

Module 1: The GEO Approach to Integrated Environmental Assessment (IEA)

1. Introduction and learning objectives

The objective of the module is to introduce the **Global Environment Outlook (GEO) Integrated Environmental Assessment (IEA)** and reporting process. GEO is an assessment process led by UNEP and IEA is a methodology used for assessment processes and products following the GEO style.

The module will make trainees understand why IEA is necessary for making policy relevant recommendations about the environmental state and trends and links with human development. Successful completion of this module will allow trainees to do the followings:

- Understand the mandate and role of UNEP in environmental assessment and reporting, and in capacity building;
- Describe the objective and scope of the GEO assessment;
- Compare and contrast IEA in the context of the first three GEO reports and the GEO 4 process; and
- Become familiar with examples of regional, national and sub-national GEO and IEA processes.

2. UNEP assessment mandate

By the resolution 2997 of 1972 from the UNGA, that UNEP's mandate is to **keep the global environment under review**, the Division of Early Warning and Assessment (DEWA) of UNEP has mission to *"provide the world community with improved access to meaningful environmental data and information, and to help increase the capacity of governments to use environmental information for decision making and action planning for sustainable human development"*.

UNEP/DEWA has continuously promoted the scientific based assessment with partners around the world. In Asia and the Pacific, seven GEO collaborating Centres have worked closely with UNEP/DEWA since 1995 in producing the GEO assessment report. The first GEO was initiated by UNEP Governing Council in its decision 18/27, which requested UNEP's Executive Director to prepare a new, comprehensive report on the present and future state of the world environment, including possible response measures. Following the establishment of the GEO process and production of the first GEO report, the Governing Council renewed the mandate for GEO in 1997, 1999 and 2003 and 2005. The Governing Council/Global Ministerial Environment Forum (GC/GMEF) decisions in 2003 and 2005 facilitated the preparation of *GEO-4*.

Within the region, UNEP has assisted ten national governments in producing the national *"State of Environment"* (SoE) report since 1999. The work has been extended to subregional and city levels. At the national level, SoE reports of Bhutan, Bangladesh, India, Maldives, Nepal, Sri Lanka, Lao PDR, Vietnam, Mongolia, and DPR Korea. Two Bangkok SoE reports were produced in 2001 and 2003 with support from UNEP/DEWA in Bangkok.

Later in 2002, when IEA was first introduced, UNEP/DEWA developed the capacity building on IEA activities in Cambodia and Tajikistan. Then, more countries have shown their interests in fostering this capacity. The number has now increased from two countries to seven; namely, Turkmenistan, Kyrgyzstan, Lao PDR, I.R. Iran, Bhutan and Sri Lanka. At the city level, UNEP has assisted Dhaka, Kathmandu Valley and Shenzhen. UNEP/DEWA has also initiated the IEA and reporting activities at the subregional level. With collaboration from GEO CCs, South Asia, Central Asia and Greater Mekong Subregion reports are to be produced.

3. GEO rationale and IEA assessment

The goal of the GEO Process is to ensure that environmental problems and emerging issues of wide international significance receive appropriate, adequate and timely consideration by governments and other stakeholders.

The process can be structured in order to provide an answer to five key questions in an assessment report:

- (1) What is happening to the climate and why?
- (2) What are the consequences for the environment and humanity?
- (3) What is being done and how effective is it?
- (4) Where are we heading?
- (5) What action could be taken for more sustainable future?

Integrated Environmental Assessment provides a participatory, structured approach to linking knowledge and action. Over time, GEO has developed an increasingly integrated approach to environmental assessment, the use of indicators and reporting. The “integrated approach” is an umbrella term for:

- o linking the analysis of environmental state and trends with the policy analysis;
- o incorporating global and sub-global perspectives;
- o incorporating historical and future perspectives;
- o covering a broad spectrum of issues and policies; and
- o integrating the consideration of environmental change and human well-being.

