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 understood 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:

- ∂ linking the analysis of environmental state and trends with the policy analysis;
- ∂ incorporating global and sub-global perspectives;
- ∂ incorporating historical and future perspectives;
- ∂ covering a broad spectrum of issues and policies;and
- ∂ 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 intergrated 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, theassessment 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

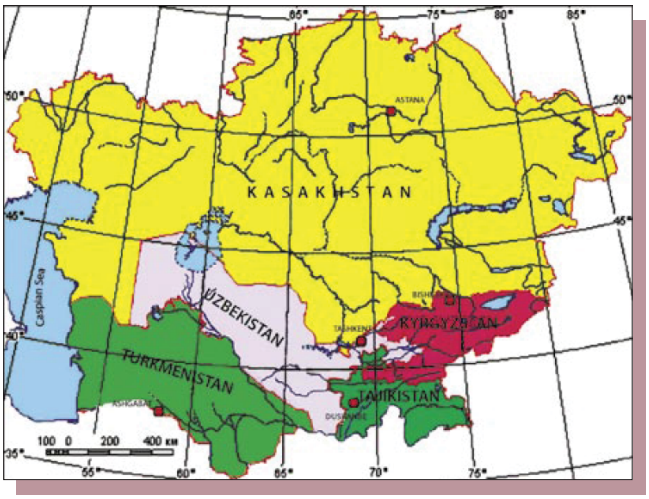
Subregional level :	Central Asia IEA report (published 2007) Greater Mekong Environment Outlook (published 2007) South Asia Environment Outlook (on-going)
National level:	Tajikistan IEA report (published 2007) Cambodia IEA report (on-going) Lao Environment Outlook (on-going) Turkmenistan Environment 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.

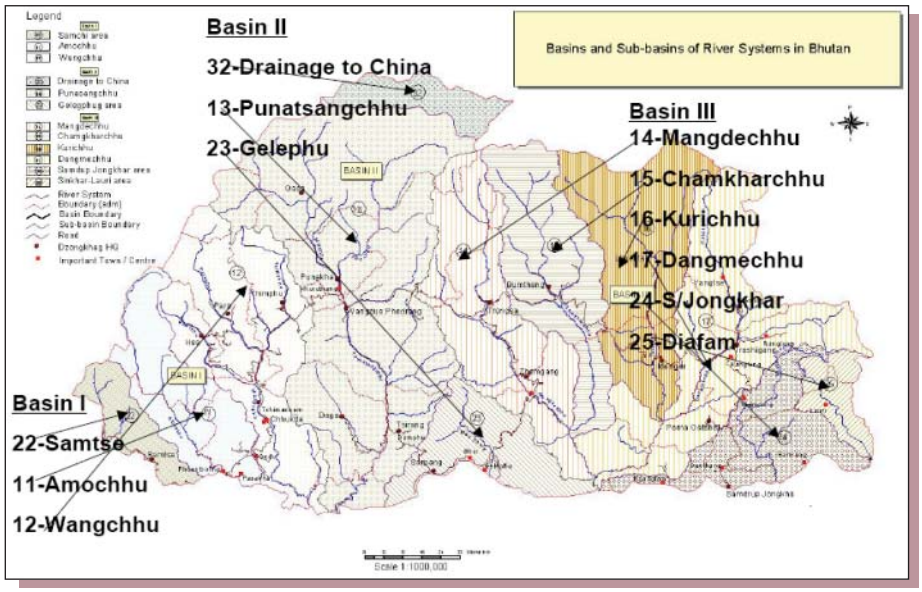
5.2 Bhutan Environment Outlook (2008)

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 facilitation in 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 catchmentareas to promote afforestation as also improve watershed management and initiate optimization in design of installed capacity of existing as wellas 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 km^2, 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 Peal River Delta Metropolitan Region and local pollution. Main air pollutants are SO_2, 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 NO_2 and SO_2 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 km^2. 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 m^3 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.

Module 2 National IEA Process Design and Organization

Overview

Integrated environmental assessment (IEA) is way of understanding and mapping environment-society interactions[1]. A national IEA is complex and dynamic, so it requires careful planning. This module on design and organization of a national IEA is based on UNEP's GEO approach to IEA. The module provides an overview of why the process is important, how it is established and governed, who would participate and in what role. It gives advice on the allocation of resources, and explains the stages involved in setting up and implementing a GEO-based IEA process. It will give you a better understanding of the role and structure of the process, and your role in participating or managing it. This module also explains how other modules in this resource book fit into the IEA process.

The module concentrates on the following aspects of the IEA process:

- securing institutional commitment for an IEA;
- identification of stakeholders and defining their roles ;
- instruments for conducting the process;
- allocation of required resources (time, human, financial); and
- interactive process design and its benefits.

A key feature of the GEO approach is the participation and interaction of different experts and stakeholders. This module explains how to identify relevant stakeholders and their roles. It shows approaches to using a participatory process, which could also enhance the capacities of the stakeholders to lead similar processes elsewhere.

Through a participatory process, IEA promotes a better use of existing capacities and information at the national level, which reduces the amount of effort allotted for IE and financial costs. Given its interactive process[2] an IEA helps to capitalize on the experience of assessment practitioners and facilitate information exchange.

Course Materials

1. Introduction and objectives

A successful integrated environmental assessment at the national level requires good advance planning. This starts with understanding the design and organization of the process, as well as identification of the main steps and activities needed to achieve the GEO goals.
After successfully completing this module, you will have developed the capacity to conceptualize, participate in and manage the design and organization of a national IEA process. You will be able to:

- understand the main stages of the IEA process;
- understand the institutional arrangements to be developed;
- learn to lead an interactive and participatory way;
- identify the main activities and procedures for preparing IEA report and promoting their findings to achieve maximum impact; and
- be aware of and able to manage challenges of running the process while involving the public.

[1] *For more detailed regarding GEO and the Integrated Environmental Assessment review modules 1 and 5.*
[2] *Interactive process stands for a process that stimulates the exchange of ideas, consider different points of view based on scientific and empirical evidence,*
that generates a value added knowledge and enrich the analysis..

In order to achieve this competence and these capacities, the module incorporates three interactive training elements: case examples, discussion questions and exercises.

The module is organized in three main sections, of which this introduction is the first. The second section explains the main contributions of the IEA process in terms of capacity building and network development. The third section presents in detail the organization and design of the national IEA process, explaining each stage of the process from start-up and institutional framework through the final steps for reporting and follow-up.

Preparation of this module was based on practical experience gained by the authors through participation in national IEA projects in the Asia-Pacific region.

2. IEA process features

National IEA and reporting process are designed to generate information on the status and dynamics of the environment and its interaction with human well-being. IEAs are typically known first and foremost for their products: reports, websites or databases. However, in order to produce such information and expect it to have both high levels of scientific credibility and policy relevance, an IEA also must have a well-planned and well-managed process.

The ultimate success of IEA process depends on who is in charge of and who participates in the process, in what specific role, how the process is structured, and how it allows for flexibility to adapt to local cultural, administrative, political, legal and other conditions.

Based on the experience of GEO preparation at global level and national IEA in the region, we have identified key attributes that can help guide planning of new initiatives at the national and sub-national level.

- **Participatory.** Involving different stakeholders is a way to achieve a better understanding of themes incorporating the issues to improve the process and quality of policy making and establish the ownership.
- **Multidisciplinary and multisectoral.** IEA deals with multidisciplinary knowledge and also involves multisectors, therefore participation of multidisciplinary and multisectoral stakeholder 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.** IEA deals with numbers of aspects in integrated way in the assessment:
  - linking the state of the environment analysis with policy analysis;
  - incorporating global and sub-global perspectives;
  - incorporating historical and future perspectives;
  - covering a broad spectrum of issues and policies; and
  - 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)[3].
- **Multi-product.** IEA process generates family of products targeting the wide key audience. The products range from simple posters through fact sheets, data compendia to the main IEA reports and summaries.

[3] *See Module 1 for details.*

- **Institutionalized.** IEA stimulates assessing and reporting on the environment and its interaction with human well-being as an integral part of governance mechanisms for sustainable development. IEA-based process 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. As long as this is an active process, based on stakeholders' participation, stakeholders will take ownership of the process and lead it.

The IEA process is made up of a number of activities including:

1. Establish an institutional framework for collaboration and organization of IEA. 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 production of your report.

2. Establish and maintain an information base (i.e., set up information system, gather and update high quality data). The information-gathering process during the preparation of the report provides an opportunity to analyze the quality and usefulness of information in the national environmental system. It is also an opportunity for institutional data sharing and harmonisation. Also, during this activity, it is possible to identify themes and information needs, as well as data availability. This step further allows identification of indicators of key environmental issues.

3. *Discussion forum.* An IEA represents an opportunity for discussions on topics such as a common methodology, trends of the driving forces and pressures, key environmental issues, policies, policy options and scenarios. The discussions involve the public and private sectors. Also, this provides an opportunity to analyze environmental policy and practice with involvement of different stakeholders.

5. *Capacity-building activities*. Based on interactive workshops and other non-workshop based interactions such as distance learning or Internet fora, the GEO process emphasizes a *learning by doing* approach to master the methodology and disseminate it, thus enhancing national capacities for integrated environmental assessment. Further, it is an opportunity to identify any capacity-building needs, and determine whether they can be met from resources within the country or require additional input.

6. *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.

Discussion questions

1. Identify the main organizations that use an integrated approach to lead participatory processes focused on environment-development interactions in your country. Explain briefly the main activities that were/are involved.
2. What key initiatives are ongoing in your country that could be strengthened by the IEA process?
3. What opportunities do you see in your country to help drive the IEA process?

3. The Overview of the IEA Process

This section provides a general view of the national IEA process, identifying its main components and the relationships among them. It will help you to understand how the process can be structured in order to provide an answer to key questions in a GEO-based report (Figure 1- can be referred in another module to reduce the page). These are further explained in Modules 5 and 6.

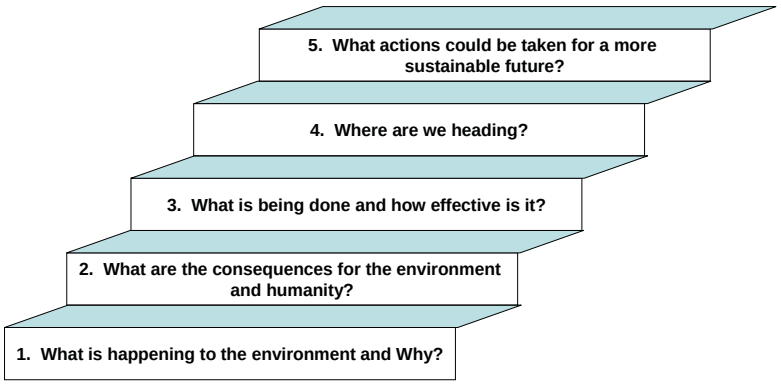


Figure 1: Schematic view of key questions to be answered by the GEO approach

3.1. Objectives and importance

The objectives of the process are the following:

- bring together relevant organizations and individuals with interests in IEA and potential for significant contribution, some of whom may not otherwise have a history of collaboration;
- involve policy-makers in order to secure their support for the process and its key findings; and
- facilitate the process of interaction based on a common methodology, fostering the dialogue between science and policy.

The IEA 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.
- promotes learning from experts and organizations based on their interaction as they proceed with the assessment (Box 1).
- opportunity to discuss possible environmental futures, identifying emerging issues and analysing scenarios.

The principal output of the process is the main IEA report. As explained in Modules 3 and 7, 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 IEA main reports need to be non-academic, but sub-products may be needed to target specific audiences.

3.2. Basic conditions for initiating a GEO process

IEA process involves a range of complex activities and promotes active engagement of government, the academic community, NGOs and the private sector. One key element is political will and commitment of the national environmental authority or equivalent to support the IEA process. A legal mandate and requirement to produce an IEA helps, as it may oblige government to support a meaningful assessment and create a basis for accountability in the political system. The mandate should be clearly laid out in the context of laws and regulations. Some key issues in such a legal mandate include the following:

- legislation may call for collaboration among government agencies that contribute to the IEA;
- a common methodology for data collection may be identified among the national authority, private and public organizations, and scientists or technical experts;
- the legislation may refer to environmental reports to be produced by a range of public and private organizations;
- legislation may promote exchange of data and harmonization of reporting initiatives; and
- the lead agency's role in preparing the way for consultations and external participation.

Some examples of legal mandates countries have for preparing environmental assessments and reports are given in boxes 1 to 3.

Box 1: India Case

The Government of India scheme for preparation of state of environment reporting in each state/UT was launched during the Tenth Five Year Plan (2002 – 2007), with the objective of highlighting the upstream and downstream linkages with environment issues besides creating a baseline document in form of SoE reports. In view of growing environmental stress and the need to conserve natural resources, the scheme has been continued in the 11th five year plan as well. There are efforts being made to regularize the preparation of these reports in the future. (Source: Development Alternative, India)

Box 2: North Korea Case

In North Korea, the UNDP office has assisted the Ministry of Land and Environment Protection with the preparation of the National Framework of Environmental Database Management for Environment Assessment and Reporting in DPR Korea. This framework states that every five years the country will prepare a state of the environment report.

Source: UNEP-RRCAP.

Box 3: China Case

In China, the national Environmental Protection Law ordains that the competent departments of national or sub-national environmental protection administration shall regularly issue bulletins on environmental situations. Since 1989, the State of Environmental Protection Administration (SEPA) has begun to issue the national SOE reports annually, with the goals of publishing the real environmental information, providing foundational information for different policy makers, and measuring the process and efforts for sustainable development. The sub-national SOE reports also have been issued regularly in recent ten years by the governments of provinces, autonomous regions and municipalities directly under the Central Government according to their capability and actual situations.

Source: SEPA website, China

It is necessary to have national technical capacity to conduct the process. This requires leading institutions that can mobilize a range of stakeholders through the process. Also, the institutions should have professionals on environmental issues to lead and contribute to the analysis.

3.3. General Structure of the IEA Process

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.

Details of the process may change country by country, and they may need to be modified as the IEA proceeds in order to adapt to how events unfold. However, based on the practical experience of previous GEO-style reports and other assessments in the region, we can outline elements of a generic process with key elements that one way or another need to be considered in such an assessment.

Based on this body of experience we can identify seven stages of a generic national IEA process, as well as a set of generic activities and outcomes related to them (Figure 2). Each stage is explained in this module,

while details of how to manage specific components of the assessment (e.g., analysis of environmental trends and conditions, policy analysis, data and indicators, and scenario analysis) are explained in other modules in this resource book. The national IEA process in general followed in the Asia Pacific region are given in the Box 4 (?).

As shown on Figure 2, IEA is an ongoing process. It aims to improve decision making, enhance national capacities, and provides systematically collected, analyzed and presented information. Activities and outputs can be identified for every stage, and these, along with expected outcomes, provide a basis for evaluation, learning and improvement. Besides internal learning, the fact that many countries use the IEA approach presents an opportunity for sharing lessons learned across a wide range of initiatives. It is necessary to define expected results at different stages (Figure 2).Technical and political partners will identify lessons learned from the process and thus can improve it. As such, the process is enriched by continuous feedback at the national level, and information is often exchanged with other countries using a GEO approach.

3.4 The role of participation in the IEA process

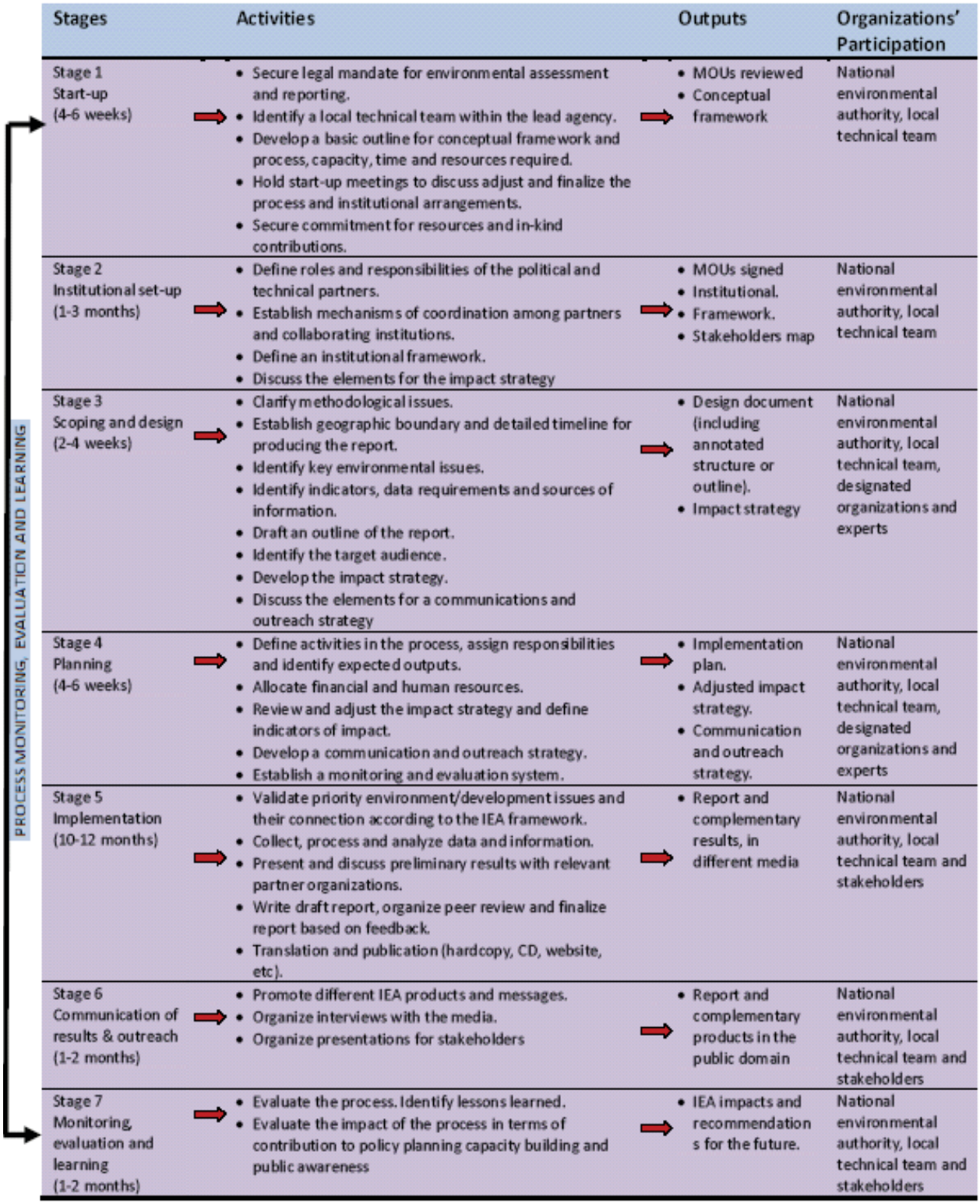
An IEA requires blending knowledge and perspectives from many different points of view. It also aims to influence audiences with different interests and information needs. In order to maximize impact, it is essential to have the participation of a wide range of actors, either as contributors to the assessment, as audiences, or as both, throughout the process (Figure 3 – ??).

IEA can and often does provide a forum for continuous dialogue, although the number of actual participants involved in the assessment and reporting often needs to be kept at manageable levels.
Participation is important not only because it helps to identify key environmental issues from the different stakeholders' perspectives, but also because it can offer options for addressing those issues. If participation is open and transparent, it is more likely that interests of different stakeholders, including interests of poor, vulnerable groups and women will be recognized and better reflected in the formulation of policy responses. A basic definition of stakeholders includes those:

- whose interests are affected by environmental problems, or whose decisions have environmental effects;
- who have information, resources or expertise required for policy formulation and strategy implementation; and/or
- who control key mechanisms for policy and strategy formulation and implementation. Potential stakeholders and partners whose support for the whole IEA process is crucial may include the following:

▪ political leaders; political party representatives; ▪ officials of national and regional public offices (such as ministries, institutes, councils, directorates and the military); ▪ local authorities; ▪ scientific community; academia (universities and research centres); ▪ representatives of industry or entrepreneurial associations;	▪ private sector representatives; ▪ professional schools or associations; ▪ non-government organizations; ▪ mass media; ▪ youth groups, women groups; ▪ indigenous communities and groups; ▪ civil society organizations; ▪ community and religious groups; and ▪ opinion leaders.

Figure 2: Stages of National IEA Process



Stages	Activities	Outputs	Organizations' Participation
Stage 1 Start-up (4-6 weeks)	• Secure legal mandate for environmental assessment and reporting. • Identify a local technical team within the lead agency. • Develop a basic outline for conceptual framework and process, capacity, time and resources required. • Hold start-up meetings to discuss adjust and finalize the process and institutional arrangements. • Secure commitment for resources and in-kind contributions.	• MOUs reviewed • Conceptual framework	National environmental authority, local technical team
Stage 2 Institutional set-up (1-3 months)	• Define roles and responsibilities of the political and technical partners. • Establish mechanisms of coordination among partners and collaborating institutions. • Define an institutional framework. • Discuss the elements for the impact strategy	• MOUs signed • Institutional. • Framework. • Stakeholders map	National environmental authority, local technical team
Stage 3 Scoping and design (2-4 weeks)	• Clarify methodological issues. • Establish geographic boundary and detailed timeline for producing the report. • Identify key environmental issues. • Identify indicators, data requirements and sources of information. • Draft an outline of the report. • Identify the target audience. • Develop the impact strategy. • Discuss the elements for a communications and outreach strategy	• Design document (including annotated structure or outline). • Impact strategy	National environmental authority, local technical team, designated organizations and experts
Stage 4 Planning (4-6 weeks)	• Define activities in the process, assign responsibilities and identify expected outputs. • Allocate financial and human resources. • Review and adjust the impact strategy and define indicators of impact. • Develop a communication and outreach strategy. • Establish a monitoring and evaluation system.	• Implementation plan. • Adjusted impact strategy. • Communication and outreach strategy.	National environmental authority, local technical team, designated organizations and experts
Stage 5 Implementation (10-12 months)	• Validate priority environment/development issues and their connection according to the IEA framework. • Collect, process and analyze data and information. • Present and discuss preliminary results with relevant partner organizations. • Write draft report, organize peer review and finalize report based on feedback. • Translation and publication (hardcopy, CD, website, etc).	• Report and complementary results, in different media	National environmental authority, local technical team and stakeholders
Stage 6 Communication of results & outreach (1-2 months)	• Promote different IEA products and messages. • Organize interviews with the media. • Organize presentations for stakeholders	• Report and complementary products in the public domain	National environmental authority, local technical team and stakeholders
Stage 7 Monitoring, evaluation and learning (1-2 months)	• Evaluate the process. Identify lessons learned. • Evaluate the impact of the process in terms of contribution to policy planning capacity building and public awareness	• IEA impacts and recommendation s for the future.	National environmental authority, local technical team and stakeholders

Box 4: National IEA process in Asia Pacific Region

One of the key features of the GEO process is its flexibility. The following description illustrates the process followed in national IEA initiatives supported by UNEP in the Asia Pacific region.

1. Hold Initial discussions with the government after receiving the letter of interest.
2. Identify a National Collaborating Centre (NCC) through consultation with the government. If the NCC has inadequate capacity, look for a collaborating centre (CC) in neighbouring countries or within the sub-region. For instance, while preparing the Bhutan and Laos SoE reports, two collaborating organizations, the Tata Energy Research Institute) in India and the Thailand Environment Institute in Thailand, both GEO CCs, provided assistance.
3. Hold training workshop(s) with about 30 participants each. Participants include representatives of government line agencies dealing with environmental matters, NGOs, the scientific community, business and civil society. During the training participants develop and agree upon the conceptual framework of the report. A focal point for data provision from each government department is identified that to help the NCC collect the required information.
4. The NCC starts collecting the environmental information required (based on the conceptual framework developed during the training workshop) by contacting the focal points in national agencies. The NCC will proceed to analyze the information collected and start to prepare the first draft report based on an outline developed and accepted during the training workshop.
5. Consult with stakeholders including relevant line agencies, academia, journalists, major groups and international donor agencies, to discuss and validate first draft of the report. Consultation serves not only to help orient and improve the draft document, but also to build awareness about the process in the wider national community.
6. Prepare second draft, taking into account comments from consultation workshop; circulate that draft to relevant line agencies and experts for review and comments. Comments are collected by the NCC to be addressed in the final report.
7. Design the layout of the report. This is usually done by the NCC under supervision of a relevant national government agency and UNEP, following UNEP publication guidelines. The report usually displays logos of both the relevant government agencies and the NCC.
8. Proofread final draft, and submit it, along with the graphic design, to the government for review and clearance publication.
9. A national launch event for the report is organized, inviting distinguished individuals who have significant political, social and/or scientific profiles. Special attention is given to inviting local, national and as applicable, international press, and to coordinating a simultaneous press release issued with UNEP.

Source: UNEP-Regional Resource Centre for Asia and the Pacific.

3.5. Stages of the GEO process

3.5.1. Stage 1: Start-up

The start-up stage of the IEA involves initial contacts between the participating organizations in the IEA, the determination of the need for the assessment, securing the necessary mandate and establishing the scale and feasibility of securing funding to carry out the work. The management of this stage may vary according to the institutional structures in any given country.

Once the lead and participating or technical support institutions are identified, the first start-up meetings are held to define the national IEA goals, and the responsibilities of the parties. Outputs at this stage include a conceptual framework and memoranda of understanding (MoUs) between the parties involved in the IEA process. The conceptual framework is prepared with input by the national environmental authority and the core team.

3.5.2. Stage 2: Institutional setup

This section explains the activities and instruments required to establish proactive institutional coordination through the process. It is important to identify suitable institutions with properly defined roles in the process. It is important to involve institutions that can continue to lead the process for a long time.

In many cases, national organizations lead the IEA process while UNEP-DEWA in the region or GEO collaborating centres provides technical support. Figures 4, illustrate the generic institutional frameworks. There are no generally applicable, rigid rules; so many variations are possible depending on national organizational capacities and structures.

The focal point for UNEP-DEWA is the national environmental authority that holds a legal mandate on environmental reporting. DEWA will provide the methodology and guidelines for the process.

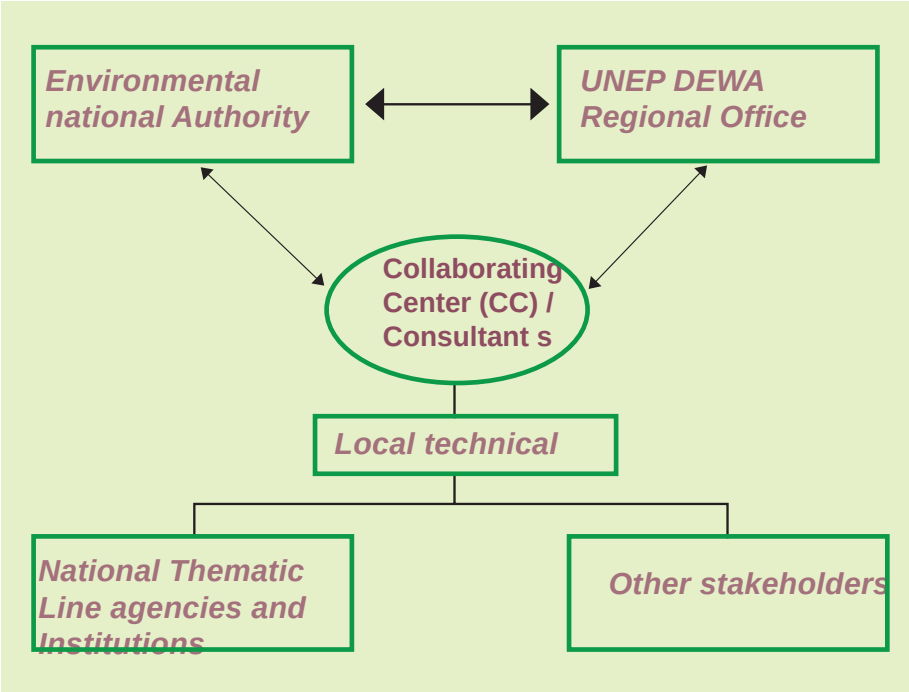


Figure 4: Generic Institutional framework in Asia-Pacific

a. Lead institution

The lead organization would have a legal mandate for preparing an integrated environmental assessment (Figure 4).The leader is usually a government organization (e.g., the ministry of environment or national environment council).

The IEA process is flexible and customized to national institutional capacities, a private organization (e.g., NGO, university) could also be selected by the mandated agency to lead the process, depending on the national preferences. This will increases the IEA's legitimacy and likelihood of its use by decision-makers. Different institutional arrangements have strengths and weaknesses that need to be evaluate during planning.

Criteria for selecting the lead institution include the following:

- leadership capability to convene and incorporate key stakeholders;
- institutional capacity to manage the process (i.e., does not need to depend on consultants);
- credible to the range of stakeholders; and
- able to construct networks, and keep stakeholders informed of progress.

b. Local technical team

The role of the technical team is to undertake specialized analysis, provide, analyze and interpret data, provide peer review, and help engage the wider expert community.

