the information provided by government and science (trust);
(7) Use a broad mix of governance strategies:

- Coordination (legal requirement, government decision-maker);
- Competition (level playing field, creativity, benchmarking, "open source information");
- Cooperation (participation, open planning, joint fact finding, joint visioning).

Instead of a strong focus on hierarchic governance by legal instruments and coordination with some elements of cooperative governance instruments such as participation added in, we should move towards a rich mix of coordination, real cooperation (including joint fact-finding, joint visioning) as well as elements of competition governance (e.g. smart use of green procurement, benchmarking and open source data).

3 Learning from SEA Practice in the Netherlands

Rob Verheem, Bobbi Schijf, Veronica ten Holder, Marja van Eck, Pieter Jongejans (*Netherlands Commission for Environmental Assessment*)

The Netherlands Commission for Environmental Assessment (NCEA) has been involved in EIA and SEA practice in the Netherlands for over 25 years. In addition, the NCEA has been active in international cooperation on EIA and SEA for 20 years. The focus of its SEA work in the Netherlands has been on independent quality assurance and on acting as a knowledge centre for Dutch practitioners, while outside of the Netherlands the NCEAs activities include both quality assurance, an international knowledge centre function and SEA capacity development. During the past 25 years the NCEA has aimed to summarize its practice experience in lessons learned on a regular basis, in order to make these available for SEA practitioners and academics both within and outside the country. This section gives an overview of some of the more recent lessons learned on SEA by the NCEA.

The lessons that will be drawn from the NCEA's involvement in Dutch SEA practice are mostly based on the lessons learned about SEA in specific sectors. Two sectors in particular have been looked at in more detail. These are spatial planning and water management (see also the separate chapters on these topics). Both sectors will be briefly described below, together with the specific insights on SEA effectiveness that have come from these sectors. After that, more general lessons on SEA are drawn up. Both the sectoral and more broadly formulated lessons learned have been established on the basis of expert judgement. One or two NCEA experts that work in the selected sector will analyse the NCEA's experiences in that sector, and look closely at selected cases, both at the SEA

reports and the NCEA's reviews of those cases. Once the key insights begin to emerge, the NCEA experts will consult with a wider group of professionals in the field, both within and outside the NCEA. This way the lessons learned are verified and refined as needed. Usually, the insights will also be presented and discussed with a larger group of peers at a conference or workshop. After this last test, the lessons learned are finalised and published.

This chapter concentrates on the lessons learned from SEA practice. In the next chapter these lessons will be compared to the conclusions that have come from the effectiveness evaluations that have been covered earlier in this book.

3.1 Lessons Learned on SEA in Spatial Planning

In the Netherlands SEA is used to support decisions on the necessity and objectives for new spatial developments, including locations and institutional organization, i.e. the authorities and instruments to be engaged to achieve these developments. One particular field of spatial planning SEA has emerged in recent years. These are the SEAs for so-called "structure visions". Since July 2008 all tiers of government in the Netherlands (central, provincial and local) have to draw up spatial structure visions for their territory. In these structure visions a long term spatial planning strategy is developed. A structure vision outlines the desired spatial developments of the area that it covers, and also explains which authorities and instruments will be engaged to achieve these developments. It is a guiding document for government, civil society, the private sector and for citizens that clarifies the spatial policy of the territory concerned. In most situations, these Structure Visions need to undergo a SEA. The NCEA (2010, 2011) has drawn out a series of lessons on the application of SEA to this type of strategic spatial planning. Application of these lessons should increase the effectiveness of the SEA. The following lessons have been learned:

- Structure Visions differ greatly in terms of geographical boundaries, complexity of the planning issues and level of ambition. Each SEA application should be tailored specifically to the planning process it supports. It is important to define environmental targets of the spatial plan at an early stage and to ensure that the SEA supports decision-making on key planning dilemmas, by setting out and comparing alternatives that address these dilemmas directly.

- Choose an assessment approach that is appropriate to the choices in the plan. E.g. make a deliberate choice between concentrating the SEA on the environmental consequences only or for the assessment to also include economic and social effects.
- Broadening the assessment to include economic and social aspects has the added benefit of bringing together all the relevant information needed by decision-makers, in a balanced and systematically arranged manner. However, sustainability means different things to different people, so if this approach is taken, clear agreement on what can be expected of the SEA should be reached at the start. For example, the Dutch Province of Drenthe wanted a broad approach to the SEA of their structure plan. In the beginning of the SEA, it was discussed how the concept of sustainability should be applied to the provincial planning process. Ultimately, the Province chose to use the methodology of the Dutch National Sustainability Outlook to develop and compare spatial alternatives and measures in their SEA.
- Consult parties involved (decision-makers, citizens, stakeholders) in the beginning. Early consultation accelerates planning processes more often than that it slows them down.
- Often, the environmental information collected at the SEA stage can be used later on during plan implementation, specifically in project EIAs that follow. In this way, the investment in the assessment at the strategic stage pays off further down the line.

For further coverage of the lessons learned in spatial planning SEA in the Netherlands, see also the chapter “Practice illustration: SEA for long-term structural design planning in the Netherlands”.

3.2 Lessons Learned on SEA for Water Management Strategy

Recently the Dutch government adopted a new system of water planning, both because of the need to better integrate climate change into flood prevention and because of new EU water regulation. The new system consists of a 4-tiered approach: national plans, river basin plans, provincial water plans and local water plans. Aside from safety (flood management), and climate change, these water plans also address themes such as water shortage and water quality, particularly

in relation to ecology. The plans then set out short-term and long-term water policy as well as listing specific measures chosen. They also determine spatial planning aspects related to water, such as the designation of sites for water storage.

The NCEA has looked specifically at SEA application in the preparation of the Dutch national water plan and of 6 provincial water plans, and can draw a number of conclusions on effective use of SEA for strategic water management (Jongejans, 2012):

- In the Dutch context, the SEA contributes more clearly to optimization of positive environmental effects, than to identification and mitigation or prevention of negative effects. This is because the water planning approach in the Netherlands is strongly focussed on finding win-win options that combine environmental protection and nature protection and development. Given this approach, the SEAs mostly showed that the environmental effects of the water plans were positive.
- Most SEAs were applied too late to be optimally effective. Particularly in provincial SEAs, it turns out that many strategic decisions have already been made in earlier spatial planning decisions. At national level the SEA only started after a draft plan had already been prepared and broad consensus achieved on the key policies. This limited the SEAs contribution to systematic collection of environmental information, and the exploration of strategic policy alternatives, such as reducing freshwater demand.
- Despite this late application, practice shows that the SEAs did provide added value, particularly:
  - The SEA processes helped to increased coordination and collaboration between water managers and to organize joint development of measures by stakeholders.
  - They improved consultation in decision making, leading to a better insight of government in the level of support that exists in society for water related measures, and helping to build support for sustainable approaches with decision-makers and others.
  - Optimisation of the win-win options for water management and nature protection and development. For example, the Province of Friesland developed additional monitoring and management measures in their SEA to ensure that the policy of fixing the level of

water in certain drainage pools would not negatively affect nature reserves in the area.