The assessment process is important because it provides an opportunity for policy-makers to have close contact with various experts and stakeholders to discuss key environmental issues from an integrated perspective, to develop a better understanding of their points of view and define together an agenda for action. The assessment also provides an opportunity to discuss possible environmental futures, identifying emerging issues and analyzing scenarios.

The principal output of the process is the main assessment report. Its audience is typically broad, including decision makers in the private and public sectors, scientists and resource managers, the general public, youth and community groups, and the education community. Therefore, the assessment main reports need to be non-academic, but sub-products may be needed to target specific audiences.

The design of these processes is from the experience of UNEP's global GEO programme including capacity building activities at national and city levels.

Box 1: Other Assessments in relation to IEA

State of Environment (SoE) : Traditional SoE reporting provides information on the environment and trends. It mainly focuses on the biophysical environment than the pressures humanity exerts on it.	IEA: IEA provides a participatory, structured approach to linking knowledge and action. It is a participatory, integrated and multi-disciplinary process
Environmental Impact Assessment (EIA): This is a tool or framework used to assess environmental impacts of an activity. EIA is a process for evaluating possible risks or effects on the environment of proposed activity or development. The purpose is to inform decisions-making and other stakeholders of potential environmental impacts, and to suggest ways to reduce or minimize impacts that would arise from proposed activities. An IEA is intended to drive decisions in the context of a given project.	IEA: IEA is used for assessment process to ensure that environmental problems receive appropriate, adequate and timely consideration by governments. The IEA approach is necessary for making policy relevant recommendations about the environmental state and trends and links with human development. The results from EIA might serve as case studies to illustrate.
Strategic Environmental Assessment (SEA): SEA is a systematic and comprehensive process of evaluating the environmental effects of a policy, plan or programme and its alternatives at its earliest possible stage. SEA represents a body of practice and methodology directly relevant to the policy analysis component of IEA, but does not involve the reporting requirement.	IEA: SEA is ideally undertaken before policies, plans and programmes are put in place. It also considers the environment as a system, looking at impacts on the interface between environment and socioeconomic conditions. IEA looks linkage between human well-being and environmental trends. IEA also extends its scope of assessment to the regular reporting.

- **Participatory.** This means that different stakeholders are involved in an interactive process that promotes knowledge and information exchange, and makes clear their position and interests on issues. Engaging participation helps identify issues that truly matter, strengthens the analysis of the observed change, and builds ownership of the findings among audiences who are supposed to follow up with action.
- **Multi-disciplinary and multi-sectoral.** The assessment is *multidisciplinary* because the analysis takes into account different branches of science in such a way that the process of discussion, construction and analysis from different disciplines enriches the assessment. It is *multi-sectoral* because environmental issues have many economic and social inter-linkages, so participation of different sectors (public and private) is necessary to carry out a sound assessment as well as to ensure that results of the assessment lead to articulate responses and actions from different sectors.
- **Integrated.** In the assessment designation, integrated refers to a number of aspects of the assessment:
 - a) linking state of the environment analysis with policy analysis;
 - b) incorporating global and regional perspectives, as appropriate;
 - c) incorporating historical and future perspectives;
 - d) covering a broad spectrum of issues and policies; and
 - e) looking at dynamic and complex interactions between the environment and human well-being in place-based contexts (e.g., particular countries, ecosystems, cities, regions, watersheds).
- **Multi-product.** Assessments typically generate a family of products targeting a wide audience. The products range from simple posters through fact sheets, data compendia to comprehensive assessment reports and executive summaries.
- **Institutionalized.** Assessment involves assessing and reporting on the environment and its interaction with human well-being as an integral part of sustainable development. Assessment needs to be built with a long-term perspective in mind where assessment is cyclical, and where periodic products and continuous interaction among participants in policy and science communities and other elements of the public are part of the process.