Criteria for selection of effective technical partners may include the following:

- experience in integrated environmental assessment;
- high public profile and recognized leadership capacity
- good relationship with the national environmental authority;
- capacity to dialogue with different stakeholders from both the public and private sector, and ability to build consensus on key environmental issues;
- experience in organizing and facilitating workshops; and
- sufficient human resources to dedicate to a demanding assessment.

The selection could be accomplished by direct invitation by the national environmental authority or through a tendering process.

Technical team organization

Depending on the national context and type of process, the structure and capacity of the technical team may vary.

a. Relatively small technical team. This model uses a team of 3–5 people including 2–3 researchers, one of them being responsible for coordinating inputs into the entire report.

b. Extended technical team. In this model, the small technical team would add subject experts for specific tasks (e.g., state of a particular component of the environment, scenarios). Experts will be engaged under terms of reference for accomplishment of specific task which need to be periodically reviewed to ensure the delivery of the task. When the lead organization is different from the organization in charge of writing the overall report, it is important to define mechanisms of coordination to ensure that there is regular communication as well as clear and agreed review and revision guidelines and timelines. Each partner should select a person from the team to serve as the contact point for issues related to the IEA process.

c. Collaborating institutions and other stakeholders

Collaborating institutions or Centre are those which has been assigned by mandated government agency for the preparation of assessment report. This institution might be from in-country or from neighbouring countries or GEO Collaborating Centre in the region if country does not have capacity. This institution will have direct role in coordination, selection of key issues to be covered, data collection and analysis, drafting of assessment reports and communication of results.

Participants or stakeholders in the IEA process are e those who are invited to contribute their views in different stages of preparation process. These are typically thematic government thematic departments or agencies, academic or specialized NGOs, corporations, civil society organizations, youth or women's groups, aboriginal associations or the media. It is important that the different stakeholders participate throughout the entire process, providing information or developing specific activities.

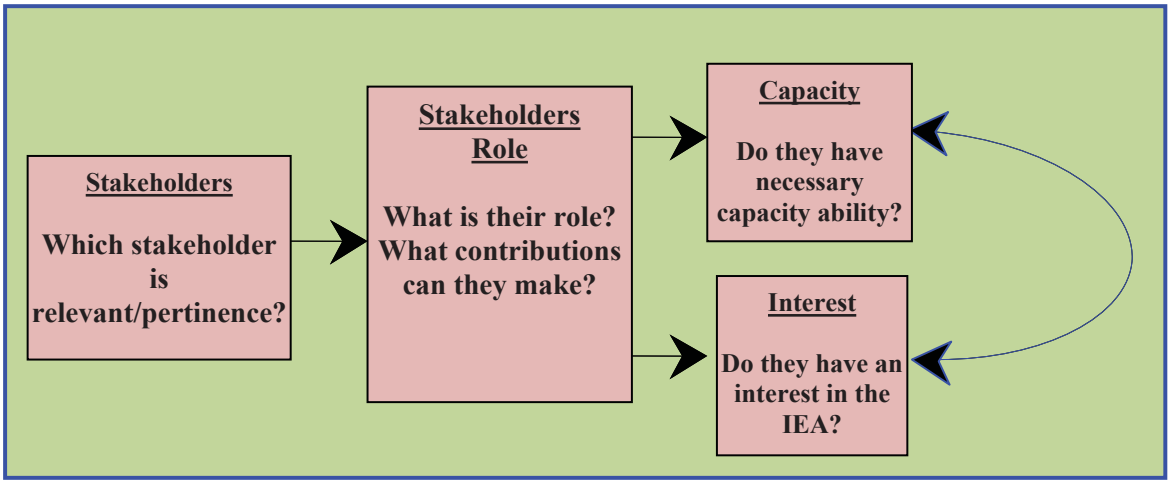
Box 5: GEO CC's towards capacity building and developing national SOEs

In 2000, as Bhutan and Laos did not have capacity to prepare the national SoE reports, UNEP RRC.AP facilitated GEO collaborating Centre in the sub region in consultation with the respective line countries environmental authority to take the responsibility of preparing the report. Tata Energy Research Institute (TERI) in India and the Thailand Environment Institute (TEI) in Thailand, both GEO CCs, provided assistance to prepare the national SOE of Bhutan and Laos respectively.

Source: UNEP RRC.AP

f. Identification of stakeholders

Stakeholders for the IEA process are those who are directly or indirectly influence and impacted by the changing trends of the state of the environment. These vary form the governmental institutions, NGO, academics, civil society, and media.



Source: UN HABITAT (2002). *Herramientas para una gestión urbana participativa. Colección de Manuales*. Ediciones SUR.

Figure 5: Identifying stakeholders, their roles and interests

Based on the key and priority environmental issues the stakeholders is required to identify. Stakeholders list should be inclusive, pertinent, and gender perspective which can be helpful in bringing the real world issues and problems in to the experts notice to be included in the IEA process to be analysed and documented. The conceptual diagram on identification of stakeholder is given in the Figure 5.

e. Establishing the basis for the impact strategy

It is important to try to understand how the national IEA process can have an impact on policies that influence the state of the environment. Particular attention should be paid at this point to identifying persons and groups that are in a position to influence policies that have an impact on the environment, and effectively manage relationships with these people. The summarized steps on the developing the impact strategy is given in the box 6.

Determining effective ways of engaging key decision-makers is a key element of crafting an impact strategy. An important element of this is to ensure the issues covered by the IEA also reflect the concerns and priorities of decision-makers. Besides decision-makers, involving the media is particularly important both as a provider of information through public surveys, and as a channel to reach key audiences.

Box 6: Developing an Impact Strategy

What is an impact strategy?

An impact strategy consists of the steps you take to ensure that the work you do will lead to real progress on key issues or concerns. It is proactive in nature, and adaptive in a public policy environment where priorities of governments and citizens can shift and change.

Why do you need an impact strategy?

It is often an underlying assumption of reporting that good information will lead to good decisions. But while good

information is necessary, it does not follow that decision makers will act on it. Decision makers are often quite well informed, but their priorities and intentions may differ from what your assessment might indicate is important. The challenge for you is to take proactive steps to ensure that your assessment does not sit on a bookshelf once it is done. Your assessment will lead to recommendations for action, and such actions may require changes in government policies and practices. You should consider from the outset how the findings from your assessment might be used, and how the priorities you identify become the priorities of your government and your country.

Steps in building an Impact Strategy (see Figure 6 below)

Step 1. Anchor the assessment with a decision statement: **what do you want to see changed, based on the findings of the assessment, what decisions may need to be made and what changes in policy or policy might be required?** There will always be other influences on decision makers. Some will compete with and others will align with your interests.

Understanding the external political and bureaucratic environment, and issue attention cycles, will help you focus your impact objectives.

Too often, people move immediately to the information gathering stages of the assessment, without due consideration of Step 2. You need to think carefully about who will be in a position to take the findings of your assessment and use them effectively. **Information by itself does not leverage change, but relationships do. It is vital to have people communicating ideas, analysis and data to other people**. The next step is to identify the individuals and groups you most want to reach. You need to consider how these people acquire information, who they trust and what do they trust. How can you get to those people? If you cannot reach them directly, then who are the people they do listen to, and can you reach them instead?

Step 2. Identify those who are in positions to make the decision or effect the changes; those who can influence the decision makers directly (intermediaries -- the people who lean in to whisper advice into the ears of the decision makers); those in civil society who can bring pressure to bear on decision makers; those who can support, reinforce and strengthen your recommendations, in particular the academic community and other research institutes; and those in the media through whom we reach the public, who can also influence decision makers. Central to determining who to reach is the concept of **relationship management, which means** maintaining the connections and influence over time.

Step 3. Once you have identified who will help with achieving the decision you seek, you need to analyze both what they need to know, and what you need to know, that will help them take or influence the decision. This is the **knowledge management** process of the assessment. The remainder of this session will introduce some of the tools you need to gather, analyze and process your information.

Step 4. Next, determine how to move that knowledge into the hands of those you want to influence. There are many tools available to do this: the products to be released, the conferences and workshops to hold, and the amplifiers, including electronic mailing lists and websites, which get replicated throughout much wider audiences than may have been targeted. At the heart of the tactics and strategies that are developed is the creative management of opportunities: both taking advantage of key windows to move the assessment findings into the hands of others, and creating opportunity directly. An important part of this process is the development of “key messages” that are short, simple, plain language statements that capture the essence of the work.

Step 5. We know that in most work, we cannot easily demonstrate causality. It is hard to prove that one’s efforts have led directly to the decision we were seeking. But it is possible to look at incremental changes in attitudes, actions, and behaviours that are a direct outcome of one’s work. Monitoring, evaluation and learning mechanisms must be in place so that you can identify and map these incremental changes that will lead towards the decisions or changes you are seeking. This will help you to adjust your strategy, if necessary.

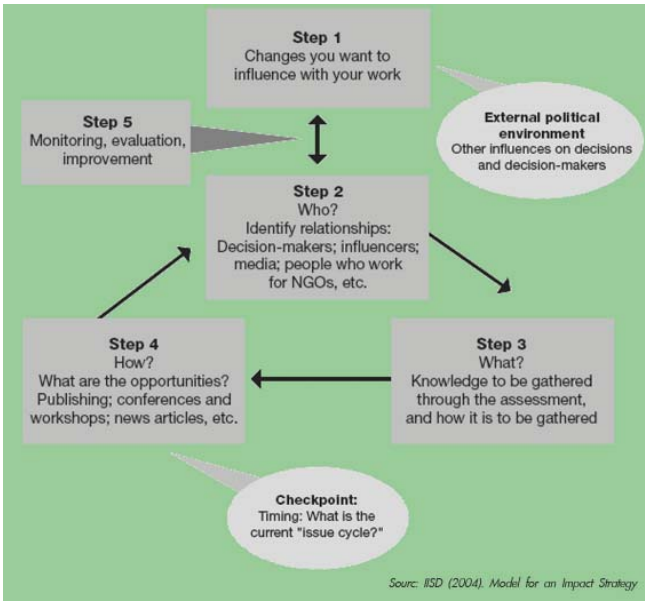


Figure 6: Impact Strategy Steps

Following are a series of steps for policy-makers that can be used to help convert recommendations into actions thus increasing impact.

1. Prepare an executive summary of the main results and policy options for policy-makers.

2. Identify instruments needed to put the actions in place and opportunities to obtain technical support.

3. Consider specific follow-up actions in compliance with policy options identified and use the mass media as well as campaigns to engage the public in dialogue.

4. Use stakeholders involved in the IEA to inform and engage other social actors about the process and its results.

3.5.3. Stage 3: Scoping and Design

The main objectives of this phase are to:

- define the geographic boundaries of the report;
- agree on the methodology for the assessment, and clarify any methodological issues;
- establish the structure of the report, considering the priority environmental issues;
- determine the target audiences;
- define an impact strategy; and
- determine the main elements for a communications and outreach strategy.

UNEP's integrated environmental assessment is based on the **D**rivers-**P**ressure-**S**tate-**I**mpact-**R**esponse (DPSIR) framework, which shows relationships between human activity and ecosystem well-being. This analytical framework helps one to understand connections among the components of an IEA.

The IEA process requires the people involved to learn and understand how to apply the IEA methodology, a process that some will find easier than others. It is important that everyone is clear about the methodology and their roles in using it. The IEA process approach is iterative (learning by doing.) with specific steps, but these are flexible, and can be adapted to different needs.

Prior to the start of detailed planning, reviewing earlier IEA products and processes may be of help. This is particularly useful regarding indicators already developed and identifying information sources and organizations related to earlier assessments.

Throughout the IEA process, the coordinating team must meet at regular intervals. This should start with a preparatory meeting at the start up stage. If the process includes a training workshop, the coordinating team should meet with the selected trainers and discuss the overall goal and approach of the IEA. The training can both help build capacity and also scope out process and content, as well as help set milestones and time line.

It is necessary to have follow up meetings to keep the report writing progressing. During the IEA process, especially once data has been collected, it can seem that activities slow down. You need to have regular interaction with the technical teams to keep up momentum. Also, technical teams need to serve as reviewers and should bring relevant experiences from other IEAs to the attention of participants.

3.5.4. Stage 4: Planning

The purpose of the planning stage is to bring together key process elements and content identified in the previous stage into a coherent and concise plan.

There are several outcomes to be achieved from the planning phase:

1. To share and make sure participants of the process understand the IEA methodology
2. To have a timetable and well-defined results at each stage
3. To identify the requirements of human, financial and infrastructure resources and how to overcome any shortfalls in these;
4. To have adequate coordination mechanisms with the process stakeholders;
5. To establish adequate mechanisms of coordination with the UNEP DEWA team and GEO collaborating centres, if applicable;
6. To review and adjust the impact strategy and define measures of impact;
7. To develop a communication and outreach strategy; and
8. To establish a monitoring and evaluation system.

During planning, you should consider using documents, survey results and workshops to get a clear understanding of the main environmental problems. This knowledge is essential for the design and planning of future activities in the process. It is also important at this stage to review and adjust the impact strategy, and to develop a monitoring and evaluation system in order to recognize, understand and learn from successes and failures of the process.

Costed work plan

The IEA process requires many types of activities that involve human, financial and infrastructure resources. The costs will vary among countries, depending on a number of factors, such as the quality of institutions dealing with environmental issues and stakeholder awareness of the problems. It is important to have a clear, transparent fully costed work plan. In-kind resources can be part of the budget.

A key component of an IEA work plan is the budget. Given different institutional contexts and financial management systems, details naturally vary, but some common elements can be identified.

DISCUSSION QUESTIONS

1. Is there a planning process for integrated environmental assessment in your country? (If yes, go to question 2.)
2. What are the characteristics of the planning process for integrated environmental assessment in your country? List the characteristics and draw a plan chart.
3. In your opinion what are the main conditions for a successful IEA planning in your country?

3.5.5. Stage 5: Implementation

The implementation stage has three basic components: identification of environmental problems, indicators and sources of data; data collection, analysis and writing; and translation (if needed) and publication. Following are details on the first two components.

Identification of environmental issues and priorities

The identification of environmental issues and priorities requires a series of steps that help participants in the IEA move from a general conceptual framework of the IEA towards specific issues and interrelationships that will be analyzed in the assessment products.

The starting point is a conceptual framework that identifies the key domains of the environment as it interacts with human society.GEO uses a modified version of the drivers-state-impact-response (DPSIR) framework as described in module 1, and this framework has been successfully used also in the context of many national IEAs.

Once the framework is developed a range of environmental issues can be identified involving both expert and stakeholder participation. Issues are more specific than the categories in a conceptual framework, but discussing them does not require deep technical expertise, which would limit the opportunities for stakeholder participation. The result of issue identification is typically a longer list of items that is usually longer than what can be effectively covered in an IEA. Therefore, there is normally a need for prioritization based on criteria. Alternatively, prioritization can happen once there is a list of indicators selected, but prioritization at an early stage can save time and work, as no indicators would be developed for lower priority issues.

The result of this stage of the process is a short list of clearly formulated priority issues with a clear link to the IEA's conceptual framework and a strong connection to stakeholders' concerns about the environment.

Indicators, data collection and analysis

National IEA reports use indicators to quantitatively describe various issues and to track changes. In a national IEA report, the number and type of indicators will depend on the objectives defined by the technical team. The list should include environmental, economic and social indicators. Indicator selection can directly build on the earlier identified priority environmental issues. Typically, indicator selection involves several rounds of discussion first producing a larger list and then narrowing it down to a tighter set of leading indicators based on scientific, policy and feasibility criteria. Indicator selection, data collection, visualization and analysis are described in detail in Module 4.

Due to limitations of time and resources, as well as common technical difficulties in gathering primary data, the technical team is likely to rely on secondary information sources, using information already prepared by various organizations, such as national statistical offices. Information needed for the report is often dispersed, and may require considerable work just to locate. The technical team need to establish agreements with organizations willing to share their files and databases. This involved two main steps: collecting and processing the information, and analyzing the information and writing the report. The first task often takes more time than expected, mainly because of institutional barriers to information sharing. Once the first task is completed, the next steps are relatively straightforward.

a. Information gathering

Technical teams usually do not produce primary data, they must acquire it from original sources, often in government agencies. Sometimes, the technical teams have to persuade government officials to get interested in the project and help in the data collection.

Once the data and information is collected, it should be organized and verified. This involves checking the sources of the information to ensure that the data is reliable. Ensure that you have enough time for the task. Then, the data has to be transformed, combined and presented in different ways according to each component of the DPSIR framework.

DISCUSSION QUESTIONS

1. In order to know the constraints that your GEO process will face, what are the main problems collecting information for the GEO-based report in your country?

2. Regarding environmental data, do you think is it reliable, and how regularly is it updated?

3. Sometimes, a report's conclusions show the lack of environmental information that make it impossible to analyze the magnitude of the problem, Can you think of examples of environmental problems for which there is no monitoring data or it s not accessible?

ROUND TABLE DISCUSSION

Discuss how the GEO Process can help to organize the collection and assessment of information and the assessment of responses to the report by government and society.

b. Information Processing, analysis and writing

The analysis of the data and information compiled sets the stage for the detailed integrated assessment, the main substantive part of the IEA. The underlying conceptual framework of the analysis in IEA is based on the logic of the driving force-pressure-state-impact-response (DPSIR) method, described both in Module 1 and 5. The DPSIR logic also serves as a basis for sequencing the steps of the assessment, although often several analytic processes are run in parallel.

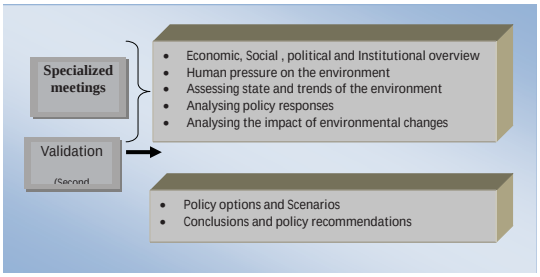


Figure 7: Sample Outline of IEA report

The DPSIR logic is also reflected in the structure of IEA reports. Figure 7 shows a possible IEA report structure that is based on this logic, though one has to keep in mind that variations are possible and used by the many countries that undertook or will undertake an IEA.

IEA Structure

This stage deals with how to structure the report to get a final product that can be used in national environmental decision making processes. In this stage, it is crucial that participants discuss and agree on the main environmental problems and choose the best way to present the information through the report and associated products. The technical team should prepare a preliminary report outline and discuss it with stakeholders and participants. The following examples the outline developed in the inception workshop. The choice and order of issues will vary among countries, depending on important issues and priorities.

Example : Table of Content of Sri Lanka Environment Outlook

EXECUTIVE SUMMARY
Part I: GENRAL INTRODUCTION
Part II: OVERVIEW OF MAJOR ENVIRONMENTAL DEVELOPMENTS AND TRENDS
- A. Social – economic condition
- B. Environmental Condition/ Resources
- C. Policy and legal framework
- D. Institutional framework

PART III: KEY ENVIRONMENTAL ISSUES
(identified in National Policy of Sri Lanka)
1. Forestry, and wildlife conservation
2. Agriculture , Land development and mining
3. Fisheries and coastal and Marine Area Management
4. Industry and Tourism
5. Energy and Transport
6. Health, sanitation and Urban Development

Part IV: PRIORITIZATION OF ISSUES (Trends, Indicators)
Part V: CONCLUSIONS AND RECOMMENDATIONS
Annexes

Economic, social and institutional overview

This section provides a high-level, retrospective analysis of the country's socio-economic and institutional conditions and identifies underlying driving forces. Driving forces refer to deep structural changes such as demographic trends or consumption patterns with fundamental influence on human activities that lead to direct pressures on the environment.

The overview can also help to firmly establish the link between environment and development and convey the need to look for the causes and solutions to environmental problems well beyond the environment itself. The economic overview could include not only a description of key macroeconomic parameters, but also, for instance, the country's approach to international trade or degree of technological advancement.

Finally, the section should also describe the institutional framework for environmental and sustainable development governance, including the underlying legal framework, key institutions and division of responsibilities among different layers of government.

Human pressures on the environment

Pressure in the DPSIR terminology refers to human activities with direct influence on environ-mental conditions. Pressures are typically correlated with driving forces and may refer to processes such as emission of pollutants, conversion from natural to cultural landscapes, or the harvest of renewable natural resources beyond their carrying capacity. Pressures are often combined, for instance land clearing for roads in a pristine forest may be accompanied by increased forest harvest intensity, introduction of non-native species or growing air pollution. Usually, information on pressures tends to be more easily available because it comes from socio-economic databases (for more details see Module 5).

Assessing the state and trends of the environment

This section presents the actual condition and trends in the environment, resulting from the driving forces and pressures. The most common approach to categorise the SOE issue is to follow a hybrid structure based on environmental media and environmental problems. For instance, this could include such aspects of environmental degradation, as levels of air pollution, water contamination and solid waste, as well as changes in biodiversity. Module 5 provides detailed information and examples on some of the more common categories used, but these should not be taken as prescriptive. You should build in sufficient time for consultations with your experts and stake-holders to identify the categories most suitable for your reporting area. This stage also involves the identification of key indicators and relevant data sources, acquiring the data, organizing the data on a suitable database, data analysis and interpretation. You need to remember that the IEA should not be driven by data but by the issues and information needs identified by stakeholders.

Assessing policy responses

The assessment of policies can either be integrated with or separated from the SoE analysis. Both approaches have their strengths and advantages: separating the two sections leads to a more disjointed report where environmental state issues and their underlying policy causes are discussed separately; on the other hand, discussing policy responses together in one section may lead to amore coherent comparative analysis. Policy analysis is a conceptually complex area and often requires either the

collaboration of science-based and policy experts or experts well versed in analyzing environmental issues on the interface of science and policy. From the substantive point of view policy analysis involves the identification of public or private sector policy drivers that contributed to earlier demonstrated environmental change and assessing their effectiveness. It may also involve pointing out policy gaps. In order to help identify relevant policies Module 5 provides a general typology and further detail on the methodology of policy analysis.

Analyzing the impacts of environmental change

Analyzing the impacts of environmental change has gained increasing prominence in UNEP'sGEO-4 report. Analyzing environmental impacts requires identifying changes in socio-economic or ecological conditions that are significantly influenced by changes in the state of the environment. Typically, the observed impacts are a result of multiple forces of change, some short term and local, others long term and global and everything in-between. You will need to both scan a wide range of impacts and then select priorities to concentrate the analysis on. This will also require consultations in the scoping and more detailed analytic stage. You will also need to remember to try and separate or at least identify cases where impacts are caused or significantly influenced by non-human induced pressures, such as natural disasters. Further methodological detail on analyzing impacts of environmental change is provided in Module 5.

Policy options and scenarios

Scenario analysis is an essential signature component of IEAs and outlooks. The scenario section builds on SoE and policy analysis and tried to answer these questions: where are we heading; what actions could be taken for a more sustainable future? This can help with long-term planning, and can support applying the precautionary approach to specific issues. By exploring possible future scenarios, decision-makers can get a clearer picture of what tomorrow might bring, and what the impact of alternative decisions is likely to be.

Scenario analysis usually combines quantitative and qualitative elements.

The quantitative component requires modelling and may directly build on data and indicators. The qualitative component involves creating and refining descriptive narratives. These two sides of scenario analysis require different methods and skills and a process that helps combine them in coherent scenarios. The process usually involves several iterations of interaction among stakeholders, thematic experts and a core group of' integrators', scenario experts who create the actual scenarios. In cases where capacity for quantitative modelling is limited, countries used only scenario narratives that may be still useful to explore alternative future trajectories and their policy implications in a series of facilitated conversations with participants. Details of the scenario process are described in Module 6.

Conclusions and recommendations

Preparing recommendations is the final analytic stage of the IEA process, but whether it is required depends on a particular country, In some cases the task of formulating policy options is seen as the realm of the policy process, and decision makers may explicitly request that the IEA does not produce recommendations. However, there are also many examples in the past where recommendations were explicitly requested and were even included in the IEA mandate. Formulating recommendations builds on all earlier IEA stages, and requires the participation of senior or high level policymakers who may not have been directly involved in earlier stages of the assessment. The technical team may be requested to prepare draft recommendations that then become a starting point for a dialogue, leading to a final set. In order to be effective, recommendations would ideally be connected with strategic policy processes, such as budgeting or long-term strategic planning. For further details of the scenario concept and process please see Module 6.

3.5.6. Stage 6: Communication and outreach

Communicating the results is a vital part of the process. The report can be an instrument for social mobilization on the question of the environment and sustainable development. You will need a strategy to stimulate pubic participation, to communicate the information and to encourage its use by citizens and public bodies not directly involved in its preparation. Following are some tips for preparing your messages so they will be more easily understood.

Make your messages understandable to your audiences

The team producing the report needs to remember that the audience will not be environmental specialists or technical people. The report has to be easy to read, with limited use of jargon. Experiences in national IEA reports show that maps are very useful for communicating some messages in an easy manner.

Make information relevant to your audiences

Communications is a two-way process. Before trying to communicate, it is important to first listen to your audiences, and understand what is relevant to them.Try to find out what they understand, misunderstand or do not know about. Use this information to shape

your messages so you provide them with useful information.

Shape the delivery system for the audience

Do not give long technical reports to people who do not have a technical background. Offer more detailed information to those who want it. Senior officials, such as cabinet ministers or business executives like a one or two-page synopsis. Only specialized audiences have the time and interest to read the full report.

There are many communications options. The classic methods are largely oriented to print (reports, synopsis report with highlights, bulletins, articles, newsletters), or to radio and TV (interviews, pre-recorded messages). In recent years, the Internet has become a major communications tool through the posting of reports online and the use of techniques such as interactive reports and electronic bulletins by e-mail. Consider alternative communications such as cartoons for populations that can't read or write or puppets in a theatre play. In addition to distribution to the news media, consider outreach to a wide range of interested organizations, such civil society organizations, universities, national and international agencies, schools and many others. (For more details see Module 7.)

3.5.7. Stage 7: Monitoring, evaluation and learning

The integrated environmental assessment report should be seen not as a one-time effort, but rather as the first step in a system that will hopefully produce IEA reports at regular intervals (e.g., every two years). Continuity of reporting will allow for better analysis of the impacts of actions taken, as well as the evolution of the links between pressures, the state of the environment, and impacts on ecosystem services and human well-being.

Evaluating the impact of the GEO process is an important part of the learning process in reporting and for progress toward sustainable development. Technical teams should document evidence of impacts of their work to confirm the legitimacy of their analysis and recommendations. This can help to increase the likelihood that its recommendations will be adopted. This means that during the process, it is important to monitor progress at each stage. For effective monitoring, it is important to define, in the planning of each stage, the expected results and some progress measures. The monitoring process allows improvements in GEO methodology and the institutional framework based on lessons learned at every stage *(For more details see Module 8-where is Module 8??)*.

DISCUSSION QUESTIONS

1. Do you think it is important to evaluate your national IEA processes? Why?

2. Which measures will be good to keep track of your impact?

3. Which mechanisms will you implement in order to promote continuity of your reporting processes?

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Module 3 & 7: Developing an impact strategy and creating communication out put of the IEA (DRAFT)

Overview

This module will focus on methods to position and deliver a national IEA findings and recommendation and creating communication of it. This can have real impact on environmental policy and practice at a series of levels, ranging from local to national.

Why bother with developing an impact strategy and creating communication of the IEA outputs?

Each day the general people and decision-makers get numerous text information. This involves times to read out of 24 hours of his day. Simply providing yet another report to your senior bureaucrats and political leaders won't be enough to ensure that they read your findings, let alone act upon them.

Before you start producing your main report and other products, you need to make a series of important decisions. By identifying your target audience(s), you will be better able to shape your message and select the right content, and later, the right presentation format. By carefully considering our budget, you will be better and more able to make realistic decisions about the kind of product you feel will be most beneficial. You will have to decide what kinds of information products best suit your message.

We want to take you through the steps that will help you determine how to engage the right people to listen to you and respond to your work. This impact process takes time; and involves a real emphasis on being clear and strategic in identifying the changes that you want to see as a result of your assessment and how well the findings can be communicated. The module discusses strengths and weaknesses of different channels and how to go about approaching the media.

The process focuses on building relationships with key people, finding out what they know already and what they need to know and how best create the communication of the IEA outputs. With that understanding, you can then seek out and create the opportunities to get your messages across, to generate dialogue, and gain the attention and support of those who may have in the past appeared non-responsive to your work.

A portion of this training will be presentational in nature. However, most of your time will be spent in pairs or small groups to discuss local political and social factors that could affect whether and how your reports are used. Small groups also will be used to practice building the components for an impact strategy for your reports where assessment output communication will be the major focus.

Outputs of this training module

- The primary output should be an outline of communication and impact strategy for your next state of the environment (SoE) or GEO-based national integrated environmental assessment (IEA) report.
- At the end of this module, we anticipate that you will see yourself as someone capable of having ability to build long term communication strategy to have real impact on decision-making.

Course Materials

1. Introduction and learning objectives

This module will focus on methods to position and deliver a national IEA outputs so that it can have real impact on environmental policy and practice at a series of levels, ranging from local to national.

At the end of this module, you should have increased your ability to ensure that an IEA has an impact.