  - ◇ Improved risk management through risk assessment in the SEA. In the provincial water plans for North Brabant and Limburg, for example, some risks of the proposed policies in the water plan were identified in the SEA, such as the possible release of phosphate when groundwater levels are raised.

- In all the SEAs considered the impact evaluation was influenced by significant uncertainty in the results, because of the strategic nature of the planning decisions. This does not preclude effective SEA, but does mean that dealing with these uncertainties is an important part of the SEA process.

On the basis of these lessons learned, some recommendation for increased SEA effectiveness in water management can be made:

- Start SEA earlier in the process.
- Include stakeholders earlier in the process.
- Manage the uncertainties, for example through including a good sensitivity analyses in the SEA.

For a more detailed analysis of the lessons learned in SEA for Dutch water planning, see also the chapter "Practice Illustration: SEA for Water Planning in the Netherlands".

3.3 Overall Lessons Learned on SEA Effectiveness

Based on the lessons learned on SEA application in the two sectors described above, the NCEA has recently formulated some more generic lessons (Ten Holder, 2012b). The options for further increase of SEA effectiveness may be summarized as follows:

- Growing importance of a tailored SEA process design. In early SEA application in the Netherlands emphasis was the legal procedure itself. This has now shifted to emphasis on translating this legal procedure into an effective SEA process, tailor made to the characteristics and objectives of the planning process to which it contributes.

- A move from providing comprehensive information to providing selective information. Early day SEA often suffered from an effort to try to collect and provide too much information. This was partly due to an attempt to minimize as much as possible juridical risks attached to missing legally required information. SEA practice has shown that a scoping process that leads to exactly the right information for the key issues in planning will hugely increase SEA effectiveness. Through its independent advisory role the NCEA tries to contribute to the quality of the scoping process.
- Increased application of integrated approaches over a strict environmental focus. Although not required by regulation, recently the NCEA has seen an increased number of SEAs that link environmental issues to social and sometimes even economic issues. This is improving the contribution SEA makes to providing government agencies insight in what would be a more sustainable development, rather than just an environmentally friendly development.
- SEA should be better integrated into the planning process. One of the key objectives of SEA is to provide government and stakeholders with reliable information on which to base dialogue and decision making. In many cases this information is formally provided in a SEA report late in the planning process. SEA practice has learned that information is needed throughout the planning process, rather than just at one point. Therefore currently experiments are taking place in which SEA attempts to provide tailored information throughout the process. To find the optimal timing and format of this information is part of these experiments.
- A need for quality assurance throughout the SEA. Logically linked to the previous issue is a changed role of the NCEA as independent quality assurance mechanism. Part of the integration experiment is to find out what it would mean if the NCEA would play a role throughout planning, rather than just at one point, without adding significantly to the financial costs of NCEAs role. Also, the experiments focus on issues such as confidentiality versus transparency, and how a process role would affect the independence of the NCEA.
- Independent quality assurance prevents juridical problems. More and more environmental and nature regulations are based on European rather than on national regulation. This makes it more complex for Dutch government agencies to keep track of developments in both interpretation

and jurisprudence of this regulation. Misinterpretation leads to plans and programs ending up in court cases, creating frustration, time delays and inefficiency in the planning process. Recent evaluations of the SEA process in the Netherlands shows that through its knowledge function and independent advice the NCEA contributes to preventing juridical problems. However, it does not add to NCEA's popularity with decision makers, since the NCEA often is the messenger of bad news.

- Keep regulation on scoping and research into alternatives strong. Dutch government is debating options to make the SEA process "simpler and better". Clearly, in this process those elements that are crucial for SEA effectiveness should be kept, and indeed be further improved. Recent Dutch research into SEA effectiveness (see the pervious chapter) shows that effective scoping and solid research of alternative planning options are among such elements.
- SEA and EIA are complementary. The growing attention to SEA application has sometimes raised the issue whether it would be possible to stick with assessment at one level, rather than applying it at both strategic and project level. SEA practice experience shows that SEA effectiveness would seriously diminish if in the SEA an attempt was made to include information with a level of detail that is needed to satisfy the needs of project decision making.
- Communication is a critical issue in preparing SEA reports. SEA is effective if it supports the information base of all the stakeholders in the plan process. However, this is not an easy task since different stakeholders require different kinds or formats of information. The SEA reports should not only be directed at government agencies, but also at NGOs. Information should not only be comprehensible to technical experts, but also to higher level planners and decision makers. Communicating the results of the SEA is critical for SEA effectiveness and in practice often needs improvement.
- Uncertainties are often not dealt with effectively in SEA. Due to its strategic nature, predictions in the SEA will always be with some substantial uncertainty. In practice the way that this uncertainty is dealt with is often by increasing either the amount of effort put into the impact assessment (more studies), or the level of detail of the information. This, however, often does not lead to less uncertainty, but rather to decreased effectiveness and efficiency of the SEA. A more effective option would

be to tackle uncertainty in SEA through the adoption of "adaptive planning". I.e. accept the uncertainty and aim the SEA on developing a good monitoring system of plan implementation, and clarifying the measures that government can take in the case of undesirable unforeseen events.

The application of these lessons learned from Dutch SEA practice should help to improve the effectiveness of SEA in the Netherlands. That is the reason that the NCEA invests in documenting these lessons. The recent studies into the effectiveness of EIA and SEA that have been described in the previous chapter have the same objective. But do practice and research result in the same insights on what works and what does not in SEA? In the next chapter the results from both Dutch efforts are compared. The lessons learned on SEA from the Netherlands are then contrasted with those learned from SEA application to mega-region planning in China.

4 Comparing Lessons Learned from Dutch SEA Research and Practice, and between China and the Netherlands

Rob Verheem (*Netherlands Commission for Environmental Assessment*)

The conclusions of the three EIA/SEA effectiveness studies presented in the chapter by Jos Arts are overwhelmingly positive: SEA in the Netherlands is perceived as highly effective, it influences decision making and enhances environmental awareness. The factors that seem to explain this high level of effectiveness are the legal basis for SEA and the transparency that SEA adds to the planning process. Most respondents consulted in the effectiveness studies do not perceive the costs and time involved in the process as stumbling blocks, nor do they see SEA as a delaying factor in the planning process.

The NCEA's conclusions on the basis of Dutch SEA practice focus not so much on the effectiveness of the SEA at system or country level, but rather at process level: what makes an effective SEA process? In the previous chapter the NCEA concludes that SEAs which are tailored to their context are more effective than any standard design can be, that ongoing communication with and between stakeholders during the process is crucial and that independent quality assurance throughout the process brings advantages, such as fewer legal procedures following decision-making. The NCEA furthermore finds in its practice that while a good SEA makes subsequent EIAs much easier to do, it does not replace EIA; the two instruments are complementary.

Comparing the conclusions, challenges and recommendations of the Dutch effectiveness studies with those from the NCEA's practice it becomes clear that there is agreement on four issues. Many recommendations made in the two chapters are complementary. However, there is also divergence on one topic: why is SEA effective? The areas of agreement and of discussion, as well as the recommendations, are discussed further below.