Assessment process is also an instrument for *social learning* where society at various levels builds knowledge about human interactions with the environment, and the resultant risks and impacts, and in the process builds capacity to better adapt to the challenges ahead. Along the process, the assessment contributes to a better understanding of the links between environment and development, strengthening the capabilities of participants to identify upcoming issues, to evaluate alternative options for action, to agree on common goals, to promote informed decisions by policy-makers, and to set future national environmental agendas. So, an ASSESSMENT is an instrument for advancing the development of public policy incorporating stakeholder participation. Establishing an assessment process requires careful advance planning. The various stages of the process creates a structure around which activities and participation can be organized, capacities built, resources and time allocated, and release of outputs scheduled.

4. The GEO process and Products

The global GEO process is described on the website (www.unep.org/geo) GEO is first and foremost a participatory and consultative process for environmental assessment; it aims to facilitate the interaction between science on the one hand and policy and decision making on the other. Participation by a broad range of stakeholders has been increasingly recognized as an essential element of assessment processes dealing with complex issues, where there is a lot of uncertainty and where societal awareness is necessary to ensure effective implementation of response options. An example is the worldwide network of GEO Collaborating Centres with regional mandates or thematic expertise that forms a strong assessment partnership at the core of the process, and helps in building capacity at various levels. Comprehensive peer review and consultative mechanisms with governments, non-governmental organizations, the private sector and scientific institutions are other integral components. The process is underpinned by a dedicated, interactive, online data portal (<http://www.geodata.grid.unep.ch>). This participatory and consultative process gives GEO assessments scientific credibility, accuracy and authority. The process targets a wide audience by providing information to support environmental management, decision making and policy development. GEO stakeholders help to spread the word on GEO's key findings and policy messages.

From GEO 1 to GEO 4

Following the establishment of the GEO process and production of the first GEO report, UNEP's Governing Council renewed the mandate for GEO in 1997, 1999 and 2002.

Each GEO assessment covers a specific time period decided by, or relevant to, the policy makers to whom it is targeted. *GEO-3*, for example, was requested by the UNEP Governing Council to be a "30-year after Stockholm" (1972–2002) report. The outlook is an important part of the time scale. As well as covering the period since 1972, *GEO-3* looked forward to the next 30 years. *GEO-4* is looking in particular at the 20-year period since the Brundtland Report "Our Common Future" (1987) and forward to the year 2050.

The latest of these Governing Council decisions extended the interval between the GEO reports to five years, and added an "annual GEO statement." In addition to producing a five-year GEO report, UNEP also has a mandate for capacity building, which is an integral part of the GEO process and works at different levels, using a range of mechanisms. At the level of global GEO reports, Collaborating Centres and other contributors advance their IEA skills through a learning-by-doing approach, working with leading international experts and producing assessment content for the main report. At the regional, national and sub-national level the target group includes practitioners and managers in charge of relevant assessment and reporting processes. These sub-global IEAs, often mandated and led by governments adopt elements of the GEO approach, building consistency and strengthening the global process.

Each GEO assessment is multi-dimensional in scope, incorporating environmental, policy, geographic and temporal perspectives. Environmental dimensions include:

- thematic (related to the state and trends of land, atmosphere, water and biodiversity);
- functional (related to the provision of environmental goods and services);
- sectoral (the relationships between the environment and activity areas such as energy use, industry, tourism, agriculture and trade);
- cross-cutting (relating to issues such as production, consumption, gender, poverty, human security and vulnerability); and
- interlinkages within and among all of the above.

Geographically, we can distinguish between the global GEO assessment and sub-global (regional, national and sub-national) assessments. While *GEO-1*, *GEO-2*, *GEO-3* and *GEO-4* are global in scope, they are differentiated at regional and sub-regional levels to highlight important spatial variations and the environmental priorities warranting policy attention in different parts of the world.