1. You will be able to articulate reasons for doing an integrated environmental assessment that can cover but also go beyond mandated requirements.
2. You will have a greater understanding of the political process and context of what you are doing, such as how changes are made in policy and practice.
3. You will be able to develop effective communications strategies to achieve impact by systematically implementing the most important steps of a dissemination plan, while choosing the most appropriate communication outputs, and ways of reaching audiences;

4. You will be able to demonstrate an ability to link target group(s) and content with their choice of presentation format and communications channels, considering budget constraints;
5. You will understand that achieving your desired impact requires more than the production of a report at the end of the assessment. Strategic positioning of your work and planned communications are essential components of your work that should be undertaken in parallel with all stages of the assessment.
6. You will understand the importance of production and distribution/dissemination process, with special emphasis on approaching the media.

2. Understanding impact

In this section you will learn:

- why it is important to have an impact strategy;
- how to understand the external environment (context) for an assessment;
- how to recognize an issue cycle (using media, polling data, etc.); and
- how to communicate the output of the assessment.

2.1 What is an IEA output communication and impact strategy?

A communication and impact strategy consists of the steps you take to ensure that the work you do will lead to real progress on key issues or concerns. It is proactive in nature, and adaptive in a public policy environment where priorities of governments and citizens can shift and change.

2.2 When do you prepare an impact strategy and who is responsible for it?

An impact strategy should be prepared once you have initiated the process for an integrated environmental assessment. It is initiated as part of the "institutional setup" stage of a GEO-style IEA process. It is formalized in the "scoping and design" stage, implemented stages 4 through 6, and regularly monitored, assessed and improved (see Module 2). The manager, or management team, for the IEA process should be responsible for:

- developing the impact strategy, or ensuring that an impact strategy is developed;
- implementing the strategy; and
- monitoring performance on the strategy to ensure that it is achieving the results you are seeking, and modifying or adjusting it, if necessary.

2.3 Why do you need an impact strategy?

In many jurisdictions, SoE assessment or sustainable development reports are now mandated by statute and regulation. In others, there may be a strong policy context that has led to a government undertaking or participating in an assessment as a voluntary initiative.

By their nature, most SoE/integrated environmental assessments are not detailed scientific assessments. They may, however, lead to more attention being paid to problem areas, and they may recommend a more detailed scientific assessment of root causes and downstream effects. The result of an assessment can shift the mood of the public, and lead to political pressure. It may educate a wide range of audiences on key issues, and as a result it may trigger further detailed studies that are more directly linked to specific issues and decisions.

It is often an underlying assumption of reporting that good information will lead to good decisions. But while good information is necessary, it does not follow that decision-makers will act on it. Decision-makers are often quite well informed, but their priorities and intentions may be different from yours. The challenge is to take proactive steps to ensure that your assessment doesn't sit on a bookshelf once it is done, but that it provides good input to decision making. Your assessment will lead to recommendations for actions that may require changes in policy and practice by the government. Consider from the outset how the findings from your

assessment might be used, and how the priorities you identify can become the priorities of your government and your country.

An impact strategy begins with articulating the changes sought as a result of the assessment. This provides purpose beyond simply following through on the mandated requirement for the assessment. For those conducting an IEA for the first time, it may not be possible to articulate a specific policy-related change that might be necessary as there is no prior assessment which identified priority issues. For first timers, seeking better linkages between the findings of the report and formal decision-making process in government (e.g., departmental strategic plans, policy, priorities, and budgets) may be the main objective. Those who are conducting an assessment for the second or later rounds might be able to think more specifically about issues and necessary policy changes identified from the process.

2.4 Understanding public environment on assessment

There are many ways to get a sense of the external political and public environment in which the assessment is taking place.

- Review not only the relevant statutes and regulations that govern the assessment, but also review the debates in parliament and parliamentary committee minutes. Find the background white/green papers, or other relevant policy documents.
- Investigate with current/former bureaucrats their recollection of the process involved in securing the mandate to do the assessment.
- Review current debates in parliament. What are the hot button issues among the members?
- Monitor political and social coverage in the national media and what they think is worth reporting?
- Chat with colleagues in other departments about what the key issues are that they are addressing.
- Attend meetings of non-government organizations (NGOs) and community-based organizations within and outside of the environment sector. Find out what their priorities are. Hold focus groups to identify user needs and interests.
- Look at polling data. If you have the resources, commission a public opinion poll, or work with the government's communications department to commission a poll to find out what is important at the present time for the citizens of your country.

Be aware that if your assessment process serves only to produce a report simply to comply with a legal or policy instruction, then the impact—the ability to have the findings used to effect change—will be severely limited.

EXERCISE

Form groups of three–four with your neighbours and discuss the following questions. Be prepared

to share your answers in plenary.

1. What was the context for previous assessments with which you are familiar? Are you operating under a legal or policy mandate? Is your assessments part of a larger programme for government accountability?

2. Why were your assessments mandated, directed or commissioned? Were your assessments a high priority for your superiors? What other things concern them?

3. How did/will higher-level decision-makers use your findings?

2.5 Understanding issue attention cycles

In preparing an impact strategy, it is important to be aware of levels of public, political and bureaucratic attention to current issues, and to the issues being explored in the assessment. Levels of attention will influence the choice of actors to engage (and the likelihood of getting their support), and how to engage them. Understanding what is on the public radar screen will also help identify where your assessment might be useful in bringing new knowledge and recommendations for action.

It has been found that for environmental risks there is generally a pattern that resembles a "classic" issue attention pattern initially identified by Downs (1972) and subsequently confirmed by many scholars (e.g., Baumgartner and Jones 1993). Social attention to global environmental risks has tended to lag years and even decades behind scientific and technical developments. At some point,

it rises relatively rapidly, remaining high for a short period of time, and then drops off again (Social Learning Group 2001). In some cases, as with stratospheric ozone depletion in the United States, attention to the issue can occur in just two such cycles.

The research of the Social Learning Group suggests three phases of issue development (Figure 1).

During the first phase, before the issue first achieves widespread public attention, the principal functional change is the gradual build-up of scientific and analytic capacity through research, monitoring and assessment activities. Over a long period characterized by relatively low public attention, society's capacity to address new issues gradually accumulates within a relatively fixed group of institutions, largely determined by historical circumstances and the way the issue is perceived.

It is unlikely that new institutions will become involved to a major extent with the issue during this period of low attention.

The subsequent period of rapid rise in public attention marks a second phase in issue development. During periods of rapid rise in public and political attention to a new issue, there will be a renegotiation of leadership within already engaged institutions, and a need for new institutions will emerge. At this stage of issue evolution, it is important to recognize the need for coalitions of actors to push the issue forward. These coalitions provide the basis for a shared understanding of the problem and its possible solutions. Effective management of emerging issues will therefore encourage this coalition building rather than encouraging generally increased participation by individuals, or isolated groups of actors.

A third phase of interactions among management functions is associated with the period following the peak in public attention and continuing through the subsequent decline in attention. During this period, the linkages between the knowledge-intensive and action-intensive management functions increase in frequency and run in both directions: knowledge influences action and vice versa.

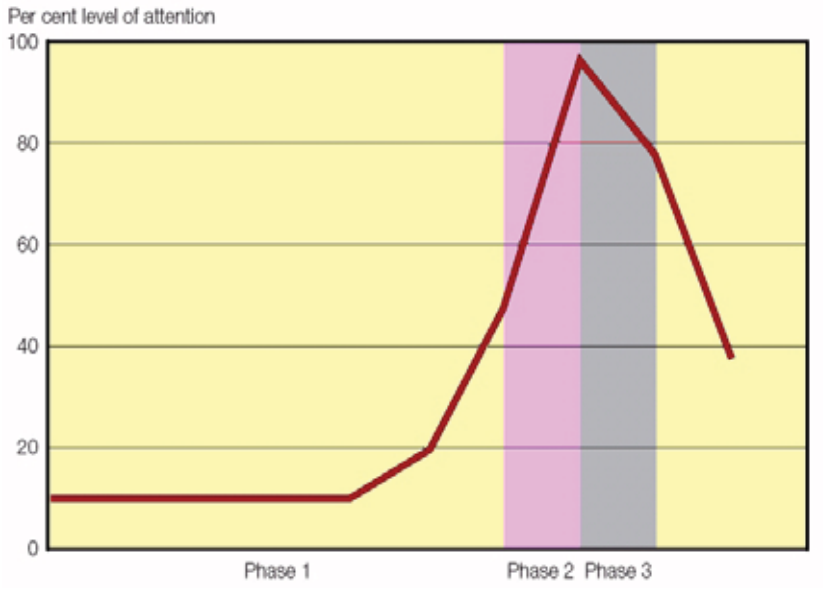


Figure 1: Phases of an issue attention cycle (adapted from Social Learning Group 2001).

EXERCISE

In preparing for this assignment, you were asked to:

- review the number of stories in your newspaper related to environment, health and development in the week prior to your training; and
- find sources of public opinion polling data in your country and review them for the current year.

Based on your "homework:"

- what issues are of most concern to citizens in your country right now?
- how is your political leadership responding and;
- how might you align findings from your assessment with these concerns?

A case study of the climate change issue attention cycle

The case of attention to climatic change is illustrated in Figure 2.This graph charts levels of public interest in climate change as indicated by coverage of the issue in the elite newspapers of several countries. While the graph only shows the media coverage, additional research carried out by the Social Learning Group suggests that the levels of attention accorded to climate change in the elite media correlated strongly with levels of attention shown to it at the same period in time by other actors such as parliaments, industry groups and the scientific community. The media data can thus be taken as a rough reflection of overall changes in levels of attention to global environmental risks among actors.

Of particular interest in this graph is the one- or two-year period of rapidly increasing attention, then a year or two with the issue in high profile, and finally a slow decline of public attention back to lower levels. Over sufficiently long periods, recurrent cycles of public attention are possible (possibly indicating that lower attention levels have more to do with the emergence of new priorities. or media and public fatigue, rather than a resolution to the problem).

Much as in the cases of acid rain and stratospheric ozone depletion, climate change was an expert issue long before it became a public one. There was relatively little attention to climate change in the press of any arena prior to 1988, despite decades of sustained scientific work. In this case, “issue linkage” appears to have been a critical factor in getting climate change onto the agenda of the public and policy-makers. The rise of stratospheric ozone depletion to the political agenda forced a certain amount of political attention in at least some national and international arenas to the issue of global climate change. Also important was the role of political leadership.

In the late 1980s, high-ranking politicians in many of the politically powerful arenas started to speak about the need to take action regarding a global warming threat. Their attention was secured by proactive, strategic and personal efforts on the part of scientists and concerned citizens working in NGOs. This put political momentum behind scientific developments in several arenas, and the issue appears to have caught on in several of the other arenas. By 1989-1990 there was a relatively high level of attention to the issue of global climate change in the media of almost all countries. Climate change remained on the public agenda even when media attention to stratospheric ozone depletion began to decline. In the period after the data collected for Figure 2, evidence suggests that attention dropped sharply in most arenas towards the mid-1990s before rising again in the run-up to the Kyoto Conference 1997.This might signal that once an issue receives a high level of both public interest and political support, it will remain on the bureaucratic agenda even though public interest may shift to other concerns. For the impact strategy, it is important to be aware of where the issue that is to be assessed lies with respect to the attention cycle. If the issue is in the first phase, in which most attention to the issue s in the scientific and technical realm, the impact strategy should consider that the audience most likely to be interested in the IEA will be in this area. It will take more concerted effort to gain the attention of the general public, private and political interests.

During the second phase in which there is a rapid rise of public and political attention to the issue, there is a “window of opportunity” in which the impact strategy can consider the possibilities of reframing the issue and attracting new actors to become involved in dealing with the issue. If the issue is in the third phase, where the issue is on both the scientific and political agendas and there is considerable interaction between these communities, the impact strategy will be able to address the broader communities of concerned actors, when scientific analysis, public interest and political agendas are closely linked. It is at this stage that an impact strategy may have its most obvious and immediate results. Keep in mind though, that an impact strategy developed at this stage will be in effective. The strategy must be developed early; it will just have its greatest impact at this stage.

There is a certain inevitability that issues will recede from the attention of the general public. An impact strategy may help to:

- mitigate the falling off of public attention by focusing on more direct engagement of target decision-makers; and
- shorten the issue attention cycle by moving a relevant issue back into the public eye more frequently.

There will always be unexpected catastrophic events that can play a major role in tectonic shifts in public policy. In these circumstances, public interest and policy response may peak simultaneously, with pressure placed on knowledge seeking efforts for rapid response. One has only to consider, for example, the effect of the 2004 tsunami in Asia on policies to implement early warning systems. These events can have two outcomes for your own impact strategy.

- You can seize the opportunity to relate your assessment findings with the catastrophic event. For example, in 1997, one could have tied SoE report findings on land management to the massive land-clearing fires and resulting haze blankets across Asia that led to $US1.4 billion in short-term health costs and fire damage (IISD 2002).
- Your work will be moved off the political and bureaucratic radar screen for the immediate future. You will need to complete your mandated requirements for the assessment, but continue to foster the relationships built through the process, and be ready for the time to advance the findings.

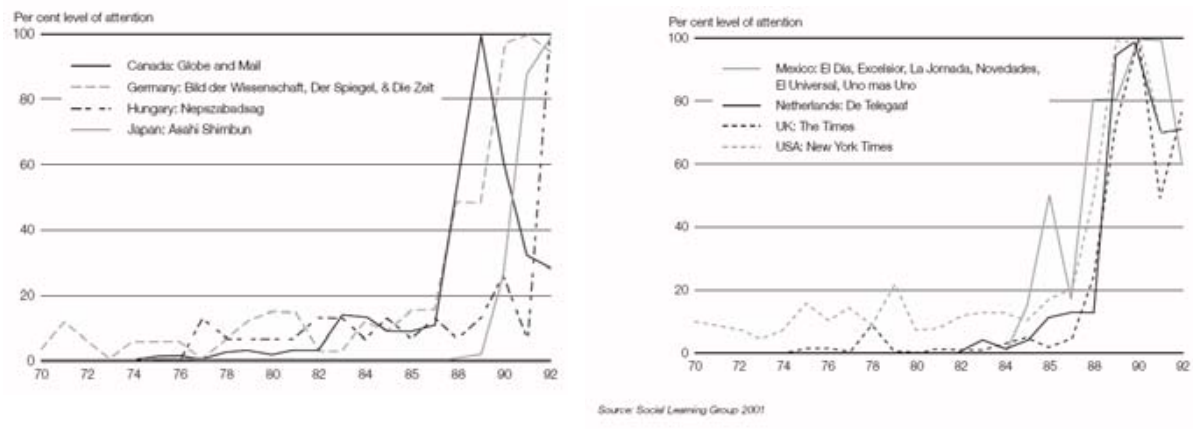


Figure 2: Country comparison of newspaper attention to climate change

3. Model for an impact strategy

3.1 Attributes of impact strategies and traditional communications activities

An impact strategy incorporates communications activities combined with a good understanding of government relations as practiced by advocacy groups and professional lobbyists. With communications

An impact strategy builds on communications activities in several key respects.

	Impact Strategy	Traditional Communications activities
Purpose	Goal is to effect change, and to identify your potential role as a change agent.	Goal is to ensure people understand the findings and recommendations.
Audience	Small group of key actors and those who have access to those actors.	Broader audiences
Timing	Developed at the beginning of the assessment process, monitored and adjusted throughout the process.	Part of the impact strategy; usually implemented towards the end of the strategy when findings and recommendations are known.

strategies, it is necessary to identify key recipients of the assessment, prepare key messages and products that will help them grasp the essentials of the research, and identify appropriate channels to deliver those messages and products, including the media, participation in events (e.g., conferences, workshops), and electronic delivery via e-mail and web.

EXERCISE

- Share a story from your own experience about how assessments have been communicated in the past to decision-makers and to the public.
- Discuss in particular the roles of different players: who was responsible for delivering the final report, what were their tasks, who were their target audiences, who handled the release to the general public and what vehicles or channels did they use to get the information out?
- Were you satisfied with the responses to the assessment?

3.2 Steps in building an impact strategy

There are five main steps to creating an impact strategy, as illustrated in Figure 3.1. These steps are elaborated below.

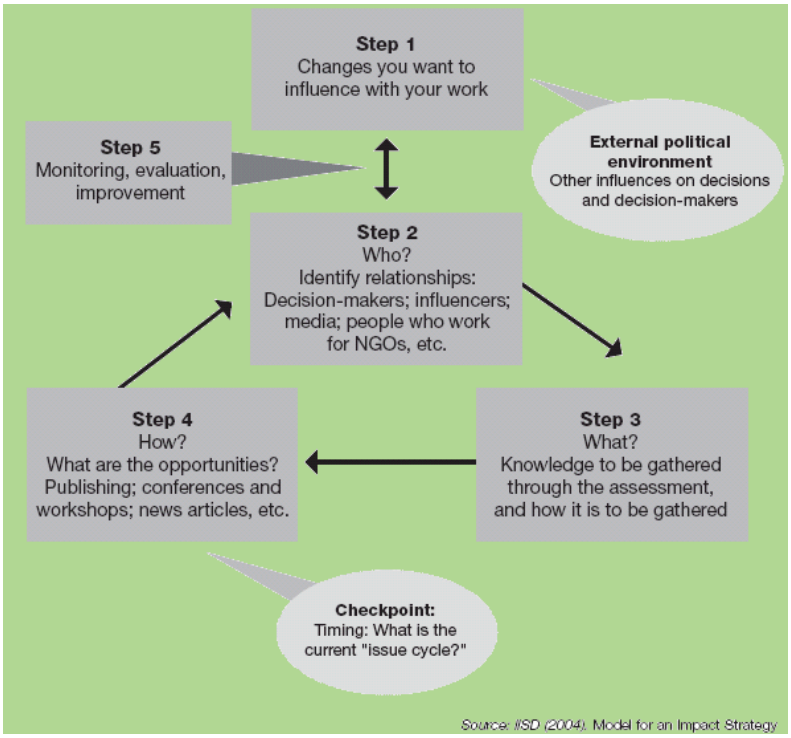


Figure 3: Model for an impact strategy

Step 1: Creating a "change" statement to anchor the impact strategy

An impact strategy is anchored by its "change statement." This is an articulation of what the impact of your assessment should be. What should be changed or done differently as a direct result of the assessment?

The change statement may be fairly broad, focused primarily on getting people in positions of authority to actively use your report. For example:

Key departmental decision-makers will use the information gathered during the assessment to develop policy priorities, departmental strategic plans and budgets.

Or

State, as well as national, level planners will review the findings of the assessment, and prepare internal policy briefs on how they will address the recommendations of the assessment.

Remember that an important part of the IEA process is a scan of the issue and policy priorities. In the context of any given priority issue to be reported, major policy mechanisms that could or should be influenced can also be identified.

The Poverty Reduction Strategy Paper planning and implementation process is adjusted to increase attention to environmental degradation, protection and rehabilitation, based on the findings of the assessment.

An impact strategy is a dynamic process. The change statement may start off fairly broad or general, but as more data become available and analysis is carried out, the change statement can be revisited and refined. Based on the findings of previous assessments, or on the new data being analysed, you may wish to focus on one key priority that you want your findings to inform and address, e.g.:

The government institutes a national watershed management plan that takes into consideration the responsibilities and capacities of local villagers to protect and rehabilitate their water sources.

You can still reach out to broader audiences to inform and engage them in the report findings. Impact in this context may be an aggregate of actions that individuals may take in response to the report. But there may be little that they can do on a personal level. The impact strategy will help you work towards leveraging real policy change on a key issue.

EXERCISE

- How you would like to see your assessment used?
- Describe a situation (a government policy or practice) that could be improved as a result of your assessment.

Step 2: Relationship management

Too often, people move immediately to the information gathering stages of the assessment, with-out due consideration of Step 2. Careful thought should be given to who will be in a position to take the findings of the assessment and use them effectively. Information by itself doesn't leverage change, but relationships do, and this involves people communicating ideas, analysis and data to other people. This step involves identifying the individuals and groups you most want to reach. Consider how these decision-makers acquire information, who do they trust, what information source do they trust and how do they make decisions? How can you get to those people? If you can-not reach them directly, who are the people they do listen to, and can you reach them instead?

This step is designed to identify those who are in positions to make the decision or effect the changes including those who can influence the decision-makers directly. These include: intermediaries, civil society, academic community and other research institutes, and media. Central to determining who to reach is the concept of relationship management: maintaining the connections and influence over time

Step 3: Knowledge management

Once you have articulated who will help with achieving the decision you seek, you need to analyse both what they need to know, and what you need to know that will help them take or influence the decision. This is the knowledge management process of the assessment. The remainder of the Resource Book will provide you with the tools you need to gather, analyse and process your information.

You will need to consider how to build trust in your final product, including the data, the analysis and the recommendations. Participation by the key decision-makers in the actual process of the assessment ensures saliency and relevancy to the finding. This could include not only leading scientists who ensure the assessment reflects the latest scientific results, but also others such as indigenous people whose traditional ecological knowledge can broaden the assessment's perspective or corporations that may have access to more in-depth and privileged information. Generally, the constructive collaboration of a wider set of actors may increase not only the credibility of the IEA but its legitimacy in the eyes of a broader set of social stakeholders.

Step 4: Opportunity management

This step involves moving that knowledge into the hands of those you want to influence. There are many tools available to do this: the products to be released, the conferences and workshops to hold, and the amplifiers, including electronic mailing lists and websites, which get replicated throughout much wider audiences than may have been targeted.

An important part of this process is the development of "key messages," a series of short, simple, plain language statements that capture the essence of the work.

The IPCC case study talks about one of the "key messages" from its work:

The world is likely to see "a rate of increase of global mean temperature during the next century...that is greater than that seen over the past 10,000 years."

This straightforward message was by most accounts, very influential in catalyzing the decision making process, which eventually led to the signing of the UN Framework Convention on Climate Change in 1992 (Agrawala 1997).

Also, keep in mind what you have learned about "issue cycles, " recognizing that timing is important as you seek to position your findings in light of other competing or comparable public and political interests.

The development of scenarios based on the findings presents another type of opportunity to engage key target decision-makers. Scenarios help decision-makers deal with uncertainties, and provide options for action. As opportunities often arise unexpectedly, responding to them requires creativity and a degree of improvization. However, one can prepare for cases like that by having products, properly prepared staff and protocols in place.

Step 5: Monitoring, evaluation and improvement

We know that in most work involving information processes and products, causality is difficult to demonstrate. But it is possible to look at incremental changes in attitudes, actions, and behaviours that are a direct outcome of one's work (Earle and others 2001). Monitoring, evaluation and learning mechanisms should be in place to identify and map these incremental changes that will lead towards the decisions or changes sought, and to adjust the strategy if necessary.

Naturally, you are going to want to know whether your strategy is working. But, sometimes the signals that you are having real influence seem small and insignificant. These quiet signals will be the incremental changes in attitudes, actions and behaviours that are a direct outcome of your work. Is a key actor returning your phone calls? Are you being invited to committee meetings that were closed to you in the past? Are key actors coming to your meetings? What is happening in the media? Are you getting more stories about your work than you did before? Is there an increased demand for assessment reports?

Monitoring and assessment mechanisms must be in place to identify and map these incremental changes that will lead towards the decisions or changes you are seeking. This can be a time intensive process, so it is a good idea to identify some key indicators, and set up simple ways to monitor your strategy against those indicators.

For example, a contacts database of key actors could be set up with a journalist's function that will allow a record of interactions with them. This can be as simple as just indicating the date and type of contact.

- Dates you sent information about the process, invitations to presentations.
- Dates they requested information or dates they accepted invitations.

Keep a record of all media inquiries or request the appropriate government departments whether they do media tracking (reviewing stories in the press about government initiatives; or more broadly, tracking issues of concern to the government). If they do, request notices of stories in the press about the assessment, or about issues relevant to the assessment. For example, a media log for the Millennium Ecosystem Assessment might have looked like this.

Important behaviour changes of your "target actors" (those you are seeking to influence) could be reflected in a progression from passively receiving information from the assessment, all the way through to acting on recommendations and demanding more work. The following would be a good checklist:

- Receiving information–IEA process leaders sending information to target actors.–IEA process leaders using media to communicate to target actors.–IEA process leaders requesting, and securing, meetings with target actors.
- Seeking and processing information–Targets seeking information from others to "triangulate" or verify information they are receiving through the IEA process.–Media reporting messages from target actors that are consistent with IEA process messages.
- Acting–Issuing of new policy briefs, white papers, frameworks, regulations, other responses.
- Demanding–More work from IEA process leaders (e.g., follow-up investigations, more in depth assessments).These and other indicators are discussed in more detail in Module 8 on monitoring and evaluation. There, you will see how monitoring the impact strategy will fit into the overall monitoring process.

EXERCISE 4

- What are some indications that the assessment findings and recommendations are influencing your key actors?
- What are some ways to keep track of your performance on the strategy?

3.3 Case studies of assessments that had impact

In order to design and implement an impact strategy for an assessment process, it would be useful to provide examples that had a well-defined impact strategy, and to analyse the results of the strategy in terms of success and failure. Unfortunately, impact strategies in the area of global environmental assessment at national level are hard to find. Here a detail case study on Millennium Ecosystem Assessment (MA) is presented for you to understand the impact strategy and learn form it.

Case study: Millennium Ecosystem Assessment (MA)

From the outset, the MA instituted an "engagement and outreach strategy." Responsibility for this strategy was formally assigned to the MA Secretariat. From the beginning of its work, MA leaders understood the need to ensure that key actors would be engaged and informed, that broader audiences would be reached, and that this process would have to be carried on as an integral part of the whole scientific assessment.

Step 1: WHY. Impact statement: What did the MA want to see as the outcome of its work?

The MA was carried out to assess the consequences of ongoing ecosystem change for human well-being, and to establish the scientific basis for actions needed to enhance the conservation and sustainable use of ecosystems and their contributions to human well-being.

Step 2: WHO are the key actors, and how to build relationships with them

Before starting the scientific work, MA proponents proceeded to:

- confirm the need for the assessment by consulting the three main international conventions that directly deal with ecosystems (Convention on Biological Diversity, Convention to Combat Desertification and Ramsar Convention on Wetlands);
- position the assessment within the formal decision making processes of these conventions, and obtain formal expression from the UN on the need to conduct the assessment; and
- identify a broad range of users.

Step 3: WHAT knowledge is to be gathered

In addition to consultations with key actors, the MA conducted an assessment of the information needs of a broad range of users. This assessment became the basis for the outline of the MA reports as designed by the scientific panel, and remained a reference point throughout the process.

Step 4:HOW to reach key actors and broader audiences

The strategy defined two distinct areas of action.

- Engagement
  – provide target users with adequate access to the process of the information generated; and
  – enable broader audiences to access the products of the assessment, and benefit from networks and capacities growing out of the assessment process.
- Communication– raise understanding and awareness of the MA and how to use it; and– convey key messages from the findings to targeted audiences and the public. Engagement - Ultimately, the engagement strategy was an effort to ensure that adequate access to the process and products existed, so the MA could be widely shared, and would continue to yield fruits beyond its conclusion in 2005.This,in turn, would result in input from users into the process, enhancing its legitimacy, and improving the capacity of users to interpret and act on the findings of the assessment. Several channels were used to enable engagement (Figure 4):
- MA Board meetings engaged users in the process;
- the user needs assessment mentioned above;
- the MA constantly produced ad hoc briefings, trying to seize as many opportunities as possible to address large numbers of users and present them with information about the assessment;
- open calls were issued to the public, governments and institutions to nominate scientists to participate in the

assessment as authors or reviewers, and to submit proposals to undertake sub-global assessments affiliated with the MA;

- a website and newsletter were established, and a data sharing system developed;
- the internal, formal procedures of some target users were utilized to feed the MA and subject it to discussion.
- multi-stakeholder meetings were organized in various countries to present the MA and invite discussion on its relevance in each national context;
- a procedure to invite academies of sciences and scientific organizations was established, whereby these entities supported the MA in the identification of scientists and the dissemination of information; and
- the process of sub-global assessments was in itself another mechanism to connect the MA to local, national and regional processes.

Communication (outreach) - The MA communication effort focused on raising awareness about the MA and supporting the demand for:

- the assessment reports and associated information;
- integrated assessments at the sub-global scale; and
- training to conduct such assessments.

Making the MA visible to the media. One concern of the communications team was to achieve a certain level of press attention when the information was finally released. Three approaches were used.

1. Organizing seminars for the media while the assessment was being conducted to explain what it was, why it was being done and what to expect from it.
2. Establishing a loose working group with the media officers of partner organizations.
3. On the day of the official release, press briefings and seminars were organized in 13cities around the world. This ensured that appropriate angles and languages were used to draw national media attention.

Keeping the visibility of the MA before the users. The assessment was a four-year endeavour. Even after being approached and consulted at the inception of the assessment, targeted users needed to be kept updated and reminded of upcoming work. These activities were also meant to build momentum and expectations, and consisted of multiple briefings and smaller meetings in international and national arenas.

Facilitating access to MA products. A constant concern of the MA was to ensure that as many people as possible could access the information. Again, there were three approaches.