4.1 Points of Agreement between Dutch Effectiveness Research and Practice Observation

Four overall issues emerge that both the effectiveness studies and the NCEA indicate as important for improved SEA effectiveness. In the first place: the need to be selective in the information an SEA should deliver to decision makers and the public. Focus should be on the key issues only, the SEA should not be overburdened with irrelevant or too detailed information. In other words, scoping is of the utmost importance and for this reason particularly the NCEA has repeatedly argued the merits of scoping as a mandatory component of the Dutch SEA procedure. There is also consensus that SEA should evolve towards a broadened focus: i.e. on integrated assessment-including economic and social issues-rather than environmental assessment only. Indeed, it is recommended that SEA should be applied as one of the key tools for assessing a plan or program's contribution to the sustainable development of a region or sector.

Thirdly, the effectiveness studies state that "the quality of SEAs is vital for its performance, and the NCEAs reviewing role is instrumental with respect to this". This links well with the added value the NCEA finds in expanding the independent quality review role from taking place at one particular point in the SEA process, to providing quality assurance *throughout* the SEA process. This SEA process, and this is the fourth recommendation, should start much earlier in the planning process than currently is the case. Both the effectiveness studies and the NCEA agree that currently the focus in Dutch SEA practice is too much on impact assessment of an existing draft plan, rather than on supporting the design of this draft plan. If an SEA is integrated into the development of the plan, this will increase the effectiveness of SEA in achieving sustainable development.

4.2 An Issue for Further Discussion

An interesting conclusion drawn by the "25 years' effectiveness" study is that the "prevention effect" of SEA is perceived as much higher than its "correction effect". In other words: the fact that a draft plan has to pass through an SEA process is more effective in improving the environmental quality of the draft than any changes made to the draft plan as a result of the SEA process. Although this is not the first time that this effect is remarked upon - it has been raised in earlier publications - this effect does at first sight contrast with the significant added value of SEA to planning and decision making that the NCEA finds in its practice (Box 1). Also, there is seeming tension between the conclusions of the effectiveness study on the prevention effect and the conclusions that the quality of SEA is "vital for its performance". Why would the quality of the SEA matter, when the prevention effect results simply from the fact that an SEA is required? One hypothesis may be that the prevention effect only occurs in cases where a government agency responsible for the plan/SEA process knows that the SEA process will not be a formality, but that is will be subjected to stakeholder expectations, as well as procedural safeguards intended to ensure a high quality process. Another hypothesis is that respondents consulted in the studies underestimate what happens during the process. This is an interesting issue for further research.

Box 1 *Added value of the Dutch SEA process according to the NCEA*

- Helped in organizing joint development of measures by stakeholders.
- Improved coordination and collaboration between managers.
- Improved consultation, leading to a better insight of government in stakeholder preferences and perceptions.
- Contributed to highlighting local priorities in strategic decision making.
- Enhanced nature protection through better insight in win-win options, and in general led to better knowledge of better options from an environmental viewpoint.
- Led to better risk assessment and management.

4.3 Recommendations and Issues for Rethinking SEA in the Netherlands

As stated before, most recommendations from the effectiveness studies and from the NCEAs experience are complementary. However, they are about different things. A summary of these recommendations is given in Box 2.

Box 2 *Recommendations on making SEA more effective in the Netherlands*

From the effectiveness studies:
- Simplify SEA regulations;
- Apply SEA for major decisions only;
- Give more attention to SEA follow-up, monitoring and evaluation;
- Improve the image of SEA amongst "laymen".

From NCEA practice observations:
- Better integrate SEA into the planning process;
- Define the environmental objectives of a strategic decision at an early stage;
- Keep examination of alternatives a legal requirement of SEA;
- Build alternatives around the key planning dilemmas;
- Give more attention to dealing with uncertainties, as this currently takes place insufficiently;
- Make a deliberate choice between an environmental and an integrated focus;
- Organise stakeholder consultation early.

In the discussion of effectiveness studies by Jos Arts the recommendations for SEA are taken further to addresses the possible need to perhaps start "rethinking" SEA as applied in the Netherlands. This would help to tackle some of the potential weaknesses of the current Dutch SEA system, which include the following:

- Currently SEA has a strong focus on the impacts of the concrete projects that may follow from strategic decisions. Change this to a focus on strategic choices and visions.
- Change the current emphasis in SEA on impact assessment, to an assessment of the environmental quality of regions, networks monitoring and trends in state of the environment.

- Better link the SEA to sectoral and other decision making processes that provide the context for the planning process, such as financial decision-making.
- Put more effort in increasing the capability of organisations and professional networks (experience, learning) to play their role in the SEA process.
- Realise that currently there is a "credibility crisis" in the public's perception of science-and thus government decision making that is based on it-and do something about this.
- In improving SEA, use a broad mix of governance strategies:
  - ◇ Coordination: legal requirement, government decision-maker;
  - ◇ Competition: level playing field, creativity, benchmarking, "open source information";
  - ◇ Cooperation: participation, open planning, joint fact finding, joint visioning.

4.4 Comparing Lessons Learned on SEA between China and the Netherlands

Combined, the conclusions from Dutch effectiveness research and the NCEA's analysis of SEA practice set an ambitious agenda for SEA in the Netherlands. Cooperation with China on the topic of SEA can inform the activities under such an agenda. In China, similar reflections have taken place on recent SEA experiences. Particularly, Chinese government experts and scholars have jointly analysed the lessons learned from application of SEA to mega-region planning. These have been documents in the first part of this book. The insights from this Chinese practice make an interesting comparison to the messages coming from Dutch practice and research on SEA.

First of all, it is clear to see that the mega-region SEAs in fact incorporate a number of the issues that could be considered in a possible "rethinking of Dutch SEA". Particularly:

- The mega-region SEAs directly focused on strategic choices and visions -the "source" -rather than the concrete projects that come out of these choices.

- The assessments are based on a description of current environmental quality of the mega-regions and the trends in this quality.
- Throughout the assessment the SEAs link regions and sectors that are involved in decision making on both industrial development and environmental protection, and even develop an organization model for this cooperation.

The analyses of the Chinese and Dutch experiences converge where they conclude that SEA application in the two countries is successful and influential (see Chapter 4 in the mega-region text and Box 3 below), with both countries reporting, for example, better insight in win-win options between economic and environmental development, joint stakeholder development of measures and better cooperation between managers.

Box 3 *A summary of success mentioned in the Chinese 5 mega-regions SEA case study*

- Led to a better inclusion of environmental protection in integrated decision making.
- Brought environmental issues to the "source" of decision making on industrial development, i.e. the strategic decisions on layout, structure and scale of this development.
- "Broke through" administrative and bureaucratic boundaries that otherwise could have prevented integrated decision making.
- Explored and showed ways in which environmental protection may optimize economic development.
- Has helped in optimizing regional development and environmental management models.
- Promoted cooperation between different sectors and regions and developed an organizational model for this purpose.