5. GEO products and reporting related to IEA

The GEO assessment process is made up of a number of activities including:-

Establish an institutional framework for collaboration and organization of the assessment. Identify and enter into formal or informal cooperative agreements with different organizations with interest, capacity and/or mandate concerning the environment. Discuss and agree on objectives and roles to be adopted in the production of your assessment outputs.

Establish and maintain an information base (i.e., set up information system, gather and update the required data). The information-gathering process during the assessment provides an opportunity to analyze the quality and usefulness of information provided by monitoring systems. It is also an opportunity for improving data sharing and harmonisation mechanisms. Also, during this activity, it is possible to identify new themes and information needs, as well as data gaps. This step further allows identification of indicators of key environmental issues.

Discussion forum. An assessment represents an opportunity for discussions on topics such as common assessment methodologies, trends of the driving forces, pressures, and key environmental issues, policies, policy options and scenarios. These discussions may involve the public, private sectors and decision makers. Also, this provides an opportunity to analyze environmental policy and practice with involvement of different stakeholders.

Capacity-building. The assessment plays a capacity building role in two ways. First, the assessment process emphasizes an *learning by doing* approach based on interactive workshops and other non-workshop based interactions such as distance learning, Internet fora or technical and scientific collaboration. Second, the assessment can help identify capacity building needs and address them through targeted action, such as training, staff exchanges, provision of data and technical equipment or through other means.

Define and implement a communication and impact strategy. From the beginning of the process, it is necessary to understand who your various audiences are, so you can establish an efficient and effective communication and impact strategy. Strategies should include implementation plans as well as evaluation measures.

Box x: Assessment reports in Asia and the Pacific

Subregional level : Central Asia IEA report (published 2007)
Greater Mekong Environment Outlook (published 2007)
South Asia Environment Outlook (on-going)

National level: Tajikistan IEA report (published 2007)
Cambodia IEA report (on-going)
Lao Environment Outlook (on-going)
Turkmenistan Environment Outlook (on-going)
Kyrgyzstan Environment Outlook (on-going)
Sri Lanka Environment Outlook (on-going)
Bhutan Environment Outlook (published 2008)
Vietnam Climate Change Report (on-going)

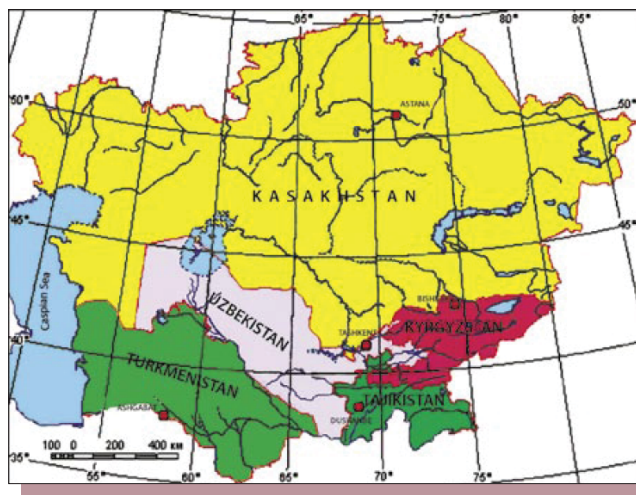
City level: Dhaka IEA report (published 2007)
Kathmandu Valley IEA report (published 2007)
Shenzhen Environment Outlook (on-going)
Bangkok Climate Change Report (on-going)

5.1 Subregional Report: Central Asia IEA Report (2007)

5.1.1 Mandate and report objectives

With the aim of building capacity of national governments and sub-regional organizations Central Asian states initiated the Integrated Environmental Assessment (IEA) for better reporting systems that will enable efficient and improved environmental decision-making at sub-regional level to support sustainable development. Its objective is to also facilitate assessment and monitoring of the status of the environment regularly. To assess the state and trend of the environment, there is a need for a strong data and information base on all aspects of environment and natural resources, which are to be systematically collected from decentralized multi-sectoral environmental agencies/institutions, critically analyzed and clearly presented in a timely manner and standard format.