1. Targeted publications. In addition to the full technical assessment reports, the MA produced six synthesis reports aimed at different users. The information contained in the main assessment volumes was summarized and repackaged in short, carefully designed volumes dealing specifically with biodiversity, desertification, wetlands, health and business and industry, plus a general synthesis directed at a more general audience.
2. Translations. Translating the information into various languages proved to be one of the main weaknesses of the MA process. While thoroughly aware of the need to do so, resources were insufficient to undertake this task adequately.
3. Electronic communications. Establishing electronic communication mechanisms was important, including a website, a system to share data and an intranet system for internal communications.

Partnering. The engagement and outreach team of the MA saw its communication activities as an instrument not just to reach out and convey an image of the MA but also as a mechanism to enhance the ownership of the MA, and improve the ability of third parties to understand and make better use of it. Hence, the MA sought to rely on as many partners as possible for outreach, and to encourage as many third parties as possible to undertake outreach for the MA on their own. This resulted in several instances where volunteers approached the MA to undertake activities, which was highly beneficial in dealing with media enquiries. Partnering required the following two elements.

1. A minimum level of coordination in terms of setting key dates and sharing basic strategies.
2. Generating materials to support outreach by third parties. These materials were shared through the intranet, but

also through an “outreach kit” distributed on CD. This kit contained a collection of elements developed by the MA, including:

- guidance on how to explain the MA to the uninitiated;
- guidance on how to develop a communications strategy (see Addendum 2);
- graphic elements (posters, maps, logos, photographs, videos);and
- PowerPoint slides.

Early products. The MA did not wait until the end to start releasing some outputs. In particular, releasing the conceptual framework and early findings on sub-global assessments (SGA) allowed for better outreach during the process.

Step 5: Monitoring, evaluation and improvement

The MA engagement and outreach team was continuously haunted by the question of how to define success. How would they know they had been successful in supporting the goals of the assessment? Following are some of the items that were discussed.

- Government buy-in. For example, would resolutions from international bureaucracies be an indicator of the effective use of the information, or a tactic to protect the process? Government involvement, however, was very effective in attracting leading scientists.
- An international arrangement to deal with the problem. Was the MA inserted in a clear political context in which the information would catalyze such action?
- A proliferation of sub-global assessments. Would the dissemination of the practice of integrated assessments around the world be an indicator of real success?
- Media attention. Besides being short-term, one has to be careful what the results of this attention are. By and large, when the information was released, the media focused on the negative side of the message, as in the front page article of Le Monde, below

In an effort to communicate more effectively, the MA strove to develop some powerful metaphors to explain its concepts and findings.

Perhaps the most important was that of “nature as capital” and ecosystem services. ”While clearly effective, these metaphors were taken up to draw some controversial conclusions, as the cover of The Economist shows.

In the end, the team concluded that success for the assessment needed to be measured by demand for information and expertise from a broad range of places and interests. Further use of the information (for example to start or influence a political process) is a result of the work, and clearly shows it is having some effect.

4. Creating Communication Outputs

4.1 Choosing what to Produce

Disseminating the variety of messages to target groups with innovative communication formats and channels, and at all times, considering budget and capacity constraints is the of prime importancet in developing impact strategy.

DISCUSSION QUESTION:

Mapping existing communication outputs (About 15 minutes.): In small groups discuss your experiences working with different communication formats and distribution channels, both traditional (e.g., printed) and non-traditional (e.g., electronic/multimedia, interactive).The questions for the discussion might be, “What are your observations and experiences about using different formats?” and “What results, if any, were achieved?”. Base your discussion around products and examples that you brought to the workshop, along with your collective experience dealing with communication channel.

A. Target group(s) - persons and groups to reach with message.

In order to begin choosing what communication outputs to produce, it is necessary to identify and profile the target group(s). These target groups will be identified as part of your impact strategy (see Step Two for Creating an Impact Strategy,), and should include those persons in a position to influence the types of changes needed, based on results of the IEA.

It is important to keep in mind that target groups are not only defined by their profession or areas of focus, but also by differences in language and culture. This can particularly be an important consideration in countries with several languages. Because of possible delays and extra printing costs due to multiple language requirements, this needs to be considered when planning and budgeting.

Within the target audience list ,there may be a number of specific groups, such as politicians, academics, women, business, journalists, youth, the general public and others. When segmenting the list of target audiences, it is also useful to distinguish between end users, who make decisions based on the information (e.g., adopt a law or not, buy or not buy) and "broadcasters" who recycle information to targeted messages and thus multiply its impact (e.g., the mass media, the educational system, many NGOs).

Once the target group(s) has been identified, you can take a closer look at how to tailor the key messages to reach those audiences. Remember that one size does not fit all; the messages must connect to characteristics of the target group, such as previous knowledge, attitude, level of education, lifestyle, culture, interests, and their involvement in the problem and solution. The main message should stay the same, even though it will be shaped to fit different target groups. Also consider your reach and credibility. Are you able to reach your target group(s)? Will they find your message credible, relevant and legitimate? If the answer to either of these questions is "no," you should reconsider your message or your audience.

EXERCISE:

Who is reading what? This exercise is meant to reflect on how various groups access information, who are their peers, to whom do they listen, and what you as a producer of the information can offer to your target groups. All participants will break in groups of no more then six people for a short role-play. Each group will receive a pre-defined user group role (e.g., business people, youth and government). Within each group, break into two sub-groups: those preparing the assessment and proposing various types of products, and those representing a particular target group (e.g., business, youth, government etc,). Spend 15 minutes in each group separately discussing the type of products that can be offered or that would be used. Then reconvene in plenary, where each group can summarize their need sand their preferred products. The table below will help you to structure your thoughts.

Table 1: Planning to deliver information to target groups

Target group or focus group	What are the needs of the target group	What is the message	Formats
Government representatives of environment-related sectors (e.g., transport, agriculture)	To understand the impacts, and linkages with other issues	Global warming and environmental issue, the	Extended brochure of its causes10 pages; indicator based analyses
.....	.....	.....	.....

B. Content

Content and conclusions from the assessment will be transformed into shorter and more specific messages. These short messages must be supported by the main body of knowledge generated by the IEA, like the main report where all the knowledge is brought together, and which has to provide the credibility to all "supplementary" products. This approach can be applied to reports on many scales, from local to global. It is important to maintain the connections between both the processes and messages, as well as the products of these assessments (e.g., formats, content and timing). Questions to keep in mind may include whether these messages form a coherent story and whether there are any conflicts or ambiguities? If so, resolve these first by re-examining your starting point.

Scientific uncertainty is also a significant point. Uncertainty is a core component of science, but that is rarely well understood by the public or decision-makers. Communicating uncertainty needs special consideration. It must not be confusing, but it cannot be hidden either. The relevance of uncertainty with regard to the range of possible future outcomes has been brought to light particularly through the international climate change negotiations.

To formulate a set of messages best suited for a target group, consider the characteristics of the audience. For example, how much background information will they have? What are their priorities? Do they view the environment as a necessity or a luxury? What motivates this group to act?

Box ??: Target groups and content

Decision makers: Content should be short, specific, fact based and consist of the latest information
Media: Content should be short, and consist of findings relevant for media use, messages that can easily be linked to other issues in the news. You will have a better chance of media coverage if you provide supporting visuals such as graphs or photographs.
Students: Content should be well explained, and your language should be simple.
Scientists: Content should be fact-based, and rely on the latest data. Your language can be scientific, and include technical terms.

C. Budget

Available resources, both financial and human, will influence your work and force you to prioritize. Before choosing communication formats, the budget needs to be revisited. Some communication formats, like web-based publications, are typically less expensive to produce than printed products. Depending on the budget, you may have to prioritize your messages and findings.

Consider the cost of the required products, and see what other products can be realistically pro-duce given available resources. Be innovative, and consider options like sponsorship of specific products or form alliances to co-publish.

Determine the time available to internal and external staff and allocate tasks appropriately. For materials, determine how much it costs to design and produce the products, and how much it will cost to distribute them. You will have to consider the cost of publishing, along with office supplies, mailing costs, telephone costs and copying. We recommend a contingency line item for unexpected costs that typically arise in developing communication outputs.

D. Formats

Generally, formats like a paper report might be requested. However, consider if additional or other alternative formats might help to broaden your reach to target group(s). Other formats can be synopses, executive summaries, periodic reports on critical issues, bulletins, newspapers, posters, calendars, atlases and vital graphics, just to name a few.

More innovative ways of communication like films might also be considered. Even though making films is a process demanding both economic and human resources, lit has proven to be a very effective way of communicating a message, sometimes reaching much broader audiences than the more traditional means of communication. With the rapid expansion of internet services in many countries, using short video clips (e.g., interviews with affected stakeholders, senior experts, etc.) could be considered. Whatever be your choice, note the importance of consistency of your message through all the formats.

Box ??: Sample of formats and channels

Spoken options include visits, interviews, speeches, meetings, press conferences, training sessions, radio broadcasts, discussion groups and hearings.
Written options include reports, flyers, newsletters, posters and brochures.
Visual options include presentations, television, slide shows, films and videos.
Digital options include Internet, CD and DVD-ROMs, PC-demos, e-mail bulletins, discussion groups and online conferences.

E. Consider your channels

People are exposed to environmental information, as they are to other issues, through a vast range of communication channels. It is therefore important to choose channels based on the audience's favoured way of accessing information. Your communication goal should align with the desired changes recorded as part of the impact strategy (see Module 3) (e.g., to change people's attitude towards an environmentally-related problem, to communicate your key findings to a narrow circle, such as politicians and ministries). Remember that communication is not only about information, but also about meaning. Meaning is actively constructed,

not passively extracted from books or other sources provided by a sender. Keeping this in mind will assist in choosing outlets because the channels will be tailored to reach the target groups in large or narrow circles. When selecting an appropriate channel consider its effectiveness and efficiency.

Box ??: communication effectiveness and Efficiency

Communication effectiveness means that your message is:

- •Received by the target audiences
- •Interpreted by recipients as intended by senders
- •Remembered over a sufficient period of time
- •Triggered an appropriate action

Communication efficiency of a channel means that the maximum number of recipients has been reached per unit cost

Information may reach its target audience directly: people buy books in a bookstore, borrow at a library, receive a briefing note in the mail, or download a map from the Internet. In other cases, information reaches its audience through media channels. The environmental information rarely is trivial. It is very complex: those who receive briefing notes might also be exposed to news paper headlines, but they may not have a time to download a map. Information received from different sources on the same issue may be conflicting or highlight different angles of the problem, requiring active construction of meaning by the audience.

Be innovative in your tactics, and utilize community for a, theatre, music, dialogues or meetings as alternative means. Each channel has its strengths and weaknesses. Therefore, it is advisable to use a combination of channels, choosing some that offset weaknesses of others.

Consider the messenger and the timing of the message (link to issue cycles, as discussed in impact strategy part). These are both important and affect the effectiveness of the communication.

Be aware that language and cultural differences can affect your choice of channels. Choosing only a few main channels might prevent you from reaching as broad an audience as you might wish. In countries with several official languages, this is a crucial point to keep in mind.

If you want to reach large target audiences, repetition and continuation of messages in different channels is crucial. Promotion campaigns are an efficient approach to raising awareness. You may use a range of methods over a longer period to get your message across, including media campaigns, information leaflets and posters. Remember that information produced but not disseminated will remain unknown and lose its significance.

It is very important at this stage of the project to start developing a well-structured dissemination plan for your various products. The table below provides guidelines for dissemination activities planned throughout the project. It indicates purpose, target audience, timing, media used for dissemination and follow-up with target audience and actions to be taken. Table 3: A possible outline to disseminate IEA products

Dissemination Plan						
Timing	Dissemination Activity	Purpose	Target Audience	Potential impact	Media use	Follow-up/ action taken
Date	Special planned event involving all relevant partners and media	Launch of the report. Get attention	Key Partners (ministries, NGOs, public institutions) media	Media coverage awareness within the ministries, outreach to the public	Press release press kit interviews media	Media monitoring free distribution to the ministries
Date	Free mailing of the report to all ministries (approx.20 copies per ministries)	To inform them about the content of the report, so that the report can be used in decision making processes	High-level decision-makers, governments clerks	Affect decision making	Report	Get user feedback
.....	.....	.....	.....	.....	.....	.....

EXERCISE

Discuss existing media relations in your country, and use your experience to draft a short-term dissemination plan to approach the media

Work in groups of four. Choose someone in your group to record your results following the discussion points below; report the results in plenary. Duration of the exercise is 40 minutes.

- Discuss the needs and available resources for communication.
- What ongoing relations with mainstream media exist within your organization/department?
- Do you have staff/members who are familiar with mainstream media norms and needs? Do these staff/members have sufficient time to do consistent media outreach?
- Make a list of responsive journalists and other "insiders," and describe plans to use them to spread your message.
- Does your organization have a distribution network? Is it updated and ready to be used? Summarize your results on a flipchart for presentation in plenary later.

EXERCISE

Participants continue working in the same groups. Duration of the exercise is 30 minutes. The aim of the exercise is to find out what are the best communication channels, considering given time, resources and possibilities. The participants map out a variety of communication channels, analyze strength and weaknesses of each of them, and prioritize their dissemination channels. Participants choose someone in the group to report the results of the group discussion in plenary.

Channel/media	Strength	Weaknesses	Priorities
Television			
Press (Papers, magazines)			
Printed material (book….)			
.....			

4.2 How do we do it?

A. Print products

Because not all publications are alike, the time needed to produce material for them varies. Due to extensive analysis and writing process, a comprehensive report may take six months to a year (or more) to produce. In contrast, a one-colour flyer may be completed in a few weeks and a full-colour brochure may take a few months from concept to delivery. Rushing the process may compromise the quality of your product and increase production costs. To better prepare for the production process, you will benefit from asking who needs to be involved, in what way and during which phases. For example, you will need to involve writers, a graphic designer, a web designer, a database manager, maybe a cartographer and an editor. Further, clarify who is responsible for specific parts of the plan, and who coordinates the joint efforts.

Common steps in the production of a printed IEA report.

The following list summarizes common steps in the production of a printed IEA report.

Specifications: Rough specifications on format of the publication, size, font, illustrations and layout option. It is recommended that dummy reports are produced to present different options.

Contents: Production of text, as well as choosing graphics and pictures. At this stage it is important not to forget any elements like picture text, references and headings.

Translation: within country in the region persist different languages need to use the translated text for production if needed

Pre-design: Can be useful to test the design in order to be able to make revisions before developing all the contents.

Layout: Place all the contents into the design chosen.

Proofreading: This is the last chance to make revisions before the report goes to the printers.

Test print/blue line: You should always ask for a test print in order to get rid of the last mistakes, correct colours, identify missing elements, etc.

Print: Now your major concern is to make sure the printed report is ready on time, according to quality expectations and within budget.

Quality control: Quality control, revisions and editing. This should be done throughout the production process.

EXERCISE:

Budgeting needs and skills This exercise builds on the exercise on establishing the main budget lines. The exercise is not limited to planning printed formats, but can be used when planning communications in any format.

The participants break into groups of about five. The exercise lasts for 30 minutes. The production phase requires people with different skills. This is an exercise in mapping needs and skills for preparing printed or electronic reports. Participants should discuss expertise, skills and services they need for preparing their communication outputs. The leading question for the discussion is: What expertise, skills and services do you needs to succeed with your project? Make a budget and time plan based on:

1.Who will be involved in the project (inside and outside expertise)?

2.What are direct expenses (e.g., meetings, communication, printing, transport) ?

3.How much it cost?

4. What is the time frame of the different steps?

3.2 Electronic/digital products

Disseminating environmental information through electronic channels, such as websites, can bring a great degree of flexibility. It allows messages in mixed formats, such as text, data, graphics and audiovisual. Today, there is a great and fast growing variety of electronic formats that can be used for different purposes. This includes formats such as PDF, html pages, RSS (a of web feed format used to publish frequently updated digital content), blogs and other personalized web-based tools.

There are many things to consider when choosing an electronic format for communicating your message, and it is important to keep in mind that many countries in the region web access is still limited.

Easily added, removed or updated on the web provide flexibility and opportunity for publishing information as it becomes available. At the same time, readers will expect that an Internet site is regularly updated so, if resources for updates are lacking, you may lose readers. It is important to keep in mind that we read differently on the web than we do with printed publications. Printed materials have a linear structure, and the reader follows a predefined path; reading a web report allows the reader to freely navigate from section to section. This has implications for how a web report should be organized and written. The most important advice when producing for the web is to limit text lengths and sharpen the messages. Be clear on what you want to communicate, and focus on the essential parts of your message. Since people tend to read more slowly on the web, they will probably not follow your messages in a linear manner all the way to a conclusion, but will jump between pages as their interest shifts. The main messages you try to communicate should therefore not be saved to the end, but brought to the beginning of the text. Hence, you start with conclusions and move on from there.

Lower resolution Images and graphics may be used in web to avoid the download time due to slow connection. If available, you may provide access to both low and high resolution versions of the same image and let the readers decide if they want to spend the time accessing the higher resolution one. An image or graphic should always have explanatory text and the source. The possibility to make links is strength of web-based publications. This allows combining different parts of an assessment in contrast to having to follow a linear path in a printed publication. If you choose to produce a web report but an important portion of your audience has poor web access, you can chose to also distribute on a CD-ROM. The navigation of a CD-ROM should resemble that of your web page, so people will find it easy to use. Before you start production of a CD-ROM, consider if your target audience will find this to be a useful format. For example, a CD-ROM might be of greater use for schools, than for the general public.

Box ??: Formats for electronic documents.

PDF. PDF stands for Portable Document Format, and has become a widely-used way of publishing electronic documents. PDF is probably the best way to transfer and view documents on the web or through e-mail. However, creating a PDF file requires Acrobat Professional but the document can be read by the simple Acrobat Reader program which can be freely downloadable..

HTML. Hypertext Markup Language is the coding language used to create hypertext documents for the web. In HTML, a block of text can be surrounded with electronic “tags” that indicate how it will appear on a computer screen (e.g., bold face or italics).

RSS. Rich Site Summary and RDF (Resource Description Framework) are web technologies that make it easy to automatically share content, such as news items, among different web sites. A web site can allow other sites to publish some of its content by creating an RSS document, and registering the document with an RSS publisher. A web publisher can post a link to the RSS feed so users can read the distributed content on his/her site.

WEBLOG (BLOG). This is a publicly accessible personal journal created by an individual, and shared over the web. The activity of updating a blog is “blogging,” and someone who keeps a blog is a “blogger.” Blogs are typically updated daily using software that allows people with little or no technical background to update and maintain the blog. Postings on a blog almost always are arranged in chronological order, with the most recent additions featured most prominently

4.3 Visual presentation of data in the IEA

The visual part of communication is often under estimated. People often consider words the most important form of human communication. Supported by the invention of the computer and desktop publishing, media and advertising, the role of visual messages in the communication process has expanded since the late 1980s. It is becoming increasingly important to recognize that the two communication systems—visual and verbal—are interdependent. It is probable that the most powerful, meaningful and culturally important messages are those that combine words and pictures. Memorable visual messages with text have the greatest power to inform, educate and persuade an individual.

Visual communication can help us shape the interpretation of data, and strengthen messages delivered through the text. Images, maps and graphics can simplify complicated insights as well as displaying complex information in a very condensed way. So, by using the right images and colours, and by getting your maps and graphics properly done, your IEA's messages and readability will be strengthened. See the presentation material on improved visual communication.

The cartographic process

Managing the cartographic process often requires a specialist (cartographer), who usually will not be the manager of the IEA. However, the assessment manager/practitioner will need to work closely with the cartographer to make sure the maps you use harmonize with the core messages and results of the assessment.

Once spatial data are collected and analyzed, they are sent to a cartographic designer for further processing and refinement. This step involves transforming the data into a clear and efficient visual representation. Ideally, the figures should give an immediate message to the users, with no more than two or three items being presented. By reducing the number of categories, you simplify the information.

GIS and maps

Geographic Information System (GIS) is a geo-referenced database which allows a rapid visualization of phenomena by automatic plotting of maps using the geo-referenced data. Usually such analysis is appropriate only for "working documents" not for "publishable documents" or ones intended for the general public. A GIS is a database used for storage of a large amount of data, and is mainly used as an efficient tool for management (e.g., water or transport networks, marine resources, land cover, grazing area). GIS is a source of primary information to be synthesized and simplified for the production of thematic maps and graphics that can be published in books or on the Internet.
The process of making a map or producing graphics is related to several disciplines. Cartography relates to art, to science and to politics. By choosing certain colours, contrasts and movements, you both emphasize and ignore information. As a cartographer or a creator of graphics, you make more or less conscious selections at all stages of the process which carry some useful meanings.

B. Implement time-saving techniques for visual and graphics

To ease your work, the organization's publications manager, graphic designer or cartographer can benefit from creating tools for graphic production. Create templates and libraries that can easily be assembled and stored, so that they can be used for multiple purposes. Using elements that already exist rather than recreating new components again and again will save time and allow consistency in your visual presentation. You can create a user-friendly template using tools available in most drawing software packages. The file structure on your hard disk also must be organized in a logical and efficient way, so that it is easy to find specific files that may otherwise be buried among hundreds or thousands of others.

4.4 Reaching out with the outputs of the IEA

A. Dissemination

At this point, it is time to implement the dissemination plan. Too many good information products are left in an office for just a few to read. Why spend time and money producing well thought-through products if nobody sees or reads them? First, verify if you

already have a distribution network, and if this network is updated. Then, revisit your communication strategy, and ensure that your distribution list matches your target group(s). Add new names and organizations to your list as appropriate. Further, consider different ways of distributing your product. This will vary depending on the format you have chosen. For example, a web-based report will probably reach more broadly, while a paper report might more easily reach directly to your target group(s). Consider contacting NGO sand ministries directly, and make a plan for seminars, meetings and events where you can attend and hand out your product dedicated to the IEA. The most important thing is that you keep thinking about distribution long after you have finished your product, even though the energy for doing that is sometimes hard to find.

B. Approach the media

Journalists are always looking for the next story, which gives you the opportunity to make them interested in your story. Building strategic and long-lasting relationships with the media is crucial for successful dissemination. If you have access to a media or a public relations officer within your organization, it would be a good idea to seek their advice. Approaching the media and establishing a network of journalists is a long process, and getting help from a colleague might ease your way towards your goal of getting media coverage.

Look at possible channels for approaching the media and attracting their attention. This can include press releases in written and audio formats and press kits, press conferences, press briefings or special media events. A strategic relationship with the media might include an environmental page every week in one particular paper. Depending on the nature of your announcement, you need to find the best way to communicate with journalists. UNEP has been practising real and virtual media tours to attract the attention of international media. For several years, UNEP held eco-journalist festivals in Central Asia.

You will need to develop a story line, and assemble and package the vital findings of your research and the key messages from your assessment .Again, seek advice if you can. Common practice is to proceed with a short (about one page), clear and understandable (non-technical) press release. Communicate the press release openly by putting it on the website, sending it to main news agencies and to your journalist network. Look for a good opportunity to launch your message, such as a political event, a scientific conference or a high-profile social event, or an on going debate. You may also organize a media event dedicated solely to the IEA.

Box ??: Preparing a press kit.

When launching an IEA report, you will benefit from preparing a press kit for the participants on the event. Journalists are often too busy to search for information or to read an IEA report from cover to cover. A press kit helps journalists to use your information, improving your chances of getting media coverage. The contents will vary, but always must include background information on the organizations behind the report;, an executive summary highlighting the key findings must also be included.

C. The press release

A press release is a statement prepared for distribution to the media, to give journalists information that is useful, accurate and interesting. Press releases have a particular format. Once you are familiar with writing them, all you have to do is fill in the blanks. Journalists receive many press releases, so they have standards and expectations that you must meet to just to have your release read and, hopefully, used.

Press Release Checklist

- Organization's/department's letterhead, name, address, phone number, e-mail, website
- PRESS RELEASE in all caps
- Contact person's name and contact information
- IMMEDIATE RELEASE OR RELEASE DATE in all caps)
- HEADLINE or TITLE in bold/caps
- Body text: Date/City-who, what, when, where and why
- Basic Font, page numbers, end with ###

EXERCISE: Creating a press release and press kit

The participants are asked to write a press release based on an issue or report of their choice.

Recommended reading: "How to write a press release "http://www.lunareclipse.net/pressrelease.htm

Example: Press release on DPRK SOE Report

First Report on the State of the Environment in the Democratic People's Republic of Korea launched at UNEP headquarters

Identifies priority issues for international response

Nairobi, Bangkok 27 August 2004 – The first assessment of the state of the environment of the Democratic People's Republic of Korea (DPRK) was launched today by the United Nations Environment Programme (UNEP) and DPRK officials at UNEP headquarters in Nairobi.

The State of the Environment report was produced in partnership with the United Nations Development Programme (UNDP) and was initiated following a visit by Executive Director Klaus Toepfer to DPR Korean capital Pyongyang in 2000.

DPR Korea officials from 20 different government and academic agencies produced the report with training and guidance from UNEP's assessment office in Bangkok and the UNDP office in Pyongyang.

The report uses a "pressure-state-response" methodology and identifies priority issues related to forests, water, air, land and biodiversity. It also acknowledges a paucity of research and data on which to base reliable environmental assessments. The report, which was completed in late 2003, was released on the occasion of the visit of a high level DPRK delegation to Nairobi.

"By bringing together the available environmental information and identifying priority issues, the report will help strengthen monitoring and assessment, policy setting, action planning and resourcing in DPR Korea," Mr. Toepfer said.

The assessment notes that while three quarters of the country is forested, almost all is on steep slopes over 20 degrees. While forested area expanded from the 1950s with national planting campaigns, over the past decade forests have declined in extent and quality due to timber production, a doubling of firewood consumption, and wild fires and insect attacks associated with drought. A growing population – now estimated at 24.4 million people, 60 percent of who live in urban areas - and conversion of hilly land to agricultural production have also taken a toll on forests. In response the government has successfully encouraged community, youth and children's groups to establish tree nurseries and to participate in campaigns such as the National Tree Planting Day each March 2.

While relatively rich in water resources, DPR Korea faces challenges in maintaining water supply and quality. Eighty percent of total surface water is currently utilized for hydropower generation. In recent years, pollution of rivers and streams has become severe, particularly the Taedong River, which flows through central Pyongyang. The report says a dozen factories and plants have been recorded discharging 30,000 cubic metres of wastewater into the river every day. Construction of the West Sea Barrage and low flows due to drought have also weakened natural purification of the river, leading to seasonal red and blue tides in the Taedong's lower reaches. The lower Amnok River, on the boundary of DPR Korea and China, is also severely affected by industrial effluent and domestic sewage.

The report notes that urgent investment is needed in domestic sewage and industrial treatment, and in water storage, purification and supply systems. The government is currently strengthening legal control on effluent from factories by applying the "polluter pays principle" and has initiated mass media campaigns to inform the public of the need for water conservation.

DPRK's reliance on coal for power generation, industrial processes and domestic heating has created serious urban air pollution problems, though comprehensive monitoring or studies on its effects on human health have not been carried out. A projected five-fold increase in coal use by 2020 underlies the urgent need for clean coal combustion and exhaust gas purification technologies, energy efficiency, and renewable energy alternatives.

Self-sufficiency in food production has been a national policy aim, however major crop yields fell by almost two thirds during the 1990s due to land degradation caused by loss of forest, droughts, floods and tidal waves, acidification due to over use of chemicals, as well as shortages of fertilizer, farm machinery and oil. Vulnerable soils require an expansion of restorative policies and practices such as flood protection works, tree planting, terracing and use of organic fertilizers.

Recognizing such issues, DPR Korea adjusted its legal and administrative framework, designating environmental protection as a priority over all productive practices and identifying it as a prerequisite for sustainable development. It has adopted national laws

on forests, fisheries, water resources and marine pollution. The country - home to several critically endangered species, including the Amur leopard, Asiatic black bear and Siberian tiger - has also signed up to international environmental agreements such as the Convention on Biological Diversity.

The report concludes that to align socio-economic progress with sustainable development, environmental laws and regulations need to be formulated or upgraded, environmental management mechanisms need to be improved and intensified, financial investment must be encouraged, science and technological research needs to be focused on the identified priorities, and environmental monitoring and statistical systems need to be set up and their data used as a basis for national planning and policy making.

"The Democratic People's Republic of Korea has shown its willingness to engage with the global community to safeguard its environmental resources and we must respond so it can meet development goals in a sustainable manner," Mr. Toepfer said.

Mr. Toepfer and the head of DPR Korea's delegation to Nairobi, Dr. Ri Hung Sik, the Secretary-General of the National Coordinating Committee for Environment, signed yesterday a framework agreement to guide joint activities that will further strengthen capacity for environmental protection.

This includes a project with UNDP to improve quantitative environmental assessment and monitoring, utilizing information technology and integrating 10 national institutions with environmental responsibilities.

The assessment report also contains 16 project proposals - from awareness campaigns to major technology overhauls - to help the donor community respond to the specific environmental issues.

For more information: The DPRK State of the Environment Report can be downloaded from http://www.unep.org and/or http://www.rrcap.unep.org/

or contact: Eric Falt, Spokesperson/Director of UNEP's Division of Communications and Public Information, on Tel: 254 20 623292, Mobile: 254 (0) 733 682656, E-mail: eric.falt@unep.org; or Tim Higham, Regional Information Officer, UNEP, Bangkok, on Tel +66 2 288 2127, Mobile +66 9 1283803, E-mail higham@un.org.