In both countries there is also still work to do (see Chapter 4 in the mega-region text and Box 4 below). In part the future challenges are different in nature. Many of the Dutch recommendations, for example, focus on "refining" rather than "reinventing" an already well developed process. This is probably due to the fact that the Dutch SEA process has already been in place for over 25 years, and that the foundation has by now been established. However, both countries emphasize the need to further increase the capability of organisations and professional networks that play a role in SEA. Similarly, both countries need to give more attention to SEA follow up, monitoring and evaluation.

Box 4 *Some recommendations in the 5 mega-regions SEA case study*

- Raise awareness within government of the SEA and its outcomes, including: more and better SEA training within government, the establishment of SEA working groups at the level of local government and publication and dissemination of SEA results, and the organization of SEA seminars.
- Prepare more specific and operational environmental guidance in the basis of the SEA.
- Better integrate SEA and its outcomes during the implementation of plans and programs, including tracking the application of the guidance that came out of the mega-region SEA.

5 Towards Effective SEA Systems

Bobbi Schijf, Rob Verheem, Ineke Steinhauer, Gwen van Boven
(*Netherlands Commission for Environmental Assessment*)

The previous chapters have reflected on lessons learned from research and practice within the Netherlands. In this chapter we will present evolving insights into SEA that have come from the international work of the Netherlands Commission on Environmental Assessment (NCEA). This international work has led to a systems approach to SEA effectiveness, which serves both for analysing the quality of existing SEA systems in the countries with whom the NCEA cooperates, as well as for measuring the contribution the NCEA makes to these systems. Indeed, it could even be used to assess the quality of the SEA system in the Netherlands at some future time.

5.1 A System Approach to SEA Effectiveness

In its international work the NCEA strives to contribute to "better SEA systems, more SEA capacity and better SEA process" in the countries with which it cooperates. Recently the NCEA was challenged by the Dutch Ministry of Foreign Affairs, which subsidizes the majority the NCEA international programs, to make these objectives more tangible and measurable. In response, the international section of the NCEA embarked on an endeavour to translate the lessons learned from both its Dutch and international practice into an "SEA systems approach" (NCEA, 2014). This approach looks at the factors that determined SEA practice in a country (or other regulatory entity such as a province), and distinguishes three levels: the system level, the organization level and the process level. For each level key effectiveness criteria are identified. Each criterion is subsequently translated in a set of indicators, including means of verification, enabling assessment of the criteria. In most cases this assessment is qualitative, although some indicators are assessed quantitatively.

5.2 SEA System Level

At the system level, six key criteria for an effective SEA system are formulated. These stand for what a country SEA system should deliver to enable effective SEA processes. We have named these criteria the "functions" of the SEA system. See Figure 2.9.

Figure 2.9 *Functions of an SEA system*

For each of the 6 "functions" a set of indicators is formulated. These are the desired "results" of each function, e.g.:

- Provide regulatory SEA framework. Indicators for a well functioning SEA system are:
  - ◇ Regulation is in place;
  - ◇ Regulation is of sufficient quality (against benchmark);
  - ◇ Guidance exists, is accessible, and is of sufficient quality.
- Raise awareness, commitment and funding for SEA. Indicators are:

- ◇ Sufficient budget to perform SEA tasks;
- ◇ Sufficient attention to SEA in the public domain (e.g. media);
- ◇ SEA is high on political agenda and decision makers involved in SEA practice;
- ◇ Sufficient interest and participation in SEA events (e.g. conferences etc.);
- ◇ Recognizable, accepted, and effective leadership on SEA.

- Etc.

5.3 SEA Organisations Level

It is essential for the effectiveness of an SEA system that the organisations that have a responsibility in this system have the capacity to perform their role. This applies both to government organisations that have formal roles in the system, and to non-governmental organisations that have informal roles, such as NGOs and Universities. See Figure 2.10.

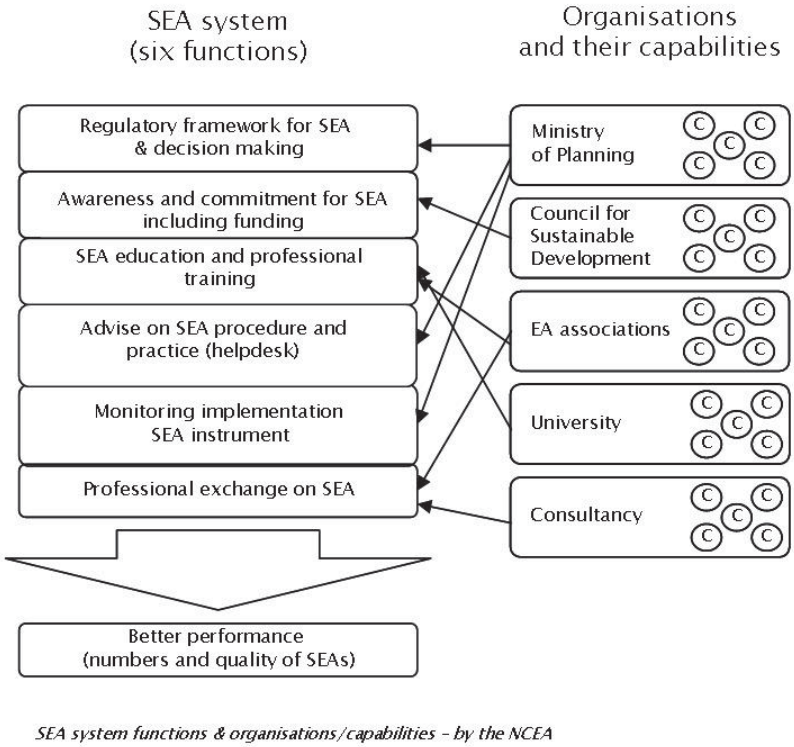

Figure 2.10 *Relation between system functions and organisations*

What does "capacity" mean in this context? When can it be concluded that an organization has sufficient capacity? To address this issue the NCEA benefits from the results of a major research effort undertaken by the IOB (2011), a department of the Dutch Ministry of Foreign Affairs. In this research, seven Dutch organizations-including the NCEA-involved in capacity development in international cooperation were evaluated on their effectiveness. From this evaluation it was concluded that any effective organization needs to have five "capabilities", together making up the "capacity" of an organization. The five capabilities (which in fact are the effectiveness criteria for organisations) are:

- The capability to act: for example, does the organization have a clear mandate for what it tries to do? Does the organization possess a strong and effective leadership? Etc.
- The capability to achieve results: does staff have sufficient skills? Does the organization have sufficient budget? Etc.
- The capability to relate: does the organization have access to an effective network? Does it effectively manage its relations? Etc.
- The capability to be consistent & coherent: does the organization have a clear vision of where it want to go? Does it have effective procedures for what to do under which circumstances? Etc.
- The capability to adapt & renew: is organization capable of learning? Is it flexible enough to adapt to changing circumstances? Etc.

For each of these five capabilities, the NCEA formulated SEA-specific indicators. For example, for the Capability to act these are:

- Mandates clearly defined in legal texts;
- Decisions are taken in time, communicated and acted upon;
- Organisations have committed and stable leadership;
- Organisations have a clear & functional organizational structure.