5.1.2 Geographical scope



5.1.3 Members of the assessment team

The preparation of The Integrated Environmental Assessment Report of Central Asia was a consultative and participatory process, involving contribution of UNEP and various partners in the Central Asia. The Integrated Environmental Assessment Report of Central Asia was developed by the Scientific Information Center of the Interstate Sustainable Development Commission of Central Asia (ISDC SIC) and national experts from five Central Asian countries, namely Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

5.1.4 Major environmental issues assessed

- Water resources pollution
- Air pollution
- Land degradation
- Loss of biodiversity
- Mountain ecosystems degradation
- Waste management

5.1.5 Conclusions

This integrated assessment of the state of the environment in Central Asia makes it possible overall to report certain changes in the activities of the countries from the basin of the Aral Sea aimed at improving environmental and socio-economic conditions as compared with the preparation period GEO-3.

The shared nature of the environmental problems in Central Asia has resulted in more active regional co-operation between the countries of the region, for which a transition to ecologically safe and sustainable development is a priority. Ten years of independent development in the Central-Asian countries has shown that un-coordinated efforts on the part of individual sectors, countries or international organizations did not lead to the anticipated results, and did not solve critical problems in the field of the environment and the development of the Central Asian region. There is a need for a different approach, based on a long-term strategy and processes adapted to the needs of these countries, with the involvement of interested parties and the wider public and participation in international and regional programmes and agreements based on international experience already accumulated and national capacities.

The Central-Asian countries have developed such an approach and proposed a partnership initiative which has been included in the Implementation Plan of the WSSD. The process, which started from below on the initiative of the Central-Asian countries in co-operation with regional and global programmes should form the necessary base for the development of democratic reforms, the preservation of eco-systems and the rational use of resources. A Framework Convention on Environmental Protection for Sustainable Development in Central Asia is currently ready for signing and undergoing the approval process in the governments of the Central-Asian countries. This convention covers all the components of the environment as well as the most important ecological issues for regional co-operation. In 2006 the Ministers of the Environment of the Central-Asian countries have specified a number of environmental problems on which evaluation reports have been prepared and a number of activities have been identified for addressing them.

5.1.6 Capacity Building

The activities under IEA preparation process are a component of the GEO 4 process on building capacities undertaken by the Division of Early Warning and Assessment (DEWA) in UNEP. It provided a consultative and participative mechanism to solicit scientifically credible and policy relevant inputs to GEO 4 at national, subregional and regional levels, and built national and subregional capacity and partnership network to facilitate more widespread adoption of the GEO approach, that has increased the compatibility of reporting and assessment processes and products, and ultimately contributed to better global GEOs

5.1.7 Impact and follow-up

Comparative assessment and analysis of the current state of the environment of Central Asia have made it possible to single out several issues, some of which are being resolved, while others need to be addressed in the immediate future. In addition, the Report is used as the solid and credible source of information for development of some strategic subregional documents, such as Subregional Sustainable Development Strategy.