UNEP News Release 2004/ 40

C. Sustaining communication: Long-term approaches

While information quality is essential, active communication is another vital ingredient that needs to be addressed in sustainability. People may or may not know about environmental conditions to which they are exposed. In any case, it takes a long time to achieve changes in attitude (e.g., consumption patterns, prevention, minimizing health risks, and participation). Practice shows that if you want to achieve positive changes, a long-term approach is needed.

There are differences in the expected impact that various information and communication strategies cause over time. Intense publicity over a short period of time may have only a short-term impact. A short, intense mass media publicity campaign, for example is able to attract attention and even cause action; but unless the campaign lasts, its effect will soon fade, as attention of the audience will turn to another subject. On the other hand, research without or with little communication builds very limited impact over time. The recommended long-term communication strategy is based on continuous persuasion. It begins with relatively active publicity in the beginning, and continues with a fast, consecutive improvement of the information base.

Your work is almost done, but a last and important step in the work process remains: evaluation. The evaluation step often is forgotten after the project is completed. However, information received through systematic evaluation and feedback (i.e., through interviews with key people), will save resources in the future. In addition, the possibility of providing feedback and influencing the process will increase the sense of ownership within the community. Your evaluation experiences also could be of use to other institutions planning to carry out a similar process.

Overview

A steady increase in reporting on environmental trends and performance during the past decade reflects a broad societal need for strengthening the evidence base for policy making. We also see a growth in systems for collecting and analysing data about the environment and human well-being at local, national, sub-regional, regional and global levels. Interest in fine tuning monitoring and data collection systems to reflect the real needs of society and decision-makers is now part of the mainstream.

At some point during the process of developing your integrated environmental assessment (IEA), you will need to collect, process and analyze data. As you begin, you will need to know essentials about data collection including selecting the most appropriate and reliable types and sources of data and how to collect, store and analyze your data. This module addresses these issues, with particular focus on statistics and spatial data collection, analysis and the use of tools such as the GEO Data Portal and regional data portals to support IEA.

With data in hand, the next step will be to convert the data into a meaningful form that can be used during decision making processes. Indicators and indices help us package data into a form that speaks to a relevant policy issue. You will learn the basic building blocks of indicators and indices, including frameworks, selection criteria, and elements of a participatory indicator selection process. The module outlines these elements, and includes examples of indicators, including the GEO core indicator set.

Once you have developed indicators, you will need to derive meaning from them. What trends, correlations, or spatial relationships are revealed through the data? To answer these questions, you will need familiarity with various non-spatial and spatial analysis techniques.

A common theme running through this module is the importance of participatory processes. Understanding which stakeholders and experts need to be involved in the process, and when and how is essential because what we choose to measure reflects our values. A participatory process also provides an opportunity for change, as society seeks to improve what gets measured.

A second theme is the importance of reliable data and well-chosen indicators. This is critical to the process, because poor information can lead to poor decisions. At the same time, information needs to speak to the intended audience in a relevant way; otherwise, the most of the well-developed indicators could have only limited impact.

Through a series of presentations, examples and exercises, this module will provide you with a number of tools and techniques necessary to complete the data collection and indicator development aspects for an IEA.

Course Materials

1. Introduction and learning objectives

Relevant and accessible information based on sound knowledge and facts is a cornerstone of integrated environmental assessment. Without a strong evidence base government, civil society and the public at large are not in a position to make informed decisions that take essential environmental and human well-being issues into account.

By the time you begin to develop data and indicators, you will likely have gone through the processes of planning the IEA, identifying lines of responsibility, clarifying key issues and identifying target audiences. Data development is an integral part of the implementation of integrated environmental assessment.

This training module is a practical guide to information tools, with emphasis on monitoring, data and indicators. Key concepts, techniques, benefits and constraints are explored in areas of monitoring, data collections, indicator and indices and analysis, through readings, exercises and examples. At the end of this course you will:

- understand the roles and uses of data, indicators and indices in integrated environ-mental assessment;
- know how to develop strategies for collecting and validating data;
- understand how indicators and indices are developed and used;
- be able to analyze indicators and indices based on outcomes; and
- be able to communicate and present statistical and map-based data visually.

2. Developing data for integrated environmental assessment

The flow of data in the IEA process as a means to influence decision making is shown in Figure 1. Given that data have an important role in decision making, it is critical that the data and indicators you use and develop are reliable and scientifically sound, relevant to your audiences and easily understood.

Understanding environmental issues, their causes and impacts on humans and ecosystems, and the effectiveness of current policy solutions is inherent to the scientifically sound reporting of information. Monitoring and observation will provide you with the information you need to begin the substantive part of the assessment process.

While "data" consists of detailed neutral facts, indicators and indices are selected and/or aggregated variables put in a policy context, connected to an issue identified in the IEA process and ideally also a policy target. A limited number of variables are selected from a wealth of observed or measured data sets, based on relevance of the variables to major issues and general trends. Indicators become signposts to inform policy actors and the public in a way that make thick volumes of detailed statistics and other data on the state and trends of the environment more accessible for decision making purposes.

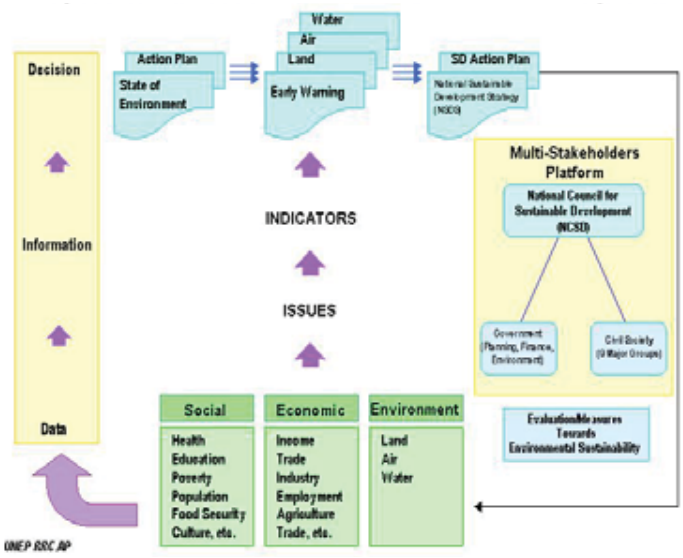


Figure 1: Framework of environmental data flows (UNEP Regional Resource Centre for Asia and the Pacific, 2000)

In order to use data and indicators for measuring performance, we need to identify reference points related to desired results. These reference points can be very generic and qualitative or, preferably, quantitative and time bound. The more specific the reference points, the easier it is to assess performance. For instance, we can monitor progress towards a target set for nitrate concentration in drinking water. Ideally, these targets or reference points are established through a science-policy dialogue, and become an organic part of policies adopted by government. The identification of climate change targets in the Kyoto Protocol underline both the necessity but also complexity and pitfalls of selecting targets and using them to implement programs and monitor progress.

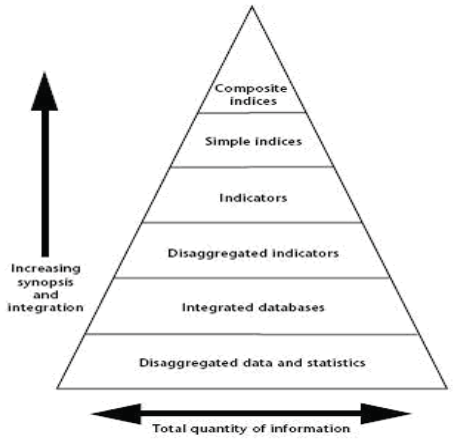


Figure 2: Relationship between Data, Indicators and Indices
Source: Australia Department of the Environment, Sport and Territories 1994

You can combine multiple indicators to form an index. Indices provide simple and high-level information about the environmental or social system or some parts of it. Indices may also be tied to a policy or society target. As shown in Figure 2, a gradient moves from data to indices resulting in increasingly aggregated data. At higher levels of aggregation, it is easier to see broader patterns, while indicators can pinpoint specific trends and performance. As an analogy, it is easier for us to see patterns when looking at the whole forest than when looking at a single tree. In real life indicators and indices are often used side by side and can form an integrated information system.

Box 1: Definitions: Environmental Monitoring, Data, Indicators, Indices and Information Systems

- Monitoring: Activity involving repeated observation, according to a predetermined schedule, of one or more elements of the environment to detect their characteristics (status and trends) (UNEP 2002).
- Data: Consists of facts, numerical observations and statistics that describe some aspect of the environment and society, such as water quality and demographics (Abdel-Kader 1997). A basic component of indicator work, data needs to be processed so that it can be used to interpret changes in the state of the environment, the economy or the social aspects of society (Segnestam 2002).
- Indicator: Observed value representative of a phenomenon to study. Indicators point to, provide information about, and describing the state of environment with significance extending beyond that directly associated with the observation itself. In general, indicators quantify information by aggregating and synthesizing different and multiple data, thus simplifying information that can help to reveal complex phenomena (EEA 2006).
- Indices: Combination of two or more indicators or several data. Indices are commonly used at national and regional levels to show higher levels of aggregation (Segnestam 2002).
- Information systems: Any coordinated assemblage of persons, devices and institutions used for communicating or exchanging knowledge or data, such as by simple verbal communication, or by completely computerized methods of storing, searching and retrieving information (GMET-MHD).

2.1 Importance of Process

While data, indicators and indices have value in and of themselves, this value can be significantly strengthened by the process you use to develop them. A participatory approach can be used when developing an IEA in general and its data and indicator components in particular. Involving experts and stakeholders in identifying, developing and interpreting data or indicators not only strengthens their relevance and understand ability, but also their actual use in decision making.

A larger number of issues may come up during a stakeholder IEA process .You might find it useful to use a set of criteria to narrow down the issues, using criteria such as the following:

- Urgency and immediate impact
- Irreversibility
- Effects on human health
- Effects on economic productivity
- Number of people affected
- Loss of aesthetic values
- Impacts on cultural and historical heritages

Similar to the process of identifying and selecting key issues, obtaining and analysing data, developing indicators and indices involves making decisions about what to measure and include. Due to constraints in resources, not everything that we want to measure or analyze can be included in the assessment process. A participatory approach may help you narrow down the list of indicators by ensuring that the ones selected are relevant, reliable and understandable. A participatory approach also engages people in the process, which can lead to shared responsibility for the state of our environment and society, leading to greater possibility for change. It is useful for us to consider who needs to be involved, and when and how to include them. Experts, stakeholders and policy-makers are general categories of critical actors in the process

Within the context of collecting data and developing indicators, you may find it useful to identify the following:

1. Who needs to be consulted when collecting data and developing indicators?
2. What are the most appropriate levels of participation for each group or individual?
3. What are the most relevant stages of the process for including stakeholders?
4. What are the most efficient and effective mechanisms to include various people in the process, given available resources?
5. How will input from those consulted be used and reported?

DISCUSSION QUESTIONS

1. In pairs, reflect on a participatory process that you led or were involved in that had successful elements. Use the following questions to help focus your discussion.
   - Why was using a participatory approach in the project important?
   - When in the project was a participatory approach used?
   - What were the main techniques?
   - What parts of the process worked well?
   - What were some of the challenges? How were these challenges overcome?
2. In plenary, ask people what they noticed or learned from their conversations. Then, ask them to describe features of the project that worked well.

3. Information Systems

Data, indicators and indices form an interlinked information system. While these elements are all related, developing them involves specific tasks that are different. The following section will provide you with an overview of some of the key conceptual issues and methods in developing data for use in indicators and indices.

3.1 Data

Data provide you with useful information that can be processed into a more readily accessible form for use by policy-makers and decision-makers. Data can be linked to important societal issues when the data are placed in the context of a relevant issue.

- Data on the increase in number of patients with the respiratory disease can mak you explore the information on where something is wrong with the quality of the air.
- Data on the increase in the number of cars in urban centres can provide estimations on the magnitude of air quality-related problems.
- Data on the changes in quantity of use of different kinds of fuel for indoor household use (e.g., cooking, heating) can help identify health-related problems.
- Change in the composition of solid waste in past 10 or 20 years can clearly indicate the trends of emerging issues (e.g., electronic waste in China and India).

3.1.1 Types of data

Environmental monitoring is typically involves “hard” science although there are also an increasing number of examples of non-expert (community, youth) involvement. Quantitative indicators and data, usually based on statistics or remote sensing and presented numerically in tables, graphs and maps, serve as the main foundation of environmental assessment and subsequent decision making by policy-makers, civil society and the public at large.

A. Qualitative Data

Besides the growing number of initiatives focused on quantitative measurement, there is also increasing interest in keeping track

of qualitative ecological and socio-economic attributes that help provide a more holistic picture. Not everything can, or needs to be, quantitatively measured, so quantitative data could miss critical elements. Looking only at quantitative data and nothing else could lead to someone believing that the problem is understood in great detail, which may not always be true. There is a growing sense that environmental assessments could be strengthened by drawing on a wider range of information types and sources, and might be at their best when numerical, technical "hard" data are combined with socially-derived information that more relate to the practical "real-world" dimension of the environment.

Although socially-derived, experience-based information can be turned into quantitative, empirical data and scientifically scrutinized, it is usually gathered using qualitative methods and sources. This can be done, for example, through methods such as:

- field observations;
- interviews with people who live in and have direct experience with local environments; and
- narrative, descriptive, oral histories and interpretive sources on issues such as how much water each household uses in a day, how many cars there are per household and who gets to use them, how people cope with changing environmental conditions, as well as opinions on environmental policy priorities, disaggregated by race, gender, age or ethnicity.

Qualitative information can complement numerical data and physical indicators by:

- broadening of the scope of environmental inquiry to include people's experiences, perspectives and perceptions;
- making use of critical environmental information long before it shows up on the scientific or public radar;
- integration of certain indigenous or other groups into formal environmental discussions and decision making; and
- acknowledgement of the fact that human responses to environmental conditions are often based on perception rather than externally-validated facts.

Working with qualitative information poses many challenges in terms of validation, verification, reliability and comparability. For example, individual narratives or small-scale observational field notes can produce highly idiosyncratic and unreliable information. Local and subjective knowledge may not be comprehensive, reliable or correct. People's perceptions and memories can be distorted, and interviewers' interpretations of what is said can be skewed.

It is a challenging task to integrate qualitative and quantitative information into a holistic view of the state of the environment. Scale problems often mean that scientific assessments and experiential "bottom-up" information are not really examining the same environmental area or problem. Furthermore, it can be difficult to reach across the multiple variations in the form and presentation of information: scientific information often can be presented in a series of data tables, while qualitative information may require long narratives and nuanced interpretation.

Addressing these issues and figuring out how to integrate "hard" quantitative data and "soft" qualitative information in a science-based assessment is increasingly challenging when it is recognized that both approaches can complement each other and together enrich assessment results.

A growing number of case studies point to the successful combination of technical-scientific and social science approaches to environmental assessment. Several governmental and inter-governmental agencies are developing capacity for integrating these approaches. In the end, the goal may not be to "integrate" these apparently different forms of environmental information, but rather to make use of their complementarity. Side by side, these different kinds of environmental data and information can offer a broader field of vision than either does alone.

DISCUSSION QUESTION

The following discussion question is intended to identify potential sources of qualitative data, as well as explore other aspects of collecting this type of data.

Scenario: Part of your assessment includes a segment on water quality. In addition to using available water quality measurements from monitoring stations, you have decided to incorporate qualitative data into your research because you would like to have a better understanding of local perceptions and experiences related to water quality for the region in which you are working. What might you ask community members in order to understand their perceptions about water quality? Consider different segments of the community, such as local, indigenous community members, non-profit groups, local policy-makers, children, youth and the elderly.

Materials: Worksheet listing including blank spaces for adding others.

Alternative questions.

- What has been your experience with collecting and using qualitative data?
- What practices or approaches have worked well?
- How did you use this data in your assessment?
- What are some of the challenges in collecting, using and presenting qualitative data?

B. Quantitative Data

Quantitative data provide "raw material" for indicator and index development[1] . They are the primary, raw output of monitoring and observation systems, surveys and other forms of data collection, and normally require analysis to be meaningful to the wider audience.

Characteristics of quantitative data may include:

- generally have geographic locations (coordinates);
- are often large in volume (databases, reports, etc.);
- come from a variety of often heterogeneous sources ;
- have variability of resolution (details) and scales that sometimes hamper their compilation and integration;
- have a high degree of complexity;
- are needed at varying temporal frequency (e.g., hourly, daily, monthly, yearly), depending on the phenomena or subject under consideration;
- are available in varying forms and formats; and
- more and more available in digital or electronic versions.

Generically, data are categorized as bibliographical materials (including descriptive texts and reports), statistical tables, maps and remotely sensed data (World Bank, 1992) but they can come in many forms such as:

- maps;
- remotely sensed data such as satellite imagery, aerial photographs, or other forms of data;
- computer data files;
- reports and documents;
- bibliographies;
- videos and films;
- graphs and charts;
- tables;
- computer animated images; and
- drawings.

All assessment processes ultimately depend on data, but very few have the mandate, resources and capacity to collect primary data, so they rely on monitoring and data collection efforts by others. Therefore, compiling data for assessment usually requires that you obtain data from other sources, usually many different ones, both in terms of statistical (non-spatial) and spatial data.

[1] In general, for data is understood a representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation and processing by human or automated means (Rosenberg, 1987).

Non-Spatial Data

Non-spatial data are collected for one particular point and result in a single number. Often, multiple data points for the same parameter are averaged so that a single value is obtained to represent a collection of spatial units. Non-spatial data can have temporal resolution if they are collected continuously over a period of time from a specific geographical point. You can obtain non-spatial data from statistical sources or isolated research. Statistical sources use the same methodology for multiple data, so that they can be statistically compared and averaged. Isolated research, while valuable, often does not provide the breadth you will need for analysis at broader levels.

Spatial Data

Spatial data, also referred to as geospatial data or geographic information, can most simply be defined as information that describes the distribution of phenomena and artifacts upon the surface of the earth. It is information that identifies the location and shape of, and relationships among, geographic features and boundaries, usually stored as coordinates and topology (i.e., the way in which geographical elements are related and linked to each other).

Spatial data are often displayed as layers of data one on top of the other, similar to a giant sandwich, where each layer is a related set of spatial data. Anything that has a geographic location on the Earth can be displayed as spatial data, including country statistics. Spatial data have become a major resource in environmental analysis and reporting, and present a very immediate and visual message regarding environmental issues and management.

Examples of "layers" you might use are:

- aerial photography
- satellite imagery
- country boundaries
- local administrative boundaries
- streets
- cities
- utilities
- protected natural areas
- habitat regions
- lakes and rivers
- elevation contours
- climate data
- soil layer data
- wildlife populations

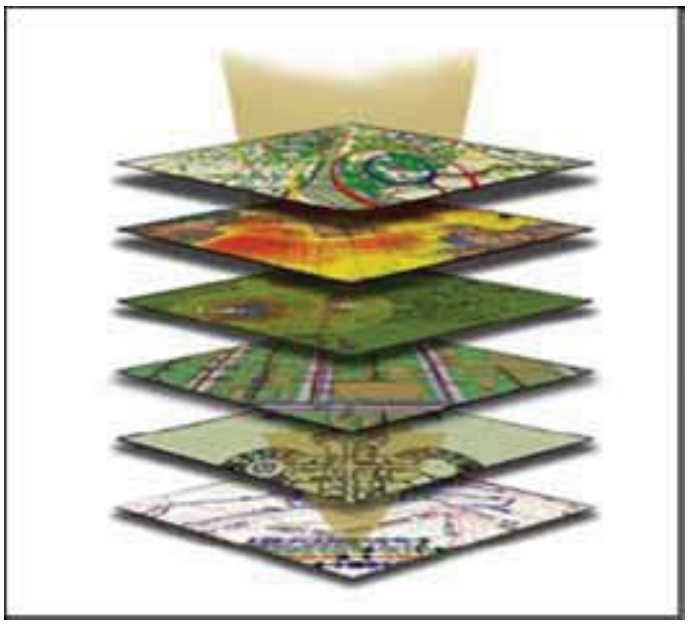
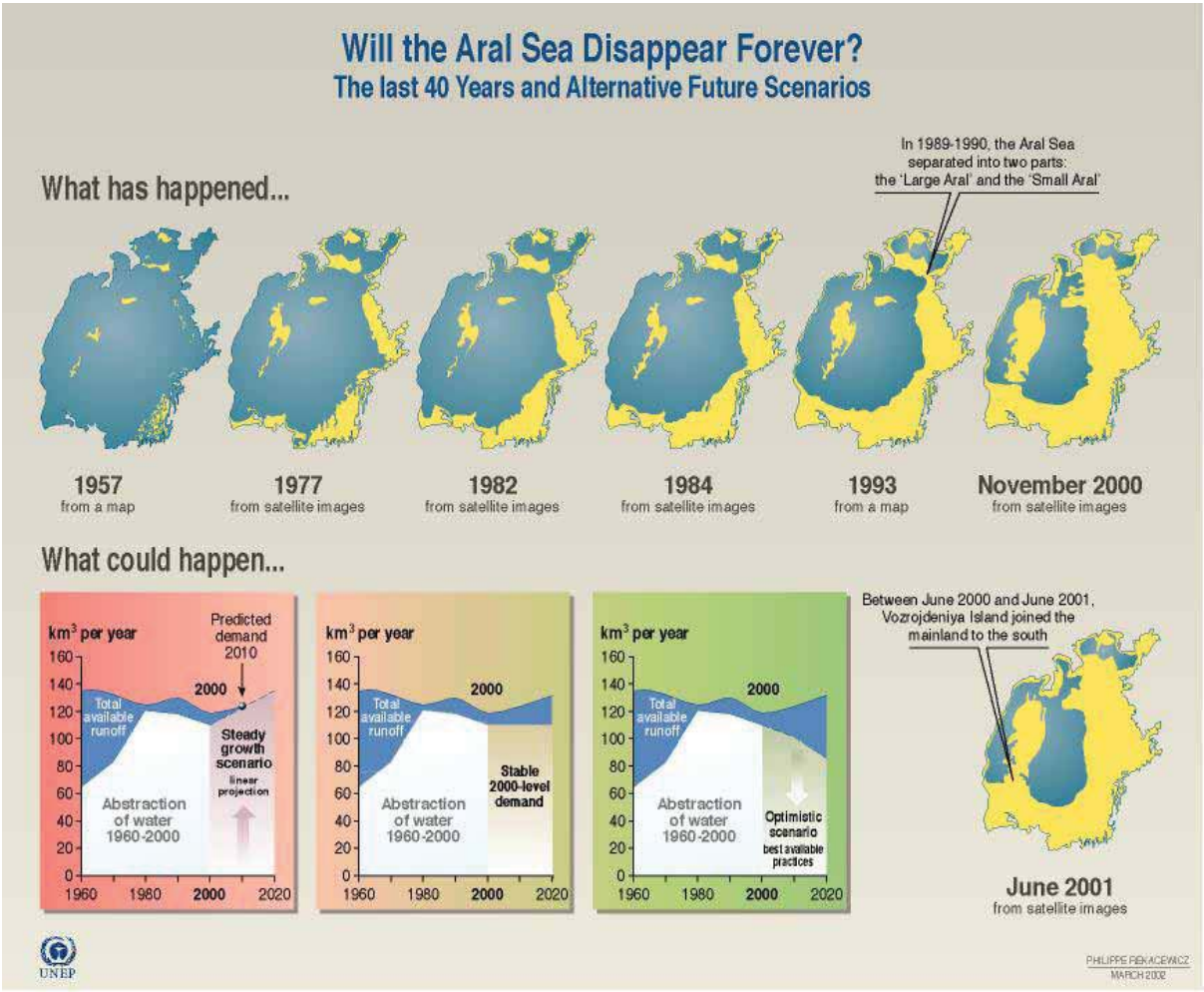


Figure 3: Layers of Spatial Data

You can also link additional non-spatial data, in the form of databases of information, to these spatial data layers by their common coordinates, and analyse and present them alongside spatial data layers. Climate data from different provinces or states in a country for example, could be linked to a provincial or state boundary layer, analysed and displayed in a spatial form, and produced as maps.

EXAMPLE: Case Study of Disappearing of Aral Sea from Central Asia

Figure 4 , shows that spatial information about the disappearing of the Aral Sea's water from 1957 to June 2001, in which water body and the dried portions are distinctly depicted in two colours. In this map the quantitative data is skillfully analysed and presented as three scenario of water availability in the graphs depicted below (Figure 4).



Sources: Nikolai Denisov, GRID-Arendal, Norway; Scientific Information Center of International Coordination Water Commission (SIC ICWC); International Fund for Saving the Aral Sea (IFAS); The World Bank; National Astronautics ans Space Administration (NASA), United States Geological Survey (USGS), *Earthshots : Satellite images of environmental change*, States Department of the Interior, 2000.

Source: http://maps.grida.no/go/graphic/aral_sea_trends_and_scenarios

Figure 4: Disappearing of the Aral Sea in central Asia

The demise of the Aral Sea was caused primarily by the diversion of the inflowing Amu Darya and Syr Darya rivers to provide irrigation water for local croplands. Figure 4, graphics show the disappearance of the Aral Sea from 1957 to 2000 in which water body and the dried portions are distinctly depicted in two colour; three possible scenarios show the relationship between future demand (and thus water abstraction) and future available runoff in cubic kilometres per year. The scenarios cover the time period from 2000 to 2020. They explain as to what may happen if water abstraction and the demand for water continue to increase, what may happen if they remain the same as they were in the year 2000, and what may happen if they decrease. In this map the quantitative data has been presented through three plausible scenarios of water availability in the region (UNEP/GRID Arendal, 2002).

Remotely Sensed Data

Remotely sensed data are useful when ground level data are difficult to acquire, such as when the area is difficult to access, or the areas of interest cross country boundaries. In other cases, it is useful when the cost of acquiring ground-based data for extensive areas, for which SoE reports are often required, is beyond the means of many governments and organizations. For these cases, remote sensing provides a partial solution for data acquisition for SoE reporting. But even for areas where conventional methods have been used to acquire data, remote sensing provides many added advantages.

Box 3: Remotely Sensed Data

- Provide a unique perspective from which to observe large regions.
- Sensors can measure energy at wavelengths which are beyond the range of human vision (ultraviolet, infrared, microwave).
- Monitoring is possible from nearly anywhere on earth.
- Remotely sensed images provide good "pictures" for convincing the public and decision makers to participate in discussions on issues of importance that may not be part of their daily life.
- Used to monitor long-term changes.
- Readily integrated into GIS.

How is remote sensing useful for IEA?

Remote sensing is particularly useful for environmental monitoring and reporting because it provides a unique overhead or "bird's-eye" perspective from which to observe large areas or regions. Because of this, it can be used for management and planning in large local areas, and for monitoring the progress of ongoing projects. In many cases, these data collection can offer proof of progress towards success of projects that are a result of policy decisions designed to improve the state of the environment. Such data may be essential for further investments.

Another merit of remotely sensed data is that they are often available on a repetitive basis. This type of time series data is extensively used to monitor changes in the environment over long periods (examples in Box 4). This is particularly important for SoE reporting in very rapidly changing environments.

Types of Remotely Sensed Data

Satellite Imagery

Satellite imagery is digital information obtained from sensors carried in satellites, and includes data both in the visible and non-visible portions of the electromagnetic spectrum (i.e., optical, thermal, radar). Satellite imagery is available from several sources from around the world (i.e., Landsat, SPOT, Quickbird, Envisat, ERS, IRS, Radarsat, NOAA, ASTER), and from numerous companies that process and distribute satellite data products. One of the benefits of satellite imagery is the ability to capture multispectral images (i.e., images in two or more spectral bands, such as visible and infrared). These images provide a unique resource for people who work in agriculture, geology, hydrology,forestry, regional planning, education, mapping and global change research.

The multi-date satellite imagery shown in the Figure 5 provides the pattern of drying up of the Aral sea between 1977 and 2006.

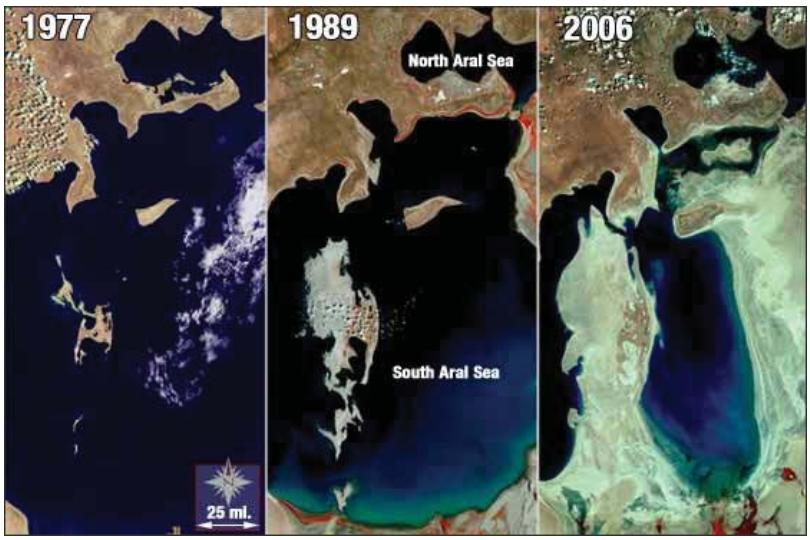


Figure 5: Temporal imagery of Aral Sea taken 1977, 1989 and 2006

Source: http://epod.usra.edu/archive/epodviewer.php3?oid=352352

Aerial Photography

Aerial photography consists of images taken of the Earth's surface from a camera on an airplane flying at a relatively low altitude. Depending on their purpose, aerial photographs are taken in black and white, colour, and/or infrared. For example, simple planning or navigation may only require black and white photography, while vegetation studies require infrared in order to distinguish among landforms based on infrared heat signals. Similar to remote sensing, aerial photography provides a unique overhead view of an area, and can be used to acquire data on local areas without the observer being in direct contact.