5.4 SEA Process Level

Together the SEA organisations have the capacity both to run an effective SEA system, and deliver effective SEA processes. See Figure 2.11 (and please note that the arrows in this Figure have been included for illustration purposes only; in reality these will differ from country to country, system to system).

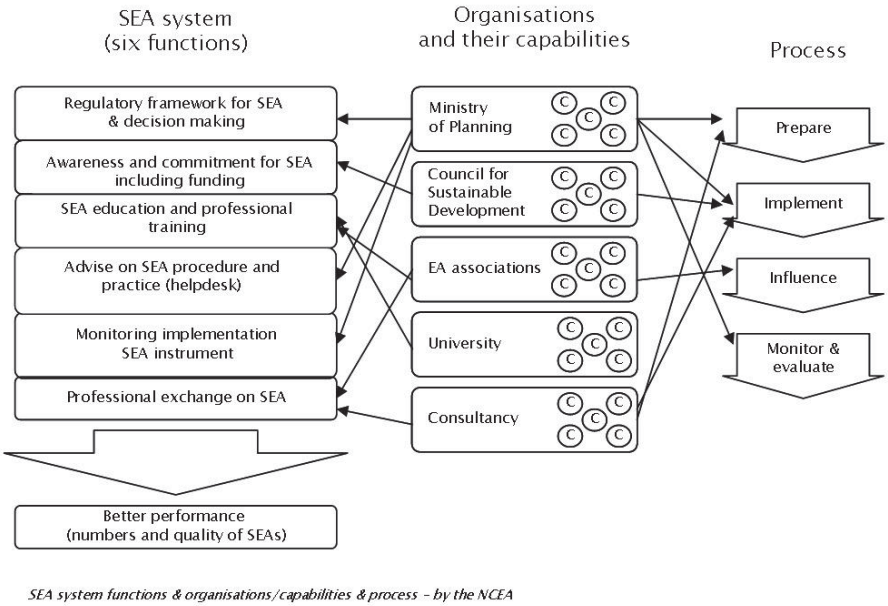

Figure 2.11 *Relationships between SEA process, organisations and system functions*

For the process level the NCEA applies the following five criteria to determine what constitutes an effective SEA:

- Good quality of the SEA report and process;
- The SEA leads to improved quality of the decision making process;
- The SEA leads to improved sustainability of adopted policy, plan or program;
- The SEA improves quality of other levels of decision making, e.g. EIAs or other sectors;
- The SEA strengthens improved capacity of organisations (through training on the job).

As with the system and organization criteria, for each of these criteria a set of indicators is formulated, for example for Good quality of SEA report and process these are:

- The assessment is complete and of appropriate scope;
- Alternatives are identified, compared and translated into recommendations for plan;

- Options are addressed to manage risks in plan implementation;
- Key stakeholders in the plan are involved in process and reporting;
- SEA well integrated into the plan process.

5.5 Application of the SEA System Approach

As stated before, the original incentive to formulate the SEA system approach was a request by the Ministry of Foreign Affairs to make the results of the NCEA's work more tangible and measurable. In its results reporting on its activities in the next few years the NCEA intends to use the formulated criteria and indicators in its daily work. Clearly, in this regard, scoping will be important. After all, in its country programs the NCEA seldom works with all institutions relevant for the SEA system, or on all of the 6 functions of the system. So we will focus on a limited set of indicators that relate to the issues we have been working on. Doing this, we expect to be able to come up with more consistent results of our work.

So far, the systems approach has proven to be useful with the formulation and monitoring of the results of the NCEA's international working programme for 2013. In the next years, we intend to investigate whether the SEA system approach may also be effective in carrying out SWOT analyses of countries that want to get better insight in the weak elements of their SEA system that need strengthening.

6 Practice Illustration: SEA for Long-term Structural Design Planning in the Netherlands[1]

Marja van Eck (*Netherlands Commission for Environmental Assessment*)

Since 1 July 2008, all tiers of government in the Netherlands (central, provincial and local) have to prepare long-term structural design plans for their area containing the main points of the spatial policy. When such plans contain framework decisions for developments or activities for which EIA is mandatory, SEA is mandatory.

From the practical experience available on SEA of long-term structural design plans it appears that SEA can deliver added value in different ways. This is illustrated by the following cases.

6.1 Case: Comparison of Alternative Future Scenarios for the Plan Area: the Randstad Case

In this case, central government wanted to make all sorts of decisions for the short to medium term about the extent and location of house building, activities and infrastructure in the Randstad (the west of the Netherlands, including the four biggest cities). The administrators wanted to position these decisions in the perspective of a long-term view of a sustainable future for the Randstad. Several fundamentally different alternatives for that future scenario were conceivable.

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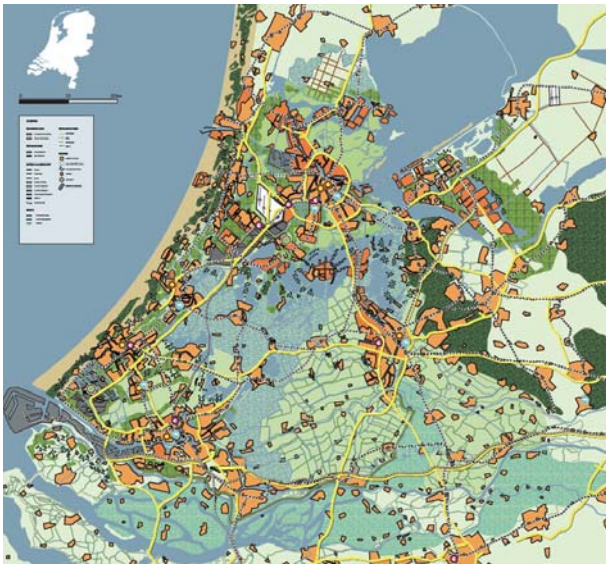
1 This chapter was first published as an article in Views and Experiences, 2009, Netherlands Commission for Environmental Assessment, Utrecht (available from: www.eia.nl/en/publications/publications-by-the-ncea).

The SEA report for the Randstad presented three different future visions of the area in 2040 side by side and compared them, using a reviewing framework. In this SEA report an integrated framework for assessing the sustainability of development was used. It considered more than just the environment (Box 1). The reviewing framework focused on people, profit, planet-now and later. On the basis of this comparison a preferred model was developed. This was administratively specified in the Randstad 2040 long-term structural design plan which now forms the reference framework for future decisions on concrete projects.

Model World City



Source: SEA report for the structural design plan Randstad 2040. By Oranjewoud and CE Delft, commissioned by the Ministry of Housing, Spatial Planning and the Environment, 2008.

6.2 Case: Testing the Proposed Policy in Terms of Sustainability for Overijssel

In Overijssel (one of the Dutch provinces) there was a general idea of what a sustainable province should look like in 2040, but the administrators were unsure whether this was achievable with current policy. They wondered whether sufficient measures were available for guiding development towards the desired future scenario.