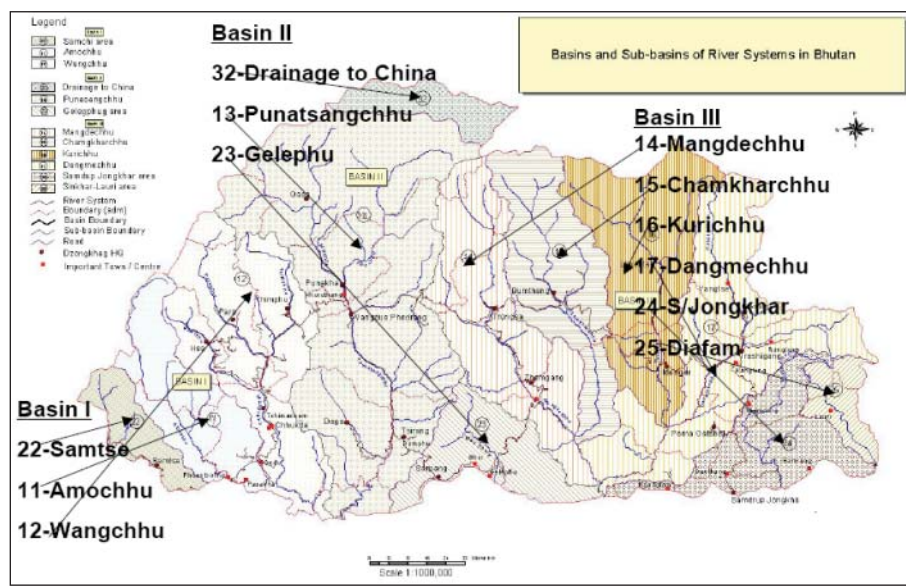
5.2 Bhutan Environment Outlook (2008)

5.2.1 Mandate and report objectives

The reporting and assessment process has the mandate from National Environment Commission, Thimphu and UNEP Regional Resource Center in Asia and the Pacific, with the financial support from both of them, as a response to calls of capacity building of IEA in Asia and the Pacific by UNEP, and Bhutan Government's need to understand and quantify the threats of the impact of climate change on fresh water resources and to facilitate the implementation of effective counter measures under Chapter 18 of Agenda 21 – Rio Declaration.

5.2.2 Geographical scope

The geographical scope of the assessment covers the basins and sub-basins of all major river systems in Bhutan's territory as depicted in the illustration below.



Source: Water resource management plan - 2003

5.2.3 Members of the assessment team

5.2.4 Major environmental issues assessed

Bhutan is already experiencing increase in intensity of intense monsoon rains causing flash floods and landslides. Bhutan has 677 glaciers and 2,674 glacial lakes, out of which about 25 are potentially dangerous. Glacial lakes are growing in size thus increasing the risk of Glacial Lake Outburst Floods. The key concerns for Bhutan include impacts of global warming on water quality and diversity as increased water temperatures promote growth of algae causing problems for wastewater treatment. More intense rainfalls can also increase outbreaks of micro-organisms, sedimentation and pollution loads, and stress sewer systems. Bhutan is also exploring the issue of species extinction due to climate change which is projected to be highest in aquatic ecosystems due to warmer waters and changes in seasonal flows.

5.2.5 Conclusions

Bhutan's engagement in IEA activities on assessment of GLOF threats for hydropower projects has, among other priority actions, helped the nation to take prompt decision on installation of early warning systems with associated awareness raising, implement hazard zonation plans and undertake artificial lowering of glacier lake levels as precautionary measures.

5.2.6 Capacity Building

The activities under IEA preparation process are a component of the GEO 4 process on building capacities undertaken by the Division of Early Warning and Assessment (DEWA) in UNEP. It has provided a consultative and participative mechanism to solicit scientifically credible and policy relevant inputs to GEO 4 from a potentially highly fragile ecosystem in the Himalayan Kingdom while facilitating the building of national capacity and partnership in Bhutan.

5.2.7 Impact and follow-up

The IEA activities undertaken in Bhutan have facilitated the assertion that there is a likelihood of enhanced temporal and spatial variation in river flow in Bhutan which will affect electricity generation due to disruption of average flows for optimum hydropower generation. The ability of catchment area to retain water may be reduced leading to increased runoffs with enhanced soil erosion. Increased sedimentation of rivers, reservoirs and distribution network could adversely affect irrigation schemes productivity/agricultural crop yields. The nation now proposes to extend, improve and maintain water supply infrastructure; Improve land use planning in degraded catchment areas to promote afforestation as also improve watershed management and initiate optimization in design of installed capacity of existing as well as future power plants

5.3 Shenzhen Environment Outlook (2007)

5.3.1 Mandate and report objectives

The reporting and assessment process has the mandate from Environmental Protection Bureau of Shenzhen Municipality and UNEP Regional Resource Center in Asia and the Pacific, with the financial support from both of them, as a response to calls of capacity building of IEA in Asia and the Pacific by UNEP, and urban sustainable development by Shenzhen municipal government's decision. Shenzhen EO initiative is the first GEO city in China where the complete IEA methodology was first applied.