Aerial photography has several benefits over satellite imagery; one is that it provides a much higher resolution of an area, allowing you to get a very close-up and detailed picture of a fairly small feature on the Earth's surface. With the necessary corrections for distortion and processing, aerial photographs are powerful tools for studying the earth's environment. Acquiring aerial photography for an area is much more expensive than obtaining satellite imagery.

DISCUSSION QUESTIONS: Spatial Data in Environmental Reporting

Option 1. - Discussion

Working in small groups, discuss how you have personally used spatial data, as well as data combinations including spatial data, in your profession, or how you have seen it used.

For Example: You may have at some point used a satellite image of your country as a base layer with an overlay showing regional boundaries. You may have then linked data, such as a climate database, to the map to show average precipitation for each region across the country.

Provide examples of any environmental monitoring or reporting you may have done, and whether or not spatial data were used for this reporting.

Choose someone in your group to record aspects of the stories collected, including what worked and what could be different.

Option 2. - Questions to discuss:

What are the benefits of spatial data?

Identify an environmental problem or concern. What kind of spatial data could you use to help understand and communicate the issues involved?

What are some of the challenges you might encounter when using spatial data?

Spatial Data and the Internet

The Internet has become a major source of data used for assessment and reporting. There is an unprecedented amount of free environmental and socio-economic data on the Internet, and more and more websites also allow the exploration of the data through online mapping and/or statistical analysis (see Box 4 for some current examples of available sources). In addition, there are many online national, subregional, regional and global data and map services available that are fairly simple to use with most Internet browser programs, and this has become a very effective way to communicate images, maps and other types of datasets to potential users without the need to acquire and run specialized computer software. UNEP Geo Data portal, ekh (environment Knowledge Hub for Asia-Pacific) and M-eKH portal(Mountain environment Knowledge) are some of the authoritative international sources of data available to the assessment community, while offering at the same time various possibilities to look at the data online by means of maps, graphs and tables.

Box 4: Examples of Monitoring Systems

National-regional data sources

- UNEP Environment Knowledge Hub (eKH) (http://ekh.unep.org/)
- ICIMOD: Mountain Environment Knowledge Hub (http://menris.icimod.net/)
- Regional 3R Knowledge hub on Waste management (http://www.3rkh.net/)

International data collecting sources

- OECD has developed solid environmental data collection systems. OECD Environmental Data Compendium and Environmental Indicators reports are published in book format every two years.
- UN Regional Commissions are collecting environmental data from countries at the regional level, sometimes in cooperation with UNEP.
- UN Statistical Division collects country data in cooperation with UNEP and coordinates with similar surveying by OECD and Eurostat, into account data collection activities by other organizations such as FAO, UNFCCC and GEMS-Water. (http://unstats.un.org/unsd/default.htm)

Some major multilateral environmental agreements that have prompted data reporting:

- Ozone depleting substances (Vienna Convention and Montreal Protocol, http://ozone.unep.org/)
- Greenhouse gas emissions (UNFCCC, http://unfccc.int)
- Hazardous waste movements (Basel Convention, http://www.basel.int/)
- Long-range transboundary air pollution (CLTRAP, http://www.unece.org/env/lrtap)

Global Environmental Observation coordination – in-situ and satellite remote sensing

- Global Observation Systems include land, oceans and climate (GTOS, GOOS, GCOS, together labelled G3OS, see http://www.gosic.org/), guided through an Integrated Global Observing Strategy (IGOS) and supported by the IGOS Partnership (http://www.igospartners.org/).

Global Earth Observation initiatives

- Committee on Earth Observation Satellites (CEOS, http://www.ceos.org/)
- United Nations Office of Outer Space Affairs (UNOOSA, http://www.unoosa.org/)
- Global Earth Observation System of Systems (GEOSS, http://www.epa.gov/geoss/)

3.2 Monitoring and Data Collection of Environmental Trends and Conditions

Monitoring provides you with tangible information on a regular basis over an extended period of time about past and present conditions of the environment. In addition to environmental information, monitoring systems also collect social and economic information that is relevant for understanding environmental issues. A monitoring system may be developed for a number of objectives, such as (ADB 2002):

- assess the quality of the environmental situation, and enhance public awareness;
- determine compliance with national or international standards;
- assess population exposure to pollution, and the impact on human health;
- identify threats to natural ecosystems, and develop early warning systems;
- identify sources of pollution and estimate pollutant loads;
- evaluate the effectiveness of pollution control measures;
- provide inputs for environmental management, traffic management and land-use planning;
- support the development of policies, determination of environmental priorities, and other managerial decisions; and
- support the development and validation of managerial tools (e.g., database models, expert systems and geographic information systems).

In addition to the above, monitoring can be used to evaluate the performance and effectiveness of policies implemented and actions taken. Monitoring data should not be used alone, however, as differences in national priorities and environmental circumstances influence various aspects of a monitoring system. These factors might include financial resources and human resource skills.

Monitoring and observation takes place at various levels, including community, regional, national, global and outer space. As it is usually not feasible to set up a dedicated monitoring system, particularly in the context of a GEO-type assessment, it is important that monitoring systems have an institutional base that builds on data using multiple methods from multiple sources.

At the national level, data are usually collected by the central bureau of statistics or equivalent office, and/or by certain ministries (e.g., environment, land, water, agriculture) who run networks of measurement stations and undertake statistical surveys.

International, national and regional monitoring system data are often used in compilations and databases. National monitoring systems are sometimes able to draw on data from both the regional or ecosystem level and international sources, such as statistical compilations of data from UN or other international agencies. International satellite observation systems often provide valuable information as well. At the same time, international organizations often use data collected at national - and sometimes regional - levels to compile global databases. Thus, in practice the data collection and dissemination flows can be quite complicated. Over the years, several global observation programmes have been initiated to harmonize, support and improve basic data collection efforts, and make them useful and available for the users, including scientists, governments, civil society and the public at large. (See Box 4.)

While a number of monitoring and data systems are available, there still remains a shortage of comprehensive, harmonized, high quality data that are readily available for analysis of environmental issues. This holds true for issues such as renewable energy, waste disposal and processing, land and coastal degradation, water consumption or deforestation. When limited to those environmental indicators for which there are sound, regular, country statistics available, one arrives at a small set of broad indicators, such as those contained in the Millennium Development Goals under Goal 7: Ensure environmental sustainability (http://www.un.org/millenniumgoals/).

Thus, coordination among international monitoring and data systems still presents challenges and opportunities in the IEA context. From the IEA side, a contribution to the improvement of data availability can be made by identifying the most important data gaps, and providing feedback to monitoring and observation programmes.

When selecting the type of monitoring system to use, you will also need to consider cost implications. For example, differences in cost between on the ground and remote monitoring can be significant. On–the-ground monitoring is more costly, as it involves measuring stations, questionnaires and other forms of collecting data.

3.3 Data Collection/Data Compilation

Though challenging, collection of high-quality data is an essential part of the IEA. You can approach initial decisions about what data to collect and how to collect it in a couple of different ways. You may begin by conducting a survey of available data prior to scoping thematic issues for the assessment. Availability of data then becomes a criterion for selecting data and developing indicators. Alternatively, you may use a more targeted approach, where priority areas are identified first, followed by data collection. In this case, if data are not already available, you may need to collect them, although you may be constrained by cost and time availability.

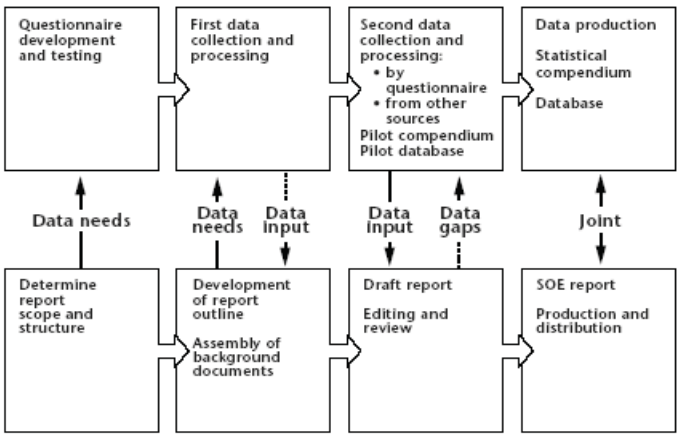


Figure 6: Links between Database and Report Development in OECD Countries (as quoted in UNEP/DEIA 1996)

Once you have decided on the approach you will use for data collection, you will need to further develop a plan that includes elements of developing research methods, defining the type of data needed, and prioritizing which data must be collected. You will also need to specify data sources, and have a clear sense of the quality of the data. The steps involved in obtaining data and building a database go hand in hand with developing an assessment report (Figure6).

Quality of data and precision of measurement are important considerations during data collection. “Perfect” data are not always necessary, but data quality must be sufficient to satisfy the objectives. Imperfect approximations (proxies) might be used in case no direct data can be obtained. Well-known examples of this are the use of CO2 emissions to show climate change, or of protected areas to indicate biodiversity. Although different opinions exist as to whether it is better to have poor data rather than no data at all, the general notion is that environmental assessment is to be based on the best available, scientifically sound data from widely recognized sources.

Once the basic data are selected and collected, usually you will need to compile and store them in a dedicated database, which might be also made available on the Internet. A database is an organized collection of data that is used to bring together all information about the state and trends in the environment, and may also include information about environmental policy, references to other data sources and to current research. It is important to ensure the database has continuity, and is kept up to date by linking it to monitoring systems, so that data generated through monitoring are regularly fed into the database. The environmental database can also be used to regularly publish printed documents, such as environmental data compendia and indicator reports, to inform policy-makers and the public, and to provide a snapshot overview of the state of the environment. In many countries, building such a database is, or can be, a collaborative effort of various agencies, such as a central bureau of statistics, environmental and related ministries (e.g., agriculture, water), as well as research organizations and non-governmental organizations.

Data Harmonization

Generation of individual Environmental parameter data depends on various aspects which contributes towards easier comparability with the similar parameter collected in another location. During the GEO process, experts were encountered with the data problem. The interpretation of the definitions of the various categories of data may vary from country to country and region to region. Aggregating such data for the purpose of IEA reporting may amount to adding apples and oranges. For example, the definition of open or closed forests may from country to country in terms of the crown cover percentage. While some countries use FAO definition, others may be using their own definition. Similar is the case while defining poverty and total fish catch. Thus, aggregating that information at sub-regional or regional level may cause a problem. Harmonizing efforts at the national level will improve the international comparability of environmental information as well as facilitate easier comparative analysis and aggregation. Consistent national, sub-regional, and regional wide information are needed on critical indicators of air, soil, and water quality, and natural resources degradation processes as several environmental issues are or transboundary in nature. The data harmonisation aspect has to be taken due consideration also in IEA reporting at national level while undertaking comparison of data of several geographical locations with definition, collection methods.

GEO Data Portal

In order to filter relevant national data from authoritative, primary international data sources and harmonized databases, as well as to provide aggregated data at sub-regional, regional and global levels, UNEP has developed a dedicated reference database for GEO and similar reporting: the GEO Data Portal.

The GEO Data Portal has by now matured into a reference data system, and has become the authoritative source of data used by UNEP and its partners in the GEO reporting process and other integrated environment assessments. The Data Portal gives access to a broad collection of harmonized environmental and socio-economic data sets from authoritative sources at global, regional, sub-regional and national levels, and allows basic data analysis and creation of maps and graphics. Its online database currently holds more than 450 variables that can be analysed and displayed as maps, graphs or tables. The data sets can also be downloaded in a variety of formats, supporting further analysis and processing by the user.

The contents of the GEO Data Portal cover a broad range of environmental themes such as climate, disasters, forests and freshwater, as well as categories in the socio-economic domain, including education, health, economy, population and environmental policies. Although primarily targeting the GEO user community (UNEP offices, GEO Collaborating Centres and contributors), extensive use of the portal is also made by other (UN) agencies, universities, schools, civil society and the general public. To the extent possible, the data cover the period since 1970, and are constantly being kept up-to-date. Apart from statistical data sets, a good selection of geo-spatial data (maps) is also available, usually at global and regional scales. The data providers include many primary data collection agencies among the UN system and other key partners, including FAO, UNEP, UNESCO, UN Statistical Division, WHO, World Bank and OECD.

The global GEO Data Portal is now being supplemented by regional versions, starting in Latin America and Africa, and to follow in Asia and Pacific and West Asian regions. The Global GEO Data Portal is available on the Internet at http://geodata.grid.unep.ch/. It gives information on updates, new items, etc. A CD-ROM version has also been produced, as well as an e-Learning set of tools and a User Guide (http://www.grid.unep.ch/wsis/).

Although the GEO Data Portal is open to everyone and provides data for all countries of the world, for national-level environmental reporting authoritative data sources are more likely found within the country itself from the government (environmental and other ministries, bureau of statistics), research organizations, NGOs and other sources.

Environment Knowledge Hub (eKH) for Asia-Pacific

The Environmental Knowledge Hub (eKH) aims to build a virtual storehouse of information about the environment in the Asia and Pacific region. Data acquisition is a continuing process. Hence, compiling datasets catalogue is also a continuing activity and service of UNEP RRC.AP under eKH. This catalogue is updated every six months to include new data acquisitions as well as new datasaets. Every effort has been made to ensure the accuracy of the information stored, and to fully acknowledge all sources of information, graphics and photographs used.

A Mountain Knowledge Hub (MKH) or Mountain Geo Portal:

A Mountain Knowledge Hub or Mountain Geo Portal is the initiative for promoting Geopraphical Information and Earth observation Application for the Sustainable Development of the Hindu Kush-Himalayan (HKH) region . This site provides the in spatial data and information and its analysis in the HKH mountain ranges expanding from Afghanistan to Myanmar. http://menris.icimod.net/

3R Knowledge Hub on Waste Management :

The Asian Development Bank (ADB), AIT, UNEP, and UNESCAP are jointly establishing a knowledge hub on “Reduce, Reuse, and Recycle” (3R). The knowledge hub will function as a think tank on technology, good practices, policy strategy and management, and issues related to 3R, which promotes sustainable production and consumption of limited natural resources, and improved economic and environmental efficiency. This site will be ideal place for the national data and information on state, trend, policy and initiatives on waste management

EXERCISE 1: GEO Data Portal

The following exercise is intended to give you practice using the GEO Data Portal. There are two themes for this exercise, Population Indicators and Making Globalization Visible. For the first part of the exercise, choose a theme and work with a partner on the exercise. For the second part, do the exercise on your own. Use the handouts provided with this activity to follow the steps.

1. Population Indicators: A Global View

Geodemography is one of the most commonly used themes for mapping in geography, mainly because population data are often readily available and lend themselves quite well to mapping, particularly at the global level. Mapping geodemography allows us to go beyond basic population numbers to the population indicators that give us a more complex picture of the population dynamics of a place, such as birth rate, death rate, total fertility rate, and infant mortality rate. This exercise gets you started comparing population indicators at a global scale.

Step 1 At your computer, launch your browser and go to the GEO Data Portal at http://geodata.grid.unep.ch/.

First, let’s focus on the fertility rate data. The fertility rate is a relatively useful indicator of forthcoming changes in population density for a country.

Step 2 Under “search the GEO Database,” enter the word “fertility,” and click “Search.” You should now see a set of available database options relevant to “fertility.”

Step 3 In this list, choose the top data option, fertility at the national level, by clicking on the radio button and then clicking “continue.”

Step 4 From the year selections, check the box labelled "Select All" next to the list of available years, and then click "continue."

You should now be looking at a list of available output options for the data, as shown on the right. The GEO Data Portal offers data to view in a map, chart or table, as well as to download for use in statistical or mapping packages.

First, let's find out what type of data we have by looking at the metadata, which are the background information about a data set itself. They include facts, such as the source of the data, the scale at which they were collected, the year they were collected, the projection if there is one, and any other information that you need to know before you can interpret the meaning of the data and use them in your analysis or report.

Step 5 Under "Show Metadata," click "display as...Metadata."

Question 1: Read the "Abstract" and "Purpose" sections of the metadata. How is fertility rate defined for this data set?

Question 2: How were the data for fertility rate collected and measured?

Question 3: Why is fertility rate considered a more useful population indicator than birth rate?

Step 6 When you're finished browsing the metadata, click the orange "go back" link on the right to return to the display options page.

Step 7 Under "Draw Map," click on the image of the map. This will open up a separate window with a world map showing estimated fertility rate for the years 2045–50.

The fertility rate map shows a century of estimated data for each country. How are regional patterns of fertility estimated to change over this period of time?

Step 8 Explore the different estimates by clicking on the "General" tab in the red Theme box below the map, selecting another time period from the "Selected Year" drop-down menu, and clicking "update map."

Question 4: Choose four different time periods from the drop-down menu, and analyse what you see. What regional patterns do you find for fertility rate?

Question 5: Based on these patterns, which countries or regions might you predict to have a decreasing population density?

Hint: By selecting the "Identify" tool icon to the left of the map, and then clicking the map with your cursor, you can get data for individual countries.

Step 9 Next, go back and explore the global data for Infant Mortality Rate. Click on the orange "new search" link to the right of the map. This should take you back to GEO Data Portal home page. In the box, type "infant mortality" and click "Search."

Step 10 From "select a dataset," choose "Infant Mortality Rate -- National," click "continue," again choose all years of the data, and click "continue."

Step 11 Draw your map as in Step 7.

Question 6: Using the options in the "General" tab again, browse the estimated infant mortality data between 1950 and 2050. What regional patterns do you see?

Question 7: Reflect on what you have learned in class about infant mortality rate as a population indicator. If you could look at these two data sets, infant mortality and fertility rate, simultaneously, how would you expect them to correlate? In other words, for a country with a high fertility rate, would you expect infant mortality to be high or low? Explain your reasoning.

2. Making Globalization Visible

Globalization is a complex concept to grasp, much less measure or monitor. Most people agree that it is a combination of specific process-like and structural shifts in economics, culture and governance at the global level. These patterns include a shift from industrial to service economies, and from national to global markets, an increasing spread of popular culture, rising consumerism and often a widening gap between the rich and poor.

Question 1: What other kinds of economic and cultural patterns are indicators of globalization?

Question 2: What kinds of activities are indicative of political and cultural resistance to globalizing forces?

Based on these patterns of globalizing forces and resistance to those forces, do you think it is possible to make a "map of globalization"? What would it look like?

It is one thing to consider globalization as a series of case studies, with separate issues, indicators and effects. But, it is far more difficult to achieve an integrated awareness of globalization, a whole picture of globalization in our head. If we cannot look at it as a whole, how can we monitor it as a whole?

In this exercise, we will experiment with online mapping to see if the kinds of datasets available to us are useful for illustrating the complex idea of globalization. We will use the GEO Data Portal and try to explore its capabilities to grasp of the notion of globalization.

Step 1 Launch your browser and go to the "GEO Data Portal" at http://geodata.grid.unep.ch/.

Step 2 For the search term, type in "trade" and click "search."

Step 3 In the resulting list, select "Trade - Percent of GDP" for the national level, and click "continue."

Step 4 Select "1970" for the year, and click "continue."

Question 3: Based on what you know about regional globalization patterns, what type of data display for "Trade - Percent of GDP" do you expect to see?

Step 5 Test your hypothesis by clicking on "Draw Map" from your list of options.

Question 4: Which countries or regions show the highest proportion of GDP in trade for 1970? Which countries show lower proportions?

Step 6 Now click the "Trend Analysis" tab in the red "Theme" box, and check the "Calculate difference" option. Choose to look at the difference between 1970 and 1980, and display the difference "in percent." Click "update map" to see your results.

Question 5: Is GDP in trade increasing or decreasing? For which regions or countries?

Question 6: Redraw the trend analysis map for 1980 to 1999, and compare the results. Does the visual pattern fit your hypothesis from Question 3? Why or why not?

Question 7: How does the "No data" category affect the different views of the choropleth map? (A choropleth map uses shading, colouring or a symbol to show the geographical distribution of the information.) How does it affect your perception of the global balance of trade?

Question 8: Explore and evaluate the generalization, scale and projection, and data classification of this interactive map. In what ways does each factor limit your interpretation of globalization trends?

Step 7 Print a copy of the map that you made, and copy and paste it into a Word document.

Using the Histogram

A histogram shows the distribution of data values for one continuous variable. Rather than showing each individual variable along a single axis, as you saw with line graphs in Exercise 1, a histogram divides the data into data classes, and then plots the frequency of occurrences of those data classes relative to the variable as a whole.

Step 8 Click the "Table" tab above the map. This should take you to a table showing the 1970 GDP trade values by country.

Step 9 Click "Histogram" to get a pop-up window showing a histogram display of the tabular data. Print the histogram pop-up using the print options on your computer, then close the pop-up.

Step 10 Click the "redefine years" option to the right of the table, set the year to 1980, choose "Draw Map," choose "Table" again, select "Histogram," and print a new histogram for the 1980 data.

Step 11 Finally, repeat step 10 to make a histogram for the most recent year available. You should now have three histograms showing change in "Trade – Percent in GDP" over time.

Question 9: Compare your three histograms. How is the proportion of GDP in trade changing? Does this support the concept of globalization? Explain why you think the histograms do, or do not, reflect globalization trends.

Question 10: Do the histograms assist with your visual picture of GDP in trade? Why or why not?

Guide to GEO Data Portal – CD-ROM and e-learning.

Run the e-Learning for Sustainable Development CD-ROM, using the GEO Data Portal. For the video demonstration and exercises, see also http://www.grid.unep.ch/wsis/

<CD-ROM to be provided with Training Manual>

4. Indicators and Indices

You have become familiar with considerations and processes involved in collecting and developing data for use as indicators and indices. The next step in the process is to package the data into a form that can be more easily interpreted from a policy relevance perspective. The following section will provide you with an overview of conceptual and methodological considerations associated with developing and using indicators and indices. The section reviews the process of selecting indicators, including criteria for good indicators, participatory processes and indicator frameworks.

4.1 Indicators

Indicators are what make data relevant for society and for policy making. They help us make decisions or plans because they help us understand what is happening in the world around us. Indicators have an important role in both informing and assessing policy (UNEP 1994). The World Bank (1997) stated that, "The development of useful environmental indicators requires not only an understanding of concepts and definitions, but also a thorough knowledge of policy needs. In fact, the key determinant of a good indicator is the link from measurement of environmental conditions to practical policy options." Practical policy options imply a relationship between environmental and societal affairs. As any decision has a price, whether it is environmental or social, a policy's impact ultimately depends on the priority of the decision-maker as influenced by the perceived priorities of that person's constituents. Thus, the integration of policy areas must provide a solid platform for supporting the path toward sustainable development (Gutierrez-Espeleta 1998).

The value of indicators in policy making can be summarized as:

- providing feedback on system behaviour and policy performance;
- improving chances of successful adaptation;
- ensuring movement toward common goals;
- improving implementation; and
- increasing accountability.

Selecting Good Indicators

One of the challenges of selecting good indicators is that it may be easier to choose indicators based on ease of measurement or data availability, rather than what needs to be measured. As mentioned previously, filling data gaps can be a resource intensive process, which means that options in terms of indicator selection may be limited. Notwithstanding, it is still valuable for you to select indicators that have the best possible fit with the IEA process.

Part of the process of selecting good indicators is weighing them against a set of indicator criteria. Selecting indicators can be a balancing act, with trade-offs among such factors as ensuring they are relevant to society and policy-makers, scientifically sound and accurate, and easy to interpret with a reasonable degree of accuracy and precision.

The following criteria, drawn from the World Bank (1997) and OECD (1993) are commonly cited as useful in the indicator selection process.

Indicators should:

- be developed within an accepted conceptual framework ;
- be clearly defined, easy to understand and interpret, and able to show trends over time;
- be scientifically credible and based on high-quality data;
- be policy relevant;
- be relevant to users, politically acceptable and a basis for action;
- be responsive to changes in the environment and related human activities;
- provide a basis for international comparison by providing a threshold or reference value;
- be subject to aggregation (from household to community, from community to nation);
- be objective (be independent of the data collector);
- have reasonable data requirements (either data that are available or data that can be collected periodically at low cost); and
- be limited in number.

An important consideration is selecting the appropriate number of indicators. Too many indicators may create “noise” that is difficult to interpret, while too few indicators limit the scope of understanding. Selecting indicators based on a select set of priority issues is an increasingly common way of limiting the number of indicators.

Participatory Process

Because indicators are intended to help inform decisions that affect society, indicators better serve society when they reflect the diverse perspectives held by multiple stakeholders, such as citizens and citizen groups, private and public sectors, and policy-makers. As shown in the following figure, participatory processes occur across the spectrum of indicator development, from an initial identification of broadly-held values and issues that inform indicator selection, to more focused tasks of setting indicator targets and criteria for performance.

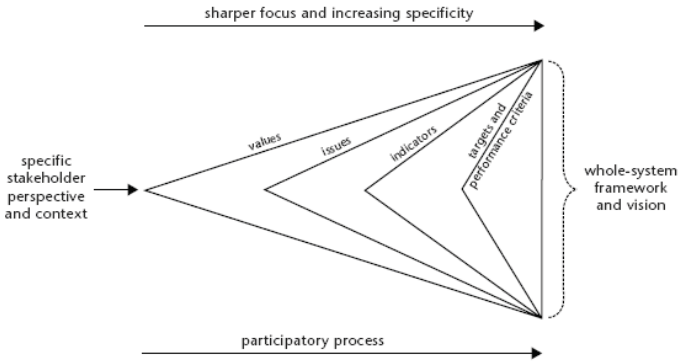


Figure 7: Linking Values, Issues, Indicators and Performance Criteria in a Participatory Process

An additional step not shown in Figure 7 is the process of communicating indicator results with stakeholders, and understanding how they interpret the results in relation to values and their world-views. Developing an effective participatory approach requires careful planning so that the people who need to be involved are involved in an appropriate way, taking into account available resources (See Section 2).

Indicator Frameworks

Indicators are developed based on priority issues. The orientation of indicators to issues as well as relationships among indicators (such as cause and effect relationships) is often structured using conceptual frameworks as shown in Figure 8. In an IEA and in GEO, the conceptual framework is the Drivers – Pressure – State – Impacts – Responses (DPSIR) framework, which shows relationships between human activity and ecosystem well-being. The DPSIR framework used in GEO-4 is shown in Figure 8. Variations on the DPSIR framework include Driving-State-Response (DSR), which was originally used by the UN Division for Sustainable Development (UN-DSD), and the Pressure-State-Response framework used by the OECD. This framework has been discussed detail in other module.

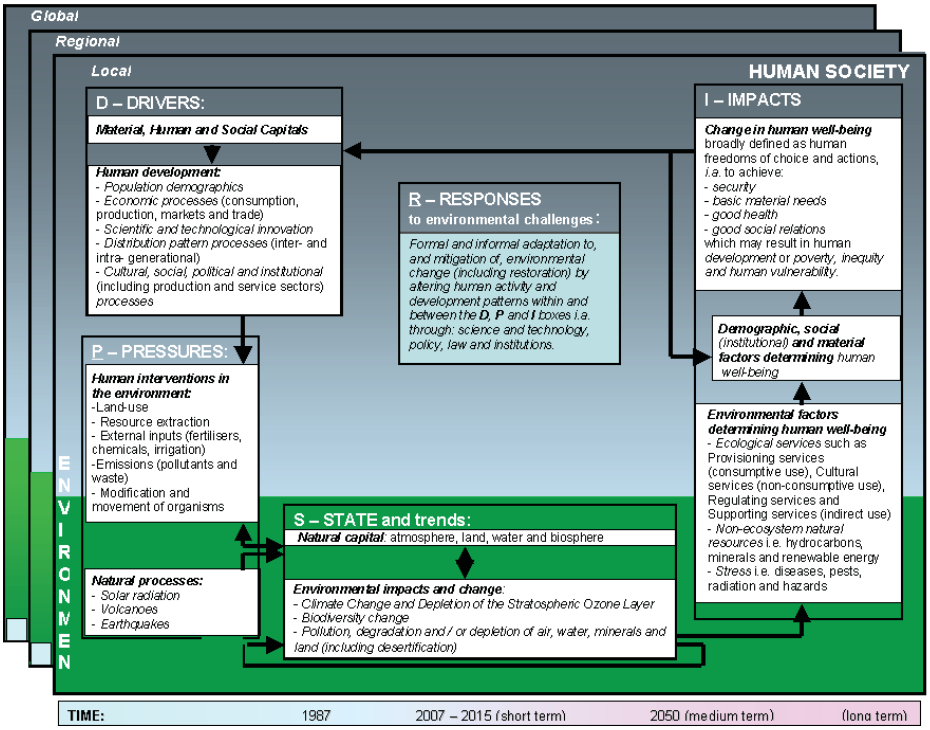


Figure 8: DPSIR Framework for GEO-4 (Source: DEWA 2006)

Another type of framework is the capital stock model. This framework focuses on the maintenance or growth of capital stock in the areas of physical capital stock, natural capital, human capital and social capital. Each form of capital is converted into a monetary equivalent. The goal of this model, which is in use by the World Bank, is to ensure that "future generations receive as much or more capital per capita than the current generation" (World Bank 1997).