The SEA report went into whether the provincial policy as proposed in the long-term structural design plan would be more sustainable than continuing current policy (Box 2). The SEA report revealed that the proposed policy was indeed an improvement, but that problems of traffic nuisance, acidification and desiccation of nature reserves, and of climate change (CO_2 reduction targets) were not sufficiently addressed. Possible supplementary measures had to be sought.

Box 1 *Highlights of the SEA for Randstad 2040*

Government: Central

Area: Randstad, the area in the west of the Netherlands where four major cities lie around the rim of an area with nature conservation, recreation and agricultural functions.
Long-term structural design plan: Future vision for 2040

SEA report:

The alternatives in the SEA report were developed in design workshops. First, the themes green and water, "networks" and "urbanization" were explored and the out - comes were discussed. On the basis of this, three integral models were constructed according to the principles of "creating space" (Coastal City), "enlarging space" (World City) and "going to where space is" (Outer City).
The same indicative specification of the land use for 2040 was incorporated in all three models. Each model contained its own particular vision of the structure of the networks (spider, ladder, archipelago).

- World City is primarily to do with the location of the urbanisation and with how concentrated it could and should be.
- Outer City investigates the pros and cons of urbanisation spreading out from the rim of the Randstad.
- Coastal City investigates the role of the coast as a catchment area to relieve the pressure of urbanisation.

The models were compared using a sustainability matrix (people, planet, profit/here and now, elsewhere and later), in which assessment criteria were filled in per cell more specifically for the SEA report.

	people	planet	profit
Here and now			
Later			
Elsewhere			

The assessment was mostly expressed in qualitative terms, in the form of a motivated expert opinion. It was attempted to combine the best of the models in a "Cabinet's Vision" , which is the basis of the Randstad 2040 long-term structural design plan (Table 2.2).

Main message

The main conclusions from the SEA report are that the best alternative to emerge from the comparison is the World City model (concentrating the urbanisation, e.g. by transforming the urban area), with the Cabinet's Vision taking second place. However, the Cabinet's Vision is more adaptable to possible future unexpected devel- opments and fits in better with Dutch people's housing wishes, because it entails less high-rise.

Time and effort

The SEA procedure began in March and the draft EA report was ready in August. It was 80 pages long, plus 40 pages of annexes.

6.3 Case: Location and Routing Considerations

The more traditional approach still remains usable along side these newer approaches (Box 3). The SEA report then focuses on large new construction schemes in the plan area, goes into their usefulness and necessity, and evaluates alternative locations. That was the main thrust of the SEA report produced by Woerden municipality to accompany the new long-term structural design plan for an industrial area and two large recreational facilities.

The approach works well if there are several relatively straightforward construction schemes planned in the short term (next few years) and otherwise few actual sticking points requiring a drastic change in policy.

Table 2.2 *Assessment table "Here and now": Randstad 2040*

		World city	Coastal city	Outer city	Cabinet's vision R2040
Subsurface/water	Flooding & safety; water storage	1	3	1	3
	Extent to which functions fit in with the properties of the subsurface	1	4	2	2
	Probability X as a result of calamity (flooding)	3	4	1	2
Energy & raw materials	Potential to approx. halve CO_2 vis-à-vis 1990	1	4	2	2
Mobility	Accessibility of other people & facilities (shops, schools, sport, etc.)	1	4	2	2
	Accessibility of businesses (for people and goods)	1	2	3	3
	Quality and linkage of networks (public transport, cars, bikes)	1	3	3	2
Nature	Conservation of the quality of Natura 2000/ National Ecological Network	2	4	1	2
	Space for new nature in the Randstad	1	4	1	1
Landscape quality	Opportunities for improving spatial quality, restructuring	1	2	4	2
	Opportunities for improving spatial quality, fragmentation	1	4	1	1
	Recognisability of historical landscapes	1	4	3	2
Quality of residential environment	Noise nuisance	4	2	1	3
	External safety (controlling the risks to the environment from the use, storage, and transport of dangerous substances)	2	1	4	3
	Social cohesion/engagement of people in their residential environment	4	3	1	2
	Safe residential environment	4	1	1	3

Source: SEA report for the structural design plan Randstad 2040. By Oranjewoud and CE Delft, commissioned by the Ministry of Housing, Spatial Planning and the Environment, 2008.

6.4 Case: New Approach to Civic Participation in Amsterdam Case

The advent of SEA for long-term structural design planning also led to experimentation with new forms of involvement and civic participation. More than previously, stakeholders and the general public are consulted at the start of the process by means of meetings and by actively seeking out people. Their comments and wishes are used as building blocks. On the basis of this information the administrators in Amsterdam defined their ambitions and stakes at the start of the SEA and planning process. This made it possible to test alternatives against them in the SEA report (target attainment). Consulting many parties at an early stage of the planning process proved a success. It led to more support for the final decision.

6.5 Advantages of SEA

Implementing an SEA has advantages: When an SEA report on a long-term structural design plan contains evidence on the usefulness of and need for new developments and also evaluates the locations, there is no need for this to be included in a subsequent EIA report, especially if a certain volume of support has been created by extensive civic participation. At the same time, an SEA at strategic level need not take so much time. As long-term structural design plans present the main thrusts of policy, the environmental impact report can also contain the main thrusts and can be more qualitative. As a result, such reports are quicker to prepare.

Box 2 *Highlights of the SEA for Overijssel Province*

Government: Overijssel province

Area: Overijssel province
Long-term structural design plan: Vision of developments to 2020 with a look ahead to 2040

SEA report:

In the run-up phase all the stakeholders were consulted and the provincial interests were formulated. The key ambition was: "future-

assured growth of welfare and wellbeing with wise use of the available natural resources" . This was worked out as:

Wellbeing	Welfare	Natural resources
• Attractive and varied residential environments that satisfy residential demand. • Conservation and reinforcement of urban quality and the landscapes on the outskirts of towns. • Safe, healthy and clean living, working, leisure and travelling.	• A vital regional economy with sufficient new opportunities for businesses to establish. • Fast and safe journeys by road, water, rail and bike to the urban networks and local centres. • A reliable and safe energy supply with limited emission of greenhouse gasses.	• Conservation and strengthening of biodiversity. • Water systems of good ecological and chemical quality that are climate-resilient and safe in the long term. • Balance between the use and protection of the subsurface.

In the SEA report the autonomous development (continuation of present policy) was compared with the impacts of new policy. It appeared that various new measures would make it easier to achieve the objectives. The new policy contributes to the quality of the landscape, the diversity in residential environments, the availability of industrial areas, and accessibility.

Certain persistent problems remain:

- Noise nuisance from traffic remains too high.
- The environmental conditions in the nature reserves do not improve sufficiently (nitrogen deposition, desiccation).
- The increase in the proportion of sustainable energy is not enough.

Main message:

The message for the administrators is that supplementary policy on these points is necessary.

Time and effort

The SEA procedure began in February 2008; the writing of the SEA report began in April. The report was completed in November 2008. It consists of 90 pages, including annexes.