The objectives of the Shenzhen Environment Outlook report are:

- to introduce integrated environmental assessment methodology into China and other Chinese community, and issue a city IEA report in both English and Chinese ;
- to provide a sound basis for decision making of the government in addressing environmental issues at the policy level;
- to make the public well know about the city environment states and its linkages with urban development, and
- to promote international exchanges on urban sustainable development of China.

5.3.2 Geographical Scope

Shenzhen is a coastal city and located among the cities of the Pearl River Delta Metropolitan Region in the south China mainland, where has grown rapidly with urbanization. Shenzhen borders New Territories of Hong Kong (the special administrative region of China) in the south, Dongguan City and Huizhou City in the north, Daya Bay and Dapeng Bay in the east and the Pearl River mouth and Lingdingyang in the west, which connects the South China Sea and the Pacific Ocean.

5.3.3 Members of the assessment team

The assessment was led by a research group from Shenzhen Graduate School of Peking University, with the support of UNEP Regional Resource Center in Asia and the Pacific, the local government as Environmental Protection Bureau of Shenzhen Municipality (EPB), and the national government as State Environmental Protection Administration. The assessment team includes local researchers and experts from Shenzhen Graduate School of Peking University, and external experts from Global Environment Outlook China Collaboration Center. The reviewers of this report are from local, regional and international levels, including scientists, academics, government officials and civil society representatives.

5.3.4 Major environmental issues assessed

- **Water:** The quality of the mid and lower reaches of major rivers fails to meet Grade V National Standard for Surface Water Quality. On the whole, the quality of reservoir water is good, but the concentrations of TN and TP are beyond the standard leading to some eutrophication trend.
- **Land:** Shenzhen has grown into one of the biggest cities in China with over 10 million populations and 7 million built-up areas in the past two decades. By 2006, construction land has reached 719.88 km², which is over 90% of the total available land for construction. As the city expands and the land development activities intensify, construction activities have gradually extended to foot and slopes of mountains. More activities to cut and fill the slopes result in lots of side slopes, which, not only are unpleasant to the sightseeing, but also tend to cause soil and water loss, become hidden troubles for geological disasters and threat the life and property of city residents.
- **Atmosphere:** The atmospheric environment of Shenzhen is subject to common influence of the regional pollution of the Pearl River Delta Metropolitan Region and local pollution. Main air pollutants are SO₂, NO_x and inhalable particulate matters. The air quality of Shenzhen is going down which is reflected by the increase of the occurrence of haze and bigger acidity of acid rains. The frequency of haze has increased from over 80 days in 1990s to 175 days in 2004. Average daily concentrations of NO₂ and SO₂ in the air have increased compared with that of late 1990s.
- **Coastal and marine areas:** Shenzhen has 229.96 km coastline and four coastal areas covering 1 145 km². Because of the development of coastal areas and serious pollution of inland rivers, the concentrations of nutrients as N and P are beyond the standard, and coastal seawaters show a trend of eutrophication. Red tides have occurred sometimes in coast and marine areas, especially in Dapeng Bay and Shenzhen Bay. In the 1980s red tides occurred once or twice every year in Shenzhen, whereas since 1990, the number has risen to four or five times almost every year and the coverage of red tides has grown as well.
- **Biodiversity:** The Mangrove Nature Reserves near urban districts provides very good biotope for the migration and propagation of the birds in the region. There have been nearly 400 wild bird species living here by 2006, up by nearly 50 species than 7 years ago. Though with these improvement of biodiversity, Shenzhen is also still facing the invasion of alien species. At present, the area invaded by *Mikania micrantha* has reached more than 2 600 ha in Shenzhen and the invasion of alien species including *Mikania micrantha* has caused relatively serious impacts on local ecological environment.
- **Human well being:** In the process of rapid urbanization, although the city faces serious environmental challenges that have adverse impacts on the residents' welfare, the fast-growing economy and increasing supply of social services have upgraded the urban residents' life quality. In terms of the Human Development Index (HDI) proposed by UNDP, Shenzhen's HDI has been rising constantly, up from 0.75 in 1989 to 0.89 in 2005. The figure is higher than that of medium-income countries (0.774) and close to that of high-income countries (0.91).