Types of capital include:

- physical capital - buildings, structures, machinery and equipment, and urban land;
- natural capital – renewable and non-renewable natural resources;
- human capital – return on investment in education; and
- social capital – norms and social relations, social cohesion.

The capital stock model enables trade-offs to be identified among different forms of capital, and also enables aggregation of all the measures. A limitation of the model is that it excludes aspects of natural and human/social resources that do not have assigned monetary values (Hardi 2000) or with which monetary values cannot reasonably be associated.

Flow of indicator development

Figure 9 provides an example of the process used for indicator development in South Africa as part of a SoE report. The main steps are further described below.

Step 1 involved identifying a framework to guide the selection of indicators. The framework was based on a review of environmental and local government legislation, and consultation with stakeholders. It was built around core environmental mandates for local government, and if a core mandate was not present, then around the role of provincial and national government.

Step 2 involved drafting a set of indicators based on a set of criteria for indicator selection. The draft set of indicators was reviewed by local, provincial and national government, to ensure that the new indicators would have as consistent a format and language as pre-existing indicators. A workshop was then held to obtain feedback from stakeholders.

Step 3 involved further categorizing the indicators. Because municipalities and provinces across South Africa manage areas with different characteristics, and with different levels of resources, capacities, knowledge and available data, further categories were needed to reflect these differences. The indicator categories were then placed within the indicator framework.

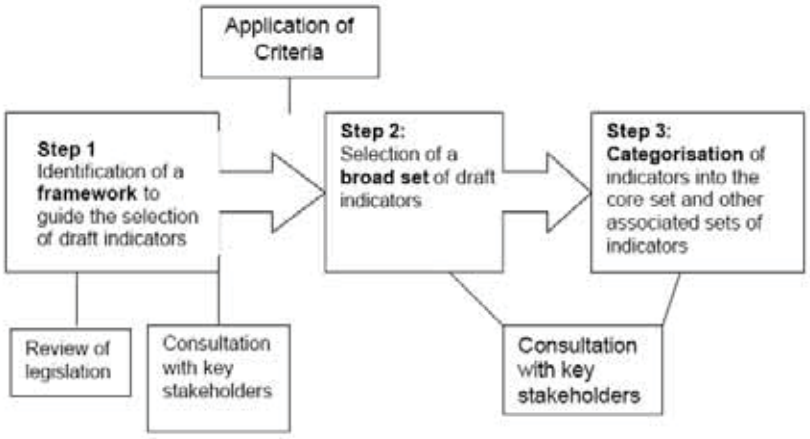


Figure 9: Example of an Indicator Development Process from South Africa

Source: Palmer Development Group 2004

Towards the end of the project, a workshop was held with stakeholders for three purposes: to finalize the draft set of indicators, to categorize the indicators into proposed sets, and to discuss issues related to the use of indicators by government. The workshop resulted in a draft set of categorized indicators and a number of recommendations from stakeholders directed towards the government department responsible for indicator reporting.

Core Indicator Sets

Once indicators have been identified, you can further reduce them into core and peripheral sets of indicators. Core indicators provide clear and straightforward information to decision-makers and civil society on trends and progress for specific issues. Few in number (10-15), core indicators are sometimes clustered around themes, parameters or dimensions to assist with understanding more complex situations. They do not, however, provide a comprehensive picture of the situation, including relationships among different aspects being measured. More detailed, supporting indicators may be included in a peripheral set to provide a higher level of detail.

Several “core data/indicator” sets have been developed, mainly differing by geographic scope (i.e., country, region, global). Examples are the OECD Key Indicator Set, the EEA Core Data Set, the EU Structural Indicators, the GEO Core Data Matrix and the UN CSD Theme Indicator Framework.

EXAMPLE: GEO Core Indicator Set

As shown in the GEO Core Indicator Data Matrix, the GEO Core Indicator Set is based on a series of theme areas that reflect global issues and trends for selected environmental issues. These theme areas include:

- land;
- forests;
- biodiversity;
- fresh water;
- atmosphere;
- coastal and marine areas;
- disasters;
- urban areas;
- socio-economic; and
- geography.

Each year, the list is updated with new indicators, based on the rise and fall of the importance of global issues. Amidst efforts to ensure data are collected using environmental monitoring, surveying and remote sensing, there remain a number of data gaps, particularly in areas concerning waste disposal and its management, land degradation and urban air pollution (UNEP 2006). Table 1 describes broad themes, issues and provides detailed information about data variables, lead indicators and lead sources for the data. The first section of the framework is shown in the text below, and the remainder of the framework is provided in Appendix A.

Table 1: GEO Core Indicator Data Matrix

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
Land	Soil erosion	♦ Water erosion (000 tonne/ha) ♦ Wind erosion (000 tonne/ha)	♦ Average annual soil erosion rate	000 tonne/ha	♦ UNEP/FAO/ISRIC: GLASOD
	Desertification	♦ Area affected by desertification (000 ha and %) of rain-fed croplands, irrigated land, forest and woodlands ♦ Livestock levels per km2 in dryland area ♦ Population living below poverty line in dryland areas	♦ Total land affected by desertification ♦ Population living below poverty line in dryland areas	000 ha, % million, %	♦ UNEP/FAO/ISRIC: GLASOD
	Land salinization	♦ Areas affected by salinization and waterlogging (000 ha and change)	♦ Total area affected by salinization	000 ha, % p/y	♦ UNEP/FAO/ ISRIC: GLASOD

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
Forests	Forest loss, Forest resources management	♦ Forest management fractions (% protected) ♦ Forest change/ domestication by sector (to agric., urban) ♦ Forest area change (open, closed, natural forests) ♦ Deforestation rate (open, closed, natural forests) ♦ Reforestation, natural and total, % success ♦ Production and trade of forestry products (wood, paper)	♦ Intensity of forest use (harvest/growth) ♦ Area of forest and woodland ♦ Proportion of land area covered by forest (%) ♦ Exports of forestry products (%) ♦ Protected forest area ♦ Regeneration/ afforestation area	% p/y total, per capita, %, p/y % p/y % p/y 000 ha, % p/y	♦ FAO: FRA/SOFO ♦ FAO: FAOSTAT ♦ UNSD: UN COMTRADE database
	Degradation of forest quality	♦ Volume distribution by major tree species group within each biome (ha per biome) ♦ Share of disturbed/ deteriorated forests in total forest area	♦ Share of affected forests	% of total forest area	♦ FAO: FRA/SOFO
Biodiversity	Loss of species	♦ No. of species known (number) and threatened species (%) for vascular plants, mammals, birds, amphibians, reptiles, freshwater fishes	♦ Number of threatened species, animals and plants ♦ Threatened animal and plant species as % of described species ♦ Red List Index for birds	No. %	♦ IUCN: Red List of Threatened Species
	Loss of habitat	♦ Recorded wildlife habitat by ecosystem, for forests (dry, moist, all forest), wetlands, mangroves, grassland/ savannah, deserts/ scrubland	♦ Total areas of wetlands/marshes ♦ Total mangrove area ♦ Change in arable land area	000 ha 000 ha 000 ha	♦ Ramsar list ♦ WWF: Lakes and Wetlands database, Global ecoregions ♦ IUCN/WCMC: Protected Areas Database ♦ USGS/EDC: Olson World Ecosys. ♦ FAO: FAOSTAT

5. Data Analysis

This section will review aspects of non-spatial and spatial analysis of data which is used in the IEA report. Module 7 provides the further information about physical product outcomes as it considers in a more in-depth presentation and communication of the IEA report in reader friendly way. In this section non-spatial analysis includes performance evaluation, along with trend, correlation and graphical analysis. Also included is the presentation of indicators using symbols. This is followed by a review of spatial analysis using GIS.

5.1 Non-Spatial Analysis

Performance evaluation

Indicators become especially useful when they can be interpreted in the context of performance. Distance to a specified target is a common way of measuring performance. These measures also promote accountability to policy-makers, particularly when policies are linked to environmental performance.

Baselines, thresholds and targets are ways of measuring changes in the system compared with previous states or future desired states. Baselines allow us to monitor either positive or negative changes in a system, based on the initial state of the system. It is important that baseline information is present at the beginning of a project to monitor changes over time. Thresholds allow us to monitor activities that may result in negative activities; the Air quality Indicator (AQI) discussed above has a threshold of 151, beyond which most people will experience health impacts. Thresholds can act as our "alarm systems," enabling us to take preventative action. Targets indicate goals for performance, and enable us to monitor positive progress towards the goal. Targets are often used for projects when sustainable development or improving the system is a goal (Segnestam 2002).

Globally, performance indicators are used to assist countries or regions in monitoring their compliance with globally agreed-upon goals and targets. A well-known example is the Millennium Development Goals, defined by the UN General Assembly in 2000.

Trend Analysis

Trend analysis is instrumental in understanding how the data are functioning over time, sometimes against targets, baselines and/or thresholds. Various possibilities exist to present the trends, which can easily lead to different interpretations and conclusions. For example, the presentation of an indicator as absolute value, percentage or index can make an important difference. If we look at the global supply of renewable energy when displaying the trend in terms of totals (kilotons of oil equivalents, Figure 10) or shares (%, Figure 11), then we see little change: the supply of total biofuels goes up a little bit, but most others are more or less stable. In fact, the shares hardly change at all. The message from these graphs simply be "renewable energy has not shown significant changes since 1990," which from an environmental point of view is rather disappointing.

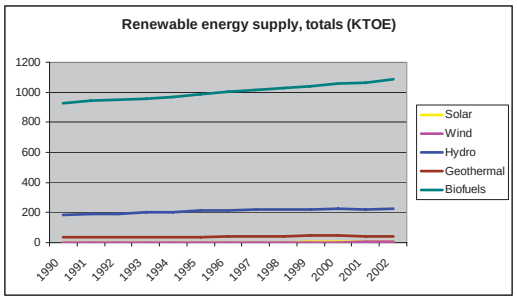


Figure 10: Renewable Energy Supply, Total

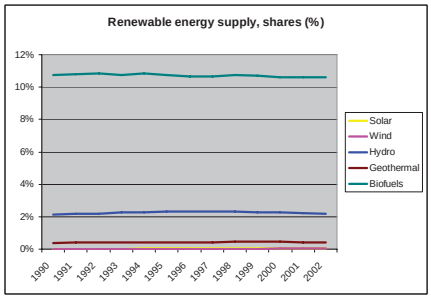


Figure 11: Renewable Energy Supply, %

However, when we show an indexed change with 1990 set at 100 (Figure 12), we can clearly depict the increase in the supply of wind and solar energy. Thus, the message now could be "renewable energy has shown a substantial increase since 1990, in particular for the supply of wind and solar energy." – which is much more positive message from an environmental perspective.

Another example is the use of appropriate scales on the X and Y-axis. For example, the two graphs below (Figures 13 and 14) can give quite different impressions. At a glance, one could easily say that Figure 13 does not show a trend at all, while Figure 14 presents a stable situation. However, they are derived form the very same data and only differ in the Y-axis scale.

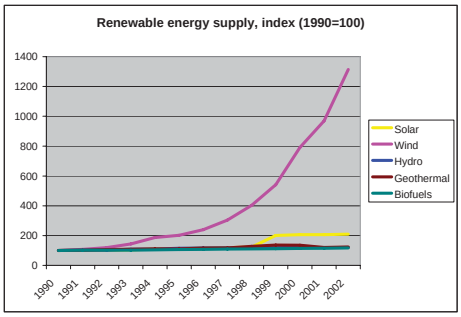


Figure 12: Renewable Energy Supply, Index

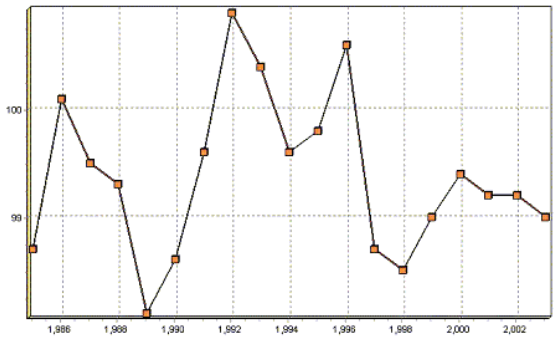


Figure 13: Graph Showing Erratic Pattern

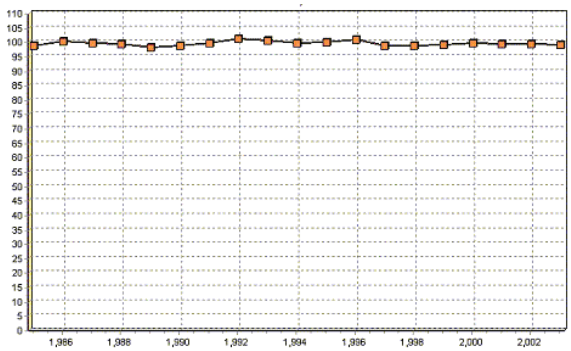


Figure 14: Graph Showing Erratic Pattern

Correlation Analysis

Correlation analysis assists us in understanding the degree to which variables is related to one another, but does not show cause and effect. Correlated data are presented on a graph, with one variable on the Y-axis and the other on the X-axis. A positive correlation is shown when the scatterplot moves in an upward direction, from lower left to upper right. When variables are negatively correlated, the scatterplot line will run from the upper left to the lower right. The closer the correlation coefficient is to +1 or -1, the stronger the relationship between the two variables, and the straighter the line on the graph.

Presenting indicators using symbols

In addition to presenting indicators in graphical form, you can also use symbols to depict the status of indicators. Symbols communicate complex information in ways that are easily and quickly understood. Changes in the value of the indicator may be shown using up and down arrows, and an indication of whether the change is favourable or unfavourable may be shown using, for example, a happy/frown face or green and red colours.

DISCUSSION QUESTION

- Consider the pros and cons of different approaches to presenting indicators to different audiences.
- Who are the different audiences that would see the indicators?
- What information needs does each audience have?
- What are some ways you can provide the technical information needed while at the same time making the indicators visually captivating?

5.2 Spatial Analysis

Using Geographic Information Systems (GIS) for IEA

Spatial analysis is the process of modelling, examining and interpreting spatial data and any associated databases. Spatial analysis is a powerful and useful tool for interpreting and understanding geographic areas, evaluating suitability and capability of natural areas, or for estimating and predicting impacts of human development. An example of a spatial analysis you might perform is to overlay several layers of data to show the proximity of different features, such as human encroachment into natural wetland or forest areas, and to identify changes in the boundaries of natural areas over time.

Applications of GIS in IEA

- View and analyse data from global perspective.
- Overlay data layers for analysis and mapping.
- Provide framework for studying complex systems.
- Powerful tool for analysing changes in landscapes and human impacts.
- Create simulations and models to predict possible future conditions and effects.
- Have a a powerful visual and universal language.

Spatial analysis is typically done using various types of computer software, one of which is a GIS.

Geographic Information Systems are database management systems for handling geographic data. Not only can you use a GIS to store data, but it is also a useful tool for manipulating and analysing data, particularly to examine spatial relationships among landscape features, and in monitoring long-term changes. GIS is not only a storage and analysis tool, but it is a very powerful visual and universal language. For example, using GIS you can easily calculate the area of forested lands within 100 m of a particular road, and identify with point locations where critical or protected areas may be. You could also utilize maps for change detection analysis (determining loss of natural habitats from one time period to the next) that can be used to influence government policies and programmes (Boxes 7 to 10 – missing ???).

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Attachment :

Appendix A: Continuation of GEO Core Indicator Matrix

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
1	2	3	4	5	6
	Wildlife Trade	♦ Trade in flora and fauna (birds, reptiles, plants, mammals, butterflies, ornamental fish)	♦ Net trade in wildlife and captive-bred species	Million US$	♦ CITES Trade Database ♦ UNSD: UN COMTRADE database
	Overfishing	♦ Total inland, fresh water and marine fish catch, production, consumption and trade	♦ Total and per capita marine fish catch ♦ Total fish catch in inland waters (incl. aquaculture)	000 tonnes/ year 000 tonnes/ year	♦ FAO: FishStat, State of World Fisheries and Aquaculture ♦ UBC Fisheries Centre
	Protected areas	♦ National, international and local parks and protected areas: Biosphere reserves (terr. and marine), Wetlands of international importance, World heritage sites	♦ Total protected areas (number, size) and % of total land ♦ Marine protected areas in LMEs	No. Km2, %	♦ IUCN/WCMC: Protected Areas Database ♦ UNESCO World Heritage List
Freshwater	Freshwater resources	♦ Annual internal renewable water resources ♦ Annual river flows from/to other countries, by basin ♦ Annual freshwater use by sector (domestic, industry, agric., following ISIC classes) ♦ Annual groundwater recharge ♦ Annual groundwater withdrawals by sector	♦ Annual internal renewable water resources per capita ♦ Annual freshwater use per capita ♦ Population with water stress	Km3/year, m3/capita/ year Km3/year, m3/capita/ year	♦ FAO: AquaStat ♦ UNSD: Envstats database ♦ UNESCO: World Water Resources ♦ WRI: World Resource Database/Earth Trends ♦ UNH/GRDC: Runoff Fields ♦ Univ. of Kassel: WaterGap ♦ IGRAC (Int Groundwater Resources Ass. Centre) GGIS

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
	Water quality	♦ River pH, concentrations of oxygen (DO, BOD), coliforms, particulates (TSS, TDS), nitrates (NO3, NH4, NP), phosphor (PO4), metals (HMs), pesticides ♦ Fish biodiversity (reserves, specie no.) ♦ Groundwater pH, concentrations of nitrates, TDS (salinity), iron, chlorides, sulphates ♦ Waste Water Treatment: % served, public expenditures	♦ BOD level of most important rivers ♦ Nitrates level of most important rivers ♦ Coliform count per 100 ml) ♦ Pesticides concentrations in most important rivers	mg/l mg/l no/100 ml, µg/l, US$/capita	♦ GEMS/Water: Atlas of Global Water Quality, GEMStat ♦ WRI: World Resource Database/Earth Trends
Atmosphere	Climate change	♦ Anthropogenic emission of GHG (CO2, CH4, N2O, also HFCs, PFCs, SF6), total and by sector (transport, industry, agric., livestock, fossil fuels) ♦ Emissions of precursors (NOx, CO, NMVOC, CH4), total and by sector ♦ Emissions of acidifying gases (NH3, NOx, SO2), total and by sector ♦ Atmospheric concentration of GHG, CO, SO2, NOx, NH3, PM, Pb, VOC, O3 ♦ Glacier retreat ♦ Annual change of temp., precip. ♦ Fossil fuel supply (% and intensity) ♦ Rainwater pH for selected areas ♦ Expenditures on air pollution abatement and control	♦ GHG, NOx, SO2 emissions total and per capita ♦ GHG, NOx, SO2 emissions per USUS ♦ Global mean temperature rise ♦ Global mean concentration of CO2, SO2, NOx, PM10 ♦ Fossil fuel consumption share ♦ Renewable energy supply index	tonne/ capita, tonne/US$ oC ppm %	♦ CDIAC: Trends Online ♦ UNFCCC: National Communications ♦ UNSD: MDG and Envstats database ♦ IGBP/GEIA/RIVM: EDGAR Database ♦ IPCC/CRU: mean monthly climatologies ♦ WMO: climate anomalies ♦ IEA: Energy Statistics and Balances

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
	Stratospheric Ozone Depletion	♦ Production, consumption, import and export of CFCs, Halons, HCFCs, Methyls, CCl4, MeBr ♦ Atmospheric ODS concentration over selected cities (parts per trillion) ♦ Ozone levels/total ozone column over selected cities (Dobson units) ♦ Ground level UV-B radiation over selected cities	♦ Total ODS production by compound ♦ Total CFC, HCFC and MeBr consumption	ODP tonnes, kg/capita	♦ UNEP Ozone Secretariat ♦ World Ozone and Ultrav. Rad. Data Centre ♦ AFEAS production, sales and emissions
Coastal and Marine areas	Coastal and Marine pollution	♦ Average annual sediment load ♦ Average annual untreated waste disposal by sector (dom. ind. and agric. – fertilizers, pesticides/ insecticides) ♦ Discharge of oil into coastal waters (000 tonne) ♦ Concentrations of HMs (Hg, Pb, Cd, Cu, Fe, Mn, Ni, Co) ♦ Concentration of PCBs ♦ Industrial activities in coastal region ♦ Share of pollution caused by sector (domestic, industrial, urban, coastal, transport, refineries) ♦ Coastal population (growth, urban share) ♦ Tourist arrival in coastal marine areas (million/ year) ♦ Number of hotels/resorts in coastal areas (000)	♦ Average annual sediment load ♦ Average annual untreated waste disposal by sector (dom./ ind./agric., fertilizers, pesticides/ insecticides.) ♦ % of urban population living in coastal areas ♦ Area of Exclusive Economic Zone (EEZ)	tonne/year tonne/year, % % km2	♦ UNEP Regional Seas Programme and Global Programme of Action (GPA) ♦ WCMC: Protected Areas Database ♦ IMO: Global Waste Survey ♦ UNSD: UN Common Database, WRI/ Earth Trends. GEO Data Portal ♦ ICLARM: ReefBase, FishBase ♦ WRI: Reefs at Risk ♦ G3OS (GOOS, GTOS, GCOS)

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
Disasters	Natural disasters	♦ Occurrences, financial damage and casualties (people affected, homeless, injured, killed) related to floods, droughts, cyclones, earthquakes, landslides, volcanic eruptions, forest fires	♦ Total number of natural disasters p/y ♦ Number of people killed by natural disasters, per mln ♦ Economic loss due to natural disasters	Number, per million, million US$	♦ OFDA/CRED: EM-DAT ♦ Munich Re: Annual review of nat. dis. ♦ UN-OCHA: ReliefWeb ♦ UN-ISDR
	Human-induced disasters	♦ Occurrences, financial damage and casualties (people affected, homeless, injured, killed) related to transport and industrial accidents	♦ Total number of techn. accidents p/y ♦ Total number of people affected by technological accidents ♦ Economic loss due to techn. Accidents	000, million US$	♦ OFDA/CRED: EM-DAT ♦ UN-ISDR
Urban Areas	Urbanization	♦ Urban population, total, growth rate ♦ Number of cities with over 750 000 population	♦ Average annual urban population growth rate	%	♦ UNPopDiv: World Urbanization Prospects
	Urban air pollution	♦ Concentration of pollutants in cities	♦ Concentration of lead, PM, SO2, NOx in major cities of the world	ug/m3	♦ OECD Environmental Data Compendium and Indicators
	Waste management	♦ Waste generation and disposal methods by sector: municipal, industrial, agricultural, hazardous	♦ Municipal waste production per capita (solids) ♦ Industrial waste generated per US$ ♦ Hazardous waste production per US$ ♦ Movement of hazardous wastes ♦ Waste management fractions ♦ Exposure to HMs, toxic chemicals ♦ Share of recycled waste	kg/capita kg/000 US$ kg/000 US$ %	♦ OECD Environmental Data Compendium ♦ UNSD: Envstats database ♦ WRI :World Resources Database ♦ UNEP Chemicals, Basel Conv. Secr.

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
Socio-Economic (incl. health)	Population and social	♦ Population, total and growth rate ♦ Total fertility rate ♦ Adult literacy (%) by sex ♦ Education enrolment, net and gross (primary, secondary, tertiary), by sex ♦ Education expenditures (prim., sec., tert.) ♦ Labour force total (% population), by sector (agric., ind., serv. and by sex ♦ Telephones (main lines and cellular per 100 people) ♦ Daily newspapers (copies per 100 people) ♦ Radios (number per 100 people) ♦ Televisions (number per 100 people) ♦ Computers (number per 100 people) ♦ Internet connections (number per 10 000 people)	♦ Average annual population growth rate ♦ Population density change	%, inh/ km2	♦ UNPopDiv: World Population Prospects ♦ UNESCO: World Education Statistics ♦ UNDP: Human Development Indicators ♦ UNSD: UN Common Database ♦ ILO: Laborstat Database, KILM indicators ♦ World Bank: World Development Indicators
	Economy	♦ Real GDP, total and per capita, annual ♦ Power Purchasing Parity (PPP) ♦ Number of people in absolute poverty, rural and urban ♦ Merchandise exports (value), total and by sector: manufacturing, fuels/ minerals/metals, services ♦ Merchandise imports (value), total, food, fuels ♦ Trade (% of GDP) ♦ Terms of trade (1995=100) ♦ Inflation, consumer prices (annual %) ♦ Unemployment rate (%) ♦ Total external debt total and % of GNP ♦ Total debt service (as % of exports of goods and services) ♦ Foreign direct investment, net inflows (% of GDP) ♦ Official Development Assistance and Aid (ODA)	♦ GDP per capita ♦ PPP per capita ♦ Value added as % of GDP by sector: agriculture, industry, services	Constant 1995 US$ Intern. $ %	♦ World Bank: World Development Indicators ♦ UNSD: UN COMTRADE database ♦ Univ. of Purdue: GTAP ♦ UNSD: UN Common Database ♦ UNSD: National Accounts Main Aggregates database

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
	Consumption and Production	♦ Total commercial energy production, by sector: fossil fuels, hydro, nuclear, geothermal, biomass, solar, wind ♦ Total commercial energy use, total and per capita ♦ Energy efficiency and intensity ♦ Traditional fuel use (% of total energy consumption) ♦ Energy imports, net (% of energy consumption) ♦ Renewable energy use (%) ♦ Total electricity generation by sector: thermal, hydro, nuclear, non-hydro, renewables ♦ Total electricity consumption ♦ % population with access to electricity ♦ Value added by sector: agric., ind., manuf., services ♦ Distribution of GDP by demand sector: government consumption, private consumption, gross domestic investment, gross domestic saving ♦ Defence expenditures (% of GDP)	♦ Total commercial energy production ♦ Commercial energy consumption per capita ♦ Energy use per unit GDP	Tonnes of oil equivalent	♦ IEA: Energy Statistics and Balances ♦ UNSD: Energy Statistics Database ♦ World Bank: World Development Indicators
	Transport	♦ Motor vehicles in use (per 000 people), by type of engine ♦ Total length of motor ways (000 km) ♦ Density of motor ways (km/10 000 km2) ♦ Road traffic intensity per unit of GDP (vehicle km/ US$) ♦ Number of departures and arrivals (airports) ♦ Energy consumption by road transport (% share of total consumption)	♦ Road traffic intensity per unit of GDP	vehicle km/000 US$	♦ World Bank: World Development Indicators ♦ UNSD: UN Common Database

THEME	ISSUE	POTENTIAL DATA VARIABLE	PROPOSED KEY AND LEAD INDICATOR	UNITS	Current Primary (Led) data Source(s), use in in GEO Data portal
	Agriculture and Livestock	♦ Agricultural production index ♦ Food production index ♦ Pesticide consumption (tonnes) ♦ Fertilizer use (000 kg) ♦ Livestock units (000 head)	♦ Use of nitrogen on agric. land ♦ Use of phosphate on agric. land ♦ Use of pesticides on agric. land ♦ Agricultural production value added	tonnes/ km2 tonnes/ km2 active kg/km2 % of GDP	♦ FAO: FAOSTAT ♦ IFA: Fertilizers and their use

Module 6: Scenario Development and Analysis

1. Introduction and Learning Objectives

The future is highly uncertain. Our understanding is limited (ignorance). The possibility for unexpected events and novel behavior of physical and social systems introduces additional uncertainty (surprise). The future is subject to human choices (volition) that have not yet been made, indeed, choices that can be influenced by the very process of studying the future.

This module shows how to develop scenarios and analyze them in terms of the impact they would have on existing policies or the kinds of policies that would be needed in order for a particular scenario to unfold. After using the material presented, you will:

- be familiar with the types of scenarios;
- have developed an understanding of the structure, complexity and dynamics of scenario processes;
- be familiar with the steps required for the development of scenarios; and
- understand how scenarios can be used for the discussion and development of policy options

2. What is a scenario?

Scenarios are descriptions of journeys to possible futures. They reflect different assumptions about how current trends will unfold, how critical uncertainties will play out and what new factors will come into play. (UNEP 2002) It is now generally accepted that scenarios do not predict. Rather, they paint pictures of possible futures, and explore the differing outcomes that might result if basic assumptions are changed. (UNEP 2002) The future cannot be predicted because of ignorance, surprise and volition. Scenarios support informed action by providing insights into the scope of the possible. They also can illustrate the role of human activities in shaping the future, and the links among issues. In the process of helping to clarify possible future developments and their effects, scenarios often are a source of inspiration for creative ideas. The ultimate aim, in most cases, especially in relation to IEA process is to:

- provide better policy or decision support; and
- stimulate engagement in the process of change.