Box 3 *Locations and Routing in SEA*

The more traditional way of assessing locations entails mutually comparing locations or routes for infrastructure, using scores on a series of environmental criteria. In addition a simple or more detailed multicriteria analysis (MCA) is used. For a simple MCA it is sufficient to have a score table of pluses and minuses. The more detailed versions entail using a computer and applying weighting factors, standardisation of scores and sensitivity analyses, etc.

Popular environmental aspects for which criteria are filled in are: soil, water, nature, landscape, cultural history, residential and experiential environment (noise nuisance, air quality, safety), automobility, land use and energy.

When this simple method is used, the consequences of the total plan are not revealed. Instead, the focus is on the components of the plan for which EA is mandatory: the major construction schemes.

The assessment of the alternatives comprises an expert and motivated judgment on the basis of good cartographic material, but without extensive calculations. However, this puts great demands on the process. Quality assurance must be good; this is achieved by, among other things, consulting other disciplines (designers, experts in public administration) and stakeholders (administrators, lobbyists).

A welcome spinoff is that the more "map oriented/main thrusts" approach brings the discussions of the environmental experts, designers and administrators more into one line than used to be.

6.6 Conclusion

Various approaches are possible in SEA for long-term structural design plans, depending on the questions at issue. The most important task is to ensure that the research, design, civic participation and administrative processes converge in an intelligent and creative way. SEA can be given the catalyzing and structuring role in this, deployed not as a posthoc motive but as an instrument playing a role in the entire process of creating a plan: it brings groups together and is attuned to the substance and level of detail of the formulation of the problem.

7 Practice Illustration: SEA for Water Planning in the Netherlands[1]

Pieter Jongejans (*Netherlands Commission for Environmental Assessment*)

A large number of Dutch water plans were drawn up or updated in 2008/2009 in response to the introduction of the European Water Framework Directive. For the first time this included the use of SEA procedures. The positive and negative experiences of using SEA for these plans were evaluated, enabling this tool to be even more useful when it comes to the next generation of water plans, which will need to be complete by 2015. This article sums up these experiences and provides tips for the future.

7.1 Integrated Water Management

Water management in the Netherlands dates back to the Middle Ages, when the water boards were set up. Climate change, rising sea levels, land subsidence and increasing pressure on space have meant that more and more attention has been paid to different ways of dealing with water since the end of the 20th century. In recent years various developments have taken place nationally and internationally that have had a major influence on Dutch water management. For example, the 1990s in particular saw several periods of flooding in the Netherlands, resulting in the revision of water safety policy. Also, the European Water Framework Directive (WFD) requires EU Member States to ameliorate and maintain the ecological quality of groundwater and surface water.

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1 This chapter was first published as an article in Views and Experiences, 2012, Netherlands Commission for Environmental Assessment, Utrecht (available from: www.eia.nl/en/publications/publications-by-the-ncea).

The water system is now being approached more as an integrated whole. Water plans at central government, provincial and water board level are based on the principle of integrated water management, focusing on safety (of flood defenses), flooding, water shortages, water quality and ecology.

7.2 Water Plans in the Netherlands

The Dutch Water Act requires water plans to be adopted by various tiers of government:

- The National Water Plan
- The provincial water management plans
- The water management plans of:
  - Water boards[1] for regional waters
  - Central government for national waters

The WFD additionally calls for "River Basin Management Plans" incorporating the total set of measures under national and regional water plans for each river basin (Rhine, Meuse, Scheldt and Ems).

These various plans set out short-term and long-term water policy and list specific measures. The National Water Plan and provincial water plans are considered spatial plans as regards planning aspects: in other words, the authors of these plans make choices regarding the spatial planning of the particular area (e.g. by designating sites for water storage areas). Water policy and environmental policy are thus strongly linked.

Because of the implementation of the WFD in the Netherlands, all water plans were simultaneously replaced or revised in 2008/2009 and came into force at the end of December 2009. Previous generations of water plans had been drawn up one by one, with central government policy incorporated in the plans of the provinces and water boards. Drawing up these plans simultaneously constituted a new approach, therefore, requiring the coordination and incorporation of policy to be organized differently.

1 Dutch water boards (in Dutch: waterschappen or hoogheemraadschappen) are regional government bodies charged with managing the water barriers, the waterways, the water levels, water quality and sewage treatment in their region.

7.3 SEA for Water Plans

The SEA procedure was adopted for various water plans for the first time in 2008/2009. An SEA is mandatory if a plan sets out a framework on activities for which environmental impact assessment is required or if there could be significant effects on Natura 2000 sites. The competent authorities can also voluntarily opt for an SEA procedure because it could provide added value for decision-making. In some cases a single SEA was drawn up for a number of plans (provincial plans and water management plans). An SEA was also drawn up for the National Water Plan, including consideration of the River Basin Management Plans.

The NCEA has reviewed a total of seven SEA reports on water plans, namely the SEA report for the National Water Plan and six SEA reports for water plans of provincial authorities and/or water boards. From this the NCEA drew a number of general conclusions:

- Many decisions had already been made prior to the SEA procedures. The water plans of the provinces and water boards were the end result of sometimes lengthy spatial planning processes involving various tiers of government and other stake holders. The interests in these processes were weighed up and support was created for policy decisions and measures. The interests of the environment implicitly figured prominently here: to a large extent the whole purpose of the plans was to solve or prevent environmental problems (flooding, water shortages, drying-out of nature reserves, etc.). In many cases the effects of the measures on the environment were therefore found to be positive (see the example “South Holland” below).
- The SEA procedures only began after the previous step. As a result the scope for alternatives was often limited and the SEA report was used primarily as an ex post analysis. The report was essentially confined to an environmental assessment of the results of the planning processes. Because of that the way in which the interests of the environment were taken into account when deciding on measures was not made explicit (see the examples of “South Holland” and “North Brabant and Limburg”).

- Similarly in the case of the National Water Plan the SEA procedure only began once a draft plan had already been produced and a broad consensus had been reached on the policy decisions required (see the example of "National Water Plan").
- In general the joint planning approach (cooperation in SEA procedures and simultaneous planning processes) did produce added value, at least procedurally: the joint development of measures, the taking of decisions in mutual consultation and the setting of priorities in the area processes were found particularly worthwhile.
- In most cases the SEA procedures resulted in some amendments to the final water plans, mainly in view of potential consequences for Natura 2000 sites (see the example of "Friesland").

7.3.1 Case: Water Plans for South Holland

In the province of South Holland a large number of decisions had already been made before the start of the SEA procedure. The province and water boards opted to use the SEA to assess the proposed policy for positive and negative environmental impacts and to identify possible alternatives for various aspects. The alternatives provided options for elaborating or fine-tuning the policy based on environmental effects. The conclusion was that the proposed water policy rated predominantly positive as regards environmental impacts. The SEA report resulted in recommendations for the final implementation of the proposed policy.