5.3.5 Conclusions

Targeting main development constraints Shenzhen confronting, four scenarios based different development modes have been analyzed, including Business as Usual, Environment-friendly First, Resource Security First, and High-end Industry First. Carrying out simulation estimate on the four development modes with the employment of systematic dynamic model, the report obtained the following conclusions:

- ◆ It is necessary to shift economic growth mode. Resource security development mode and high-end industry priority development generate relatively good balance between economic and the environment.
- ◆ Shenzhen will face severe water security problems within a long period in the future with shortage of 1 000-1 500 million m³ in 2030. To solve the issue of water shortage, it is important to develop

innovative approaches for water resources besides existing measures such as development and utilization of sea water and rain water.

- ◆ Shortage of land resources is the rigid constraint confronting the development of Shenzhen.
- ◆ Resource security development mode and high-end industry development mode could control environmental pollution with slight influence on economic growth.
- ◆ To mitigate the population pressure, the effective way is to adjust industrial structure, lower the proportions of labor-intensive manufacturing industry, and thus reduce the demand for floating population.

5.3.6 Capacity Building

The Shenzhen Environment Outlook process successfully built capacity in integrated environmental state reporting, policy analysis, and scenario analysis and modeling of development and environment at a city level. For the local methodology training, the City Environment Assessment Working Manual (for Asia and the Pacific) has been translated into Chinese and compiled according to the local application experiences.

Workshops of DPSIR framework and data collecting have been held and involved more than 30 young graduate students and researchers from universities and private sectors, whom would be or being serving local development and environmental protection. Consultant workshops invited local experts from administrations relative to urban environmental management, policy research institutions, universities and colleges, which helped make the IEA methodology to be learned by different stakeholders.

5.3.7 Impact and follow-up

A successful launch was held in the end of November of 2007, which attracted almost ten medias from national newspaper to local television media. Broad media coverage made the Shenzhen Environment Outlook process and report well known by the public.

Good communication strategy with the government and participatory workshops made the conclusions and options easily accepted by the decision makers from special administration as Shenzhen EPB to leading policy level as Shenzhen municipal government. Shenzhen EPB has made the Shenzhen Environment Outlook report as the main working output and reported the whole process to Shenzhen municipal government, whom also had the plan to follow-up the process in the next three to five years.

As the outputs of capacity building, the Chinese version of City Environment Assessment Working Manual (for Asia and the Pacific) and Shenzhen Environment Outlook report have been adopted as learning materials by local academic institutions. The IEA methodology is a good tool to assess the state of environment in cities with rapid urbanization. How to apply the IEA methodology in Chinese rural level is an emerging challenge, which will promote Chinese rural areas to find out the way leading to sustainable development.

As the first GEO city in China, Shenzhen gave an example to all the other cities as a pioneer city which made great progress in economic development and environmental protection and has advanced consciousness of keeping developing. Many cities showed great interests about the Shenzhen Environment Outlook process and report, including Wuxi city, Shanghai City etc. Global Environment Outlook China Collaboration Center is planning to hold IEA training workshops and make more cities involved in the GEO city process in the near future.