7.3.2 Case: Water Plans for Friesland

In Friesland the provincial authorities and water board decided prior to the SEA procedure to continue with their policy of a fixed water level in the Frisian system of drainage/outlet pools. The Appropriate Assessment (of impacts on protected nature)-which forms part of the SEA report-showed that this fixed water level would have significant negative effects on Natura 2000 sites, especially those dependent on "water conditions", whereas a "natural level"would have few if any effects on those sites. To achieve the targets for the nature reserves a substantial set of measures would be needed (e.g. individual water level management for each area or intensive management). The final water plan therefore included a monitoring programme and prescribed that these and additional measures, if necessary, would be taken if negative effects were found to occur.

7.3.3 Case: Water Plans for North Brabant and Limburg

When drawing up the SEA report the provinces and water boards of North Brabant and Limburg came to the conclusion that many decisions had already been made and that there was little scope for alternatives. The SEA report was used to identify the risks of negative impacts, as well as opportunities for environmental benefits when putting the proposed policy into effect. As many of the measures were concerned with the interests of the environment and nature, the risks were found to be limited, occurring mainly during implementation of the measures (e.g. disturbances during excavation work, release of phosphate when raising groundwater levels and the effects of certain measures on the landscape). The approach adopted in North Brabant and Limburg resulted in an overview of focal points for further decision-making and elaboration.

7.3.4 Case: National Water Plan (NWP)

The NWP sets out the main principles of national water policy for the 2009-2015 period and provides a glimpse into the future. An SEA report was drawn up to aid decision-making on the subject, setting out short-term and long-term developments that might have substantial environmental impacts. The purpose of the SEA report differs according to the time frame:

- The short term (2010-2015): the draft NWP had already been produced and was available for public inspection when the SEA report and the Appropriate Assessment were being drawn up. In other words, short-term decisions had in effect already been made and the SEA report served mainly as an ex post analysis. In the case of most of the short-term measures the SEA report did not justify revising any decisions in the draft NWP, as the environmental effects would be neutral or even positive, or because they were to be examined in more detail in the follow-up process. One aspect of the NWP was amended, however, as the proposed change of water level in Lake IJssel was soon found to have major consequences for the maintenance targets for Natura 2000 sites. Additional research is therefore needed on this policy.
- The long term (up to 2100): in the long term the NWP offered principal choices on e.g. water safety, freshwater supply and use of space in the North Sea. The SEA report gives a general indication of the environmental

effects of possible directions of development. The SEA report is adequate for a strategic exploration of the options, but for specific long-term decisions it does not yet provide the required information, because of the major uncertainties, the potential consequences for Natura 2000 sites and the interconnections between policy decisions.

7.3.5 Case: the Delta Programme

In view of the issue of climate change (rising sea levels and greater variation in river discharges) a special Delta Commission was set up in 2007 to consider the long-term protection of the Dutch coastline and hinterland. This resulted in the introduction of a Delta Act and a Delta Programme. The Programme, which can be regarded as a further elaboration of the NWP, is expected to result in five "Delta decisions" to be laid down in the next NWP: on water safety, freshwater strategy, spatial adaptation, the Rhine-Meuse delta and water level management in the Lake IJssel region.

Central government, provinces, municipalities and water boards are working together here, with input from organized interests and industry. The aim is to protect current and future generations in the Netherlands against high water and to ensure adequate fresh water levels, taking climatic and social trends into account. The Delta Programme has a chronology of logical steps:

- Analysis of tasks (2011)
- Possible strategies (2012)
- Preferred strategies (2013)
- Delta proposals/decisions (2014)

7.4 Evaluation and Points of Attention for Future Water Plans and SEA

The planning process for regional water plans, along with the role of the SEA procedures, has been evaluated in various ways, from which both positive and negative experiences emerged that are largely in line with the NCEA's findings as described above. The experiences from the first round can and will be used in the next generation of water plans, preparatory work on which has now started.

Some examples of focal points that emerged from both the NCEA's advisory reports and the evaluations are:

- If the SEA begins early on during the planning process it enables environmental information to be collected systematically and objectively. Information on environmental effects, the "target range" and how policy decisions and alternatives influence one another makes the consequences of decisions clear: as a result, risks and opportunities are identified at an early stage and surprises later on in the process are avoided.
- Starting the SEA and obtaining advice from stakeholders early on in the planning process provides information on the level of support for the plans-or lack therefore.
- A sensitivity analysis of measures whose environmental effects are as yet unclear provides information on potential risks (e.g. the risk of significant negative consequences for Natura 2000 sites) and opportunities (e.g. combining water storage with nature reserves).
- The WFD requires water managers to take steps to meet the water quality targets (chemical and ecological). As well as information on environmental impacts, the SEA report also provides information on the target range for the WFD objectives and water conditions for the Natura 2000 targets, enabling bottlenecks to be identified along with the measures required to deal with them. Any staging or lowering of targets can thus be substantiated in the water plan.

The planning process for the NWP, along with the role of the SEA, was also evaluated, and one of the conclusions was that the SEA procedure can substantial added value if it is started earlier on in the process, before policy decisions have been made.

7.5 The First Step towards the New Generation of Water Plans: Better Integration of Water Plans and SEA

Taking experience with the first NWP into account, the NCEA has been involved in the Delta Programme from an early stage, even before an SEA procedure has been started. The Delta Programme is an elaboration of the NWP for post-2015 period. As a result the NCEA was able as early as the year of 2011 to draw attention to some specific points, such as:

- Water safety. The policy is based on risk management. Various strategies are possible: should an acceptable level of risk be set first, followed by a decision on the necessary measures? Or should measures be formulated leaving a"residual risk"? It is important to explain how risks are determined and uncertainties dealt with.
- Freshwater strategy. The NCEA has particularly requested that attention be paid to the "demand side", as there are various ways of influencing freshwater demand. Here again, uncertainties-both on the demand side and due to climate change-can have a major influence on the strategies to be adopted.
- Spatial adaptation. Water safety and spatial planning are closely linked in the Netherlands. An associated focal point is that different tiers of government are responsible for different aspects (safety policy is mainly a central government concern, spatial planning that of provinces and municipalities), so proper coordination is required along with clear decision-making frameworks, especially in the case of developments in the Delta provinces.

The NCEA's recommendations will be taken into consideration in the subsequent process. In the next phases SEA can be an important tool in deciding on the Deltaprogramme in general and on the "Delta decisions" specifically.

7.6 Conclusions

Initial experience of the SEA procedure for water plans has yielded useful information on various fronts:

- SEA provides added value for decision-making, both procedurally (coordination and collaboration between water managers, helping to build support among decision-makers and others) and substantively (basis of decisions, opportunities to optimize plans from an environmental point of view).
- When the SEA procedure was started the major decisions had already been made in consultation with stakeholders, with the result that the scope for alternatives in the SEA report, and hence its added value, was limited. Using the SEA at an earlier point in the planning process could increase its added value, by reducing the risk of negative environmental impact and creating opportunities for more environmentally friendly decisions.

- The evaluation of the planning process for the water plans and the role of the SEA has already resulted at a national level in an SEA being considered earlier on in the process: the NCEA has been involved from an early stage-even before SEA has started-in the Delta Programme, which will result in a new National Water Plan in 2015.

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