A Qualification to the Statement that Scenarios are not Predictions

The Claim that scenario analysis is a non-predictive approach to the future does not imply the lack of inclusion of conditional predictions in the analysis. It does however require that the general purpose of the analysis is not to predict the most likely future state of the system but to assess the feasibility and desirability of different outcomes. Though the analysis is based on individual predictive calculations (e.g. the likely effect of a change in population growth rates or in technological change), the overall goal is to indicate something about the range of possible outcomes and their consequences.

Scenarios are histories of the future, telling coherent, multi-dimensional stories. They include qualitative description to capture cultural influences, values and behaviors; Shocks and discontinuities; and texture, richness, imagination and insights. They are supported by quantitative analysis to provide definiteness, explicitness, and details; consistency; and technical rigor and scientific accuracy.

Scenarios can be used as information to illuminate potential problems and bring future problems into focus; explore alternative responses in the face of uncertainty, and test them against different

possible future paths; clarify and communicate complex information and technical analysis; and evaluate policies and help making decisions despite the uncertain future.

Scenarios can also be used to enhance participation by expanding the range of perspectives considered; sharing understanding and concerns; exploring and explaining competing approached to problems; uncovering assumptions and rigorously test them

Purposes of conducting scenario analysis and development are exploration (awareness raising, stimulation of creative thinking) and decision making support (concrete strategic options, scenarios with a range of options).

3. Example of Scenario exercises

Scenario development is used in a wide variety of contexts ranging from political decision making to business planning, and from global environmental assessment to local community management. There are numerous scenarios that have been developed including an emphasis on issues of relevance for sustainable development. Below are some examples of scenarios related to GEO process.

Example 1: Medium term regional scenarios – The UNEP GEO 4 Scenarios

Development and Analysis of GEO 4 Scenarios has been built on previous chapters by exploring how current social, economic and environmental trends may unfold along divergent development paths in the future. It presents four scenarios to the year 2050, using both narrative storylines and quantitative data. There are nine models applied for computing future environmental change and the impacts on human well-being The models were soft-linked with output files from one model being used as inputs to other models. The present scenarios should be seen as revised and updated versions of those from GEO 3. Taking the drivers and assumptions of the GEO 3 scenarios as a starting point, each region had developed rich descriptions of the four scenarios from a regional perspective.

For Asia and the Pacific, under four scenarios developed, namely, Markets First, Policy First, Security First and Sustainability First, there is a danger that increasing the wealth and material well-being of the region's citizens may come at the cost of environmental deterioration and resource depletion, unless countermeasures are also taken. In Markets First, the average standard of living improves in the region, but the diversity and stability of marine fisheries are threatened, water scarcity intensifies and pollution control efforts cannot keep up with the increasing pressures. Material well-being also increases under Policy First, but in this case, the negative side effects are mitigated by enlightened centralized governmental policies that emphasize conservation and environmental protection. The standard of living also increases for the region's citizens under Sustainability First, but here population stabilizes and individuals do not consume as much as Markets First and Policy First. As a result, the pressure on the natural environment under Sustainability First is less than in the other two scenarios.

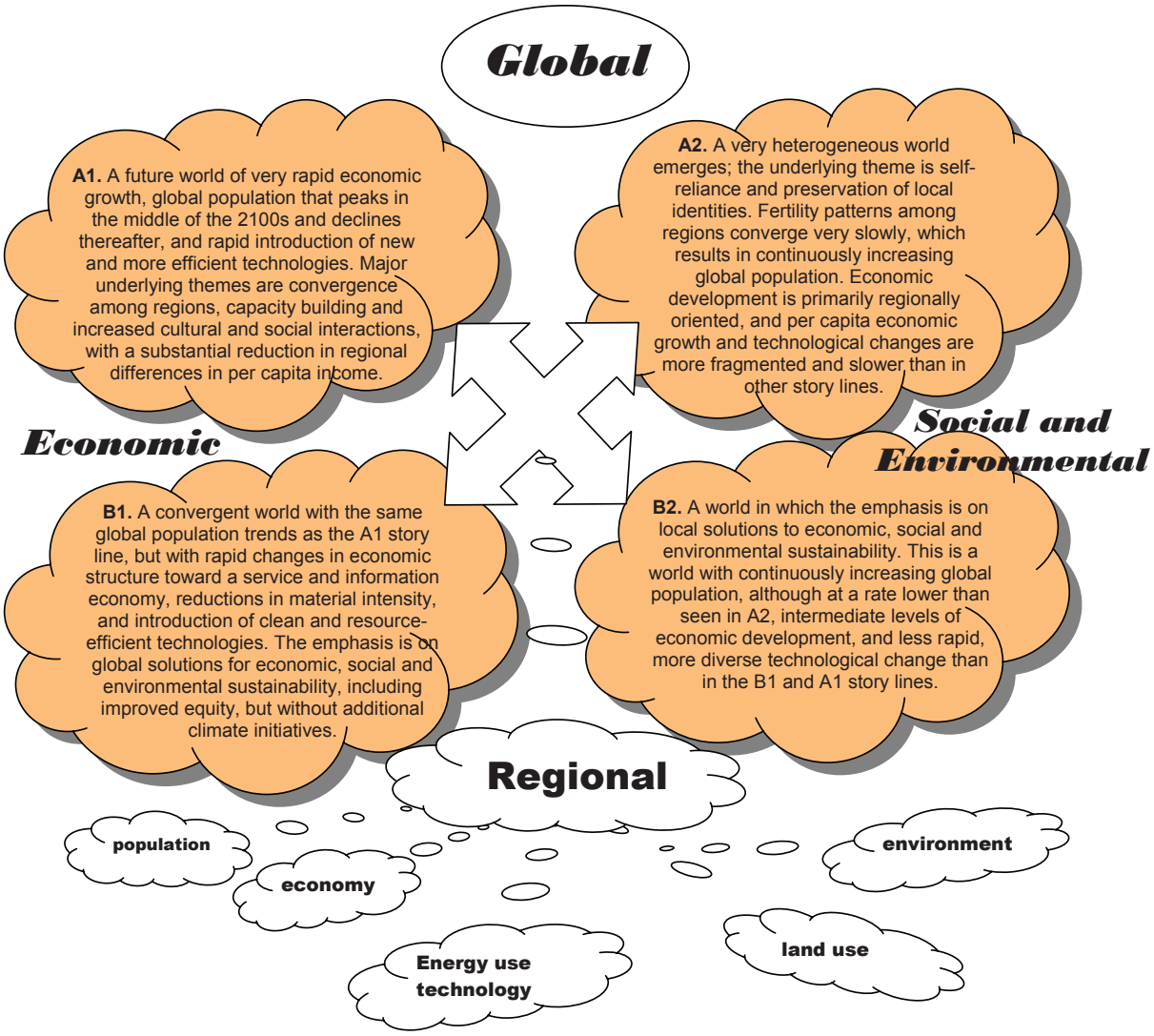
Governance will play a key role both in achieving prosperity, and in restoring and maintaining environmental quality. The breakdown of governance in Security First contributes to the decline of nearly all indicators of economic well-being, as well as to the degradation of the state of the environment. Conflicts over water scarcity widen, marine fisheries decline, and air and waster quality deteriorates. By comparison, new governance structures put into the place under that other scenarios (such as the Asia Pacific Community for Environment and Development) provide a political means for achieving environmental goals. Sustainability First suggests that these governance structures are more effective if they are built up from the communities rather than imposed by central governments. The scenarios also make it clear that investments in technology and research are key to sustainable development in the region. They can lead to improvements in

energy efficiency, water use and the consumption of resources, lightening the load on the natural environment. (UNEP GEO 4 2006)

Example 2: Long term scenario IPCC

In order to provide plausible pictures of future emissions of greenhouse gases, the IPCC developed four families of scenarios, based on an extensive assessment of the literature, six alternative modeling approaches and an "open process" that solicited wide participation and feedback from many groups and individuals. The scenarios provided a basis for analysing how drivers may influence future emissions, as well as to assess the associated uncertainties.

The four basic storylines are:



4. Process and substance of scenario and exercise

There are three over aching themes, which are 1) Project goal (why), 2) Process design (how) and 3) scenario content (scenario development). The project goal influences the process design, which, in turn, influences scenario content.

The first theme addresses the objectives of a scenario analysis as well as subsequent demands on design of the scenario development process. Normally, two goals of exploration and direct decision support are often combined and exploratory scenarios are developed first. Afterwards new scenarios are developed by zooming in on aspects relevant to the strategy development.

The second theme, process design, focuses on how scenarios are produced. It addresses aspects such as the degree of quantitative and qualitative data used, or the choice among stakeholder workshops, expert interviews and desk research. There is the intuitive approach, which consider scenario development as an art form and leaves heavily a qualitative knowledge and insights; and the technical approach regards scenario development as a rational and analytical exercise, and tends to work from quantified knowledge and often relies on computer models in developing scenario.

The third theme, **scenario content**, focuses on the composition of the scenarios. It examines on the nature of variables and dynamics in a scenario, and how they interconnect.

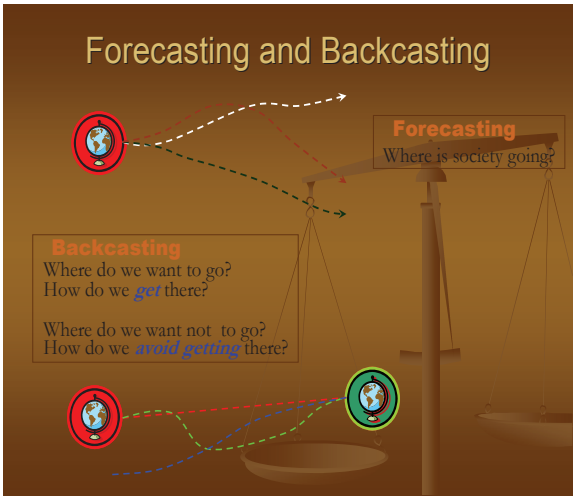
- A complex scenario is one that is composed of an intricate web of causally related, interwoven, and elaborately arranged variables and dynamics. Complex scenarios manifest alternative patterns of development consisting of a series of action-reaction mechanisms. They often draw on a broad range of actors, factors and sectors, and use multiple temporal or spatial scales.
- A simple scenario is more limited in scope. A simple scenario might focus on a single topic, considering only the immediate or first-order effects of changes in the external environment. Simple scenarios may also limit themselves to extrapolation of trends. The term “simple” is not meant to indicate poor quality.

An exercise with a narrow focus or a short-term perspective may not require the relatively lengthy and demanding investment of developing complex scenarios, which can be a benefit in many other circumstances. Furthermore, a simple scenario can be more effective in communicating its message than a complex scenario.

5. Policy Analysis

A standard use of scenario analysis is to compare the feasibility, effectiveness, and broader impacts of alternative policies (or combinations thereof), e.g., taxes vis-à-vis tradable permits on certain pollutants. This can be done by assessing scenarios that differ only with respect to the absence or inclusion of the policies of interest, by exploring their feasibility and effectiveness and broader impacts across a range of scenarios that differ with respect to other significant factors. However, if there are no relevant, existing policies, then one purpose of the scenario exercise should be the identification of policy options. Even where they do exist, the exercise can, of course, be useful for expanding the set of policy options for consideration.

In case that a scenario exercise is used to explore the feasibility and broader implications, e.g., tradeoffs, of meeting a specific target, e.g., an 80 per cent reduction in CO2 emissions by 2050 and if the vision is used to define the scenarios, the exercise takes on the character of a standard back cast.



This figure describes that some scenarios look forward (forecasts). They describe how future conditions might develop from current conditions and driving forces. Typical so-called "business-as-usual" projections are forecasts. They generally focus on the continuation of current trends and relationships into the future. But scenarios that predict breakdowns and crises are also forecasts, where the analysts project the breakdown of continuity and the structural integrity of the system. Others scenarios are called "back casts". They differ from forecasts by beginning with an image of the future. They then seek to identify plausible development pathways for getting there. Back casts are very useful to sustainable development studies. With back casts we can ask: Where do we want to go? And: How do we get there? For example, in a water sustainability study we might imagine the future of a water basin where there is investment in water infrastructure, more efficient use and water allocation rules that balance between different users and environmental requirements. Then, we might explore the changes of polices, values and technologies that could get us from here to there.

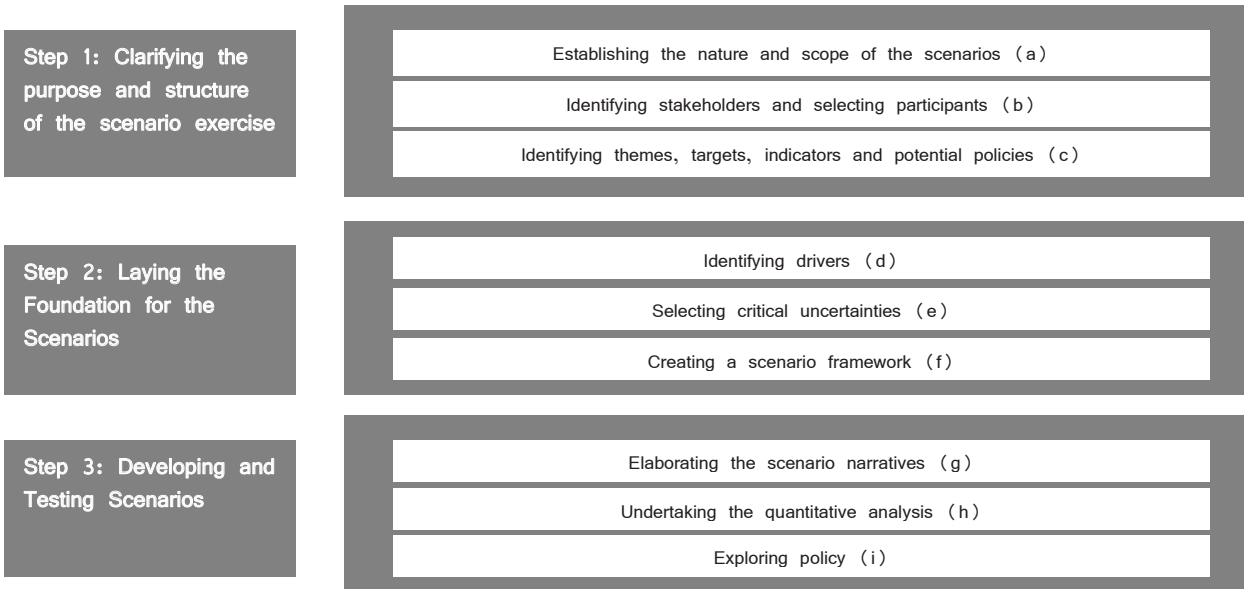
6. Developing Scenarios

The following process is proposed as a useful framework for an IEA if a complete scenario development is to be carried out. It follows the GEO approach in three ways:

1. It is explicitly policy-relevant;
2. It is intended to be comprehensive enough to allow the scenario team to incorporate a broad range of issues that arise in sustainability analyses; and
3. It is presented as a participatory, stakeholder-driven process.

The steps in the scenario development process can be grouped as follows (see also Figure 4). As they relate to similar stages in the process, the steps in each group will often be pursued in parallel. There is no single best way to undertake each of the steps; still, suggested approaches for each are presented in some detail below. Finally, although Communication & Outreach is identified as a separate group, such activities should take place throughout the process and not just at the end of the exercise, as discussed in detail in Module 3.

Steps in a generic scenario development process



Step 1: Clarify the purpose and structure of the scenario exercise

(a) Establishing the nature and scope of the scenarios

The purpose is to establish a clear view of the scenario process to be used and the expected outputs are a clear overview of and plan for the scenario process. The specific details of the plan will depend on the type of scenarios chosen and other factors e.g. available resources, and time.

Exercise: Based on selected issues, each group to discuss these following questions:

1. What are the issues we want addressed in the scenario project? If it is part of a larger assessment, how are these addressed in the other sections of the assessment?
2. Are there existing policies we wish to explore as past of the exercise? Are the effects of these of such magnitude that they would fundamentally alter the basic structure of the scenarios?
3. Do we have a preconceived end vision, or at least some aspects of a vision, such as specific targets for the scenarios?
4. Why is scenario development the appropriate approach for dealing with the problem?

(b) Identifying stakeholders and selecting participants

The purpose is to ensure that the scenario process benefits from the input of a cross-section of society, thus increasing the likelihood that the scenarios have buy-in from the appropriate actors. This improves the usefulness of the scenarios to the end-users.

Exercise:

1. Identify who (organization or institution) is convening this scenario exercise.
2. Identify other audiences for the scenarios by deciding whom the scenarios are intended to reach.
3. Identify other key stakeholders (e.g. who are affecting decision making process)

(c) Identifying themes, targets, potential policies and indicators

The purpose is to determine the important themes on which the scenario exercise will focus.

Exercise:

In small groups identify a set of themes and sub-themes for a scenario exercise in your country.

Build on the exercise in Section 6, where you selected an issue around which to develop scenarios. Discuss these in plenary and agree on a list to be used by all groups in the following exercises.

c.1 Identifying targets	
Purpose	To specify key targets and goals, including constraints or thresholds that are to be avoided.
Output(s)	An initial list of constraints, limits, goals and targets that will help define the scenarios.
Steps	In the context of the themes and policies to be considered, indicate specific targets. Some common examples are meeting the Millennium Development Goals and keeping the maximum increase in global average surface temperature below 2ºC. Be clear whether these are intended to restrict the scenarios to be considered or if they will simply provide benchmarks against which the scenarios will be evaluated..
c.2 Identifying potential policies	
Purpose	To specify the policies to be considered in the scenario exercise. Within different scenarios, distinct opportunities and threats emerge. Society would respond to those opportunities and threats in many ways, including through policy responses. Incorporating such policy responses in the scenario exercise enables participants to anticipate and prepare for possible eventualities.
Output(s)	An initial set of potential policies to consider in the scenario exercise
Steps	In the context of the themes and policies to be considered, indicate specific targets. Some common examples are meeting the Millennium Development Goals and keeping the maximum increase in global average surface temperature below 2ºC. Be clear whether these are intended to restrict the scenarios to be considered or if they will simply provide benchmarks against which the scenarios will be evaluated.

c.3 Identifying potential policies	
Purpose	To specify the policies to be considered in the scenario exercise.
Output(s)	Within different scenarios, distinct opportunities and threats emerge. Society would respond to those opportunities and threats in many ways, including through policy responses. Incorporating such policy responses in the scenario exercise enables participants to anticipate and prepare for possible eventualities.
Steps	An initial set of potential policies to consider in the scenario exercise
	The previous section of this module explored the issue of policy analysis in the context of scenarios in some detail. This is an issue that is also explored to some extent in the steps already described above. It is also a core aspect of Module 5 (Integrated Analysis of Environmental Trends and Policies). Thus, this step should build upon those efforts. At this point, it is important to be more explicit about the policies to be considered in the scenario analysis, recognizing that this should include not only previous and existing policies, but also other potential options. Consider, therefore: - Are there existing or potential policies you wish to explore as part of the scenario exercise? - Is there a preconceived end vision, or at least some aspects of a vision, i.e., specific targets?
c.4 Selecting indicators	
Purpose	To select specific (quantitative) indicators that characterize the system of interest, in order to enhance and elaborate the scenario narrative and provide measures by which to partially evaluate the scenarios against key criteria.
Output(s)	An initial set of (quantitative) indicators.
Steps	1. In the context of the themes, targets and drivers, select indicators that would provide useful elaboration and deepening of the scenario narratives. Be sure to include indicators that can serve as metrics to evaluate the scenarios in light of any identified targets. Indicators are also a key aspect of a complete assessment (see Modules 4 and 5), so it might be useful to link this step with steps in those modules. 2. Indicate in a qualitative way how the trends in a few of these indicators could evolve in the future. Even though this may not be as scientifically rigorous an exercise as quantitative modelling, it will help make explicit the participants' understanding of the issues and scenarios. It will also provide a basis against which to compare the narrative and quantitative aspects of the scenarios.

Step 2: Laying the foundation to the Scenarios

(d) Identifying drivers

The purpose is to identify, in the context of the exercise, the key trends and dynamics that will determine the course of the future. The important question is whether these drivers are likely to change and whether new drivers are expected to emerge. The expected output is the list of drivers with brief explanations. Box presents some particular samples of drivers from GEO 4.

Steps and Exercise

1. Identify the drivers. Be sure to do this in the context of the themes that you developed earlier. Think about key historical events and trends, and how these have affected the themes in the past. To identify drivers, think in terms of underlying causal relationships, not just descriptions.
2. For each driver, describe briefly the range of possible ways it could evolve in the future.

Example of drivers from GEO 4

Institutional and socio-political frameworks

- Scale of decision making
- Nature and level of international cooperation
- Nature and level of public participation in governance
- Power balance between government, private and civil society actors
- Overall level of distribution of government across areas
- Nature and level of official development assistance
- Degree of the mainstreaming of social and environmental policies

Demographics

- Actions taken related to international migration
- Number of children by women's choices.

Economic demand, markets and trade

- Openness of international markets
- Sectoral specialization vs. diversification in the economy
- Number of by-choice workers in formal economy
- Level of government intervention in the economy

Scientific and technological innovation

- Levels, sources and emphases of R&D investment
- Energy technologies
- Access and availability of new technologies

Value systems

- Cultural homogenization vis-à-vis diversity
- Individual vis-a-vis the community
- Conflicting priorities in fisheries
- Key priorities to protected areas

(e) Selecting critical uncertainties

The Purpose is to select the critical uncertainties, which will define the scenario framework. The outputs include a set of critical uncertainties, selected from among the drivers developed in (d) and a critical uncertainty is a driver that is especially important in determining how the future evolves, but whose future development is highly unpredictable.

Steps

1. Consider each driver in turn, and recall the range of possible ways it could evolve.
2. Consider the degree of uncertainty in each driver. How much variation is there in the range of possible ways it could evolve? Is there a great deal of uncertainty, or relatively little?
3. Consider the relative impact/importance of each driver into the future. Does the way that it evolves make a major difference in the overall vision for the future, or does it make a relatively minor difference?
4. Identify the drivers (usually two or three) that are highest impact and highest uncertainty.

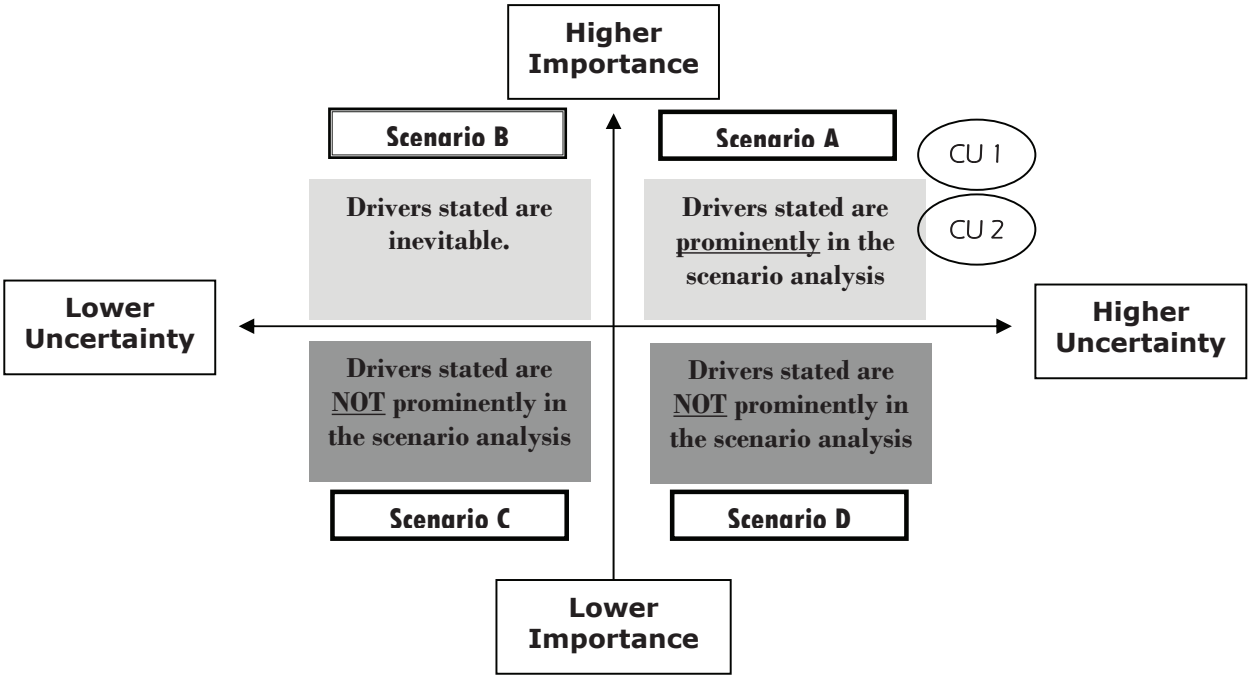


Figure x : identifying critical uncertainties (CU) and Four possible futures define the scenario framework from two critical uncertainties

Note: CU 1: sensitivity of ecosystems to human pressures, CU 2: future development of technology

Scenario A: The world proves to be an ecologically resilient, but with high potential for innovation in environmentally relevant technologies.

Scenario B: The world proves to be ecologically vulnerable, but with high potential for innovation in environmentally relevant technologies.

Scenario C: The world proves to be ecologically vulnerable, but with low potential for innovation in environmentally relevant technologies.

Scenario D: The world proves to be ecologically resilient, but with low potential for innovation in environmentally relevant technologies.

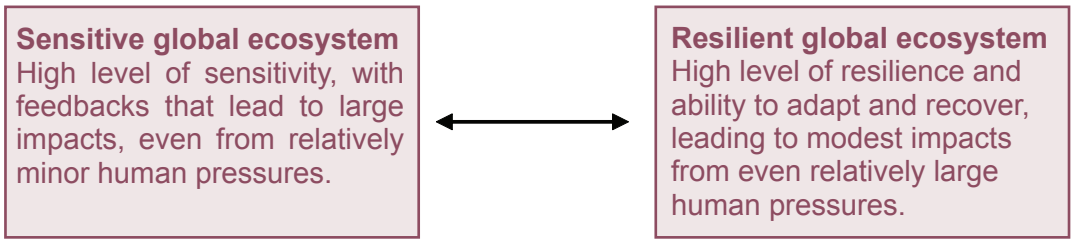
(f) Creating a scenario framework

The purpose is to establish the scenario framework using the critical uncertainties. The output is a set of clearly defined scenario bases. The critical uncertainties identified in (e) capture in a very simplified, orderly way a set of fundamental ways the future can evolve. This step provides a simple procedure for creating a scenario framework, and thereby defining four distinct scenarios.

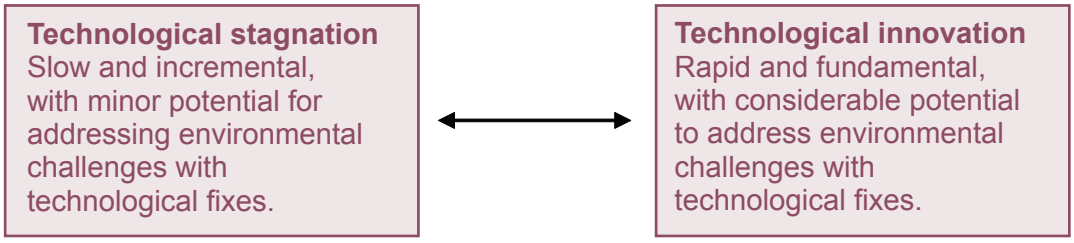
Exercise and Steps

Picture two clearly dominant critical uncertainties (say, CU 1 and CU 2 from the above figure), each of which could evolve in two distinct ways. Define a scenario grid as shown in the figure below. This framework reflects the four possible combinations of how CU 1 and CU 2 can evolve, and thus four possible future worlds.

For a simple example, consider a case where scenario participants have identified two critical uncertainties, CU 1, which refers to the sensitivity of ecosystems to human pressures, and CU 2, which refers to the future development of technology. Assume that participants have concluded that the sensitivity of ecosystems to human pressures (e.g., GHG emissions, coastal erosion, fishery exploitation) could be described as falling along the follow spectrum:



Assume also that the participants have decided that future development of environmentally relevant technologies (e.g., renewable energy, environmentally sensitive agricultural technologies) could be described as falling along the following spectrum:



This simple approach yields four distinct scenarios in the situation where there are two critical uncertainties (CU 1 and CU 2) and each has two fundamentally distinct future paths worth exploring. There would be more than four distinct scenarios, if there are more than two critical uncertainties, and/or if any of them has more than two possible paths worth exploring. In such a case, you could enumerate all combinations, and thus all possible scenarios.

In case that there are more than two critical uncertainties, for example, there are three critical uncertainties. Critical Uncertainty #1 has two fundamentally distinct possible future evolutions (1a and 1b). Likewise, Critical Uncertainty #2 has two fundamentally distinct possible future evolutions (2a and 2b). Critical Uncertainty #3, has three fundamentally distinct possible future evolutions (3a, 3b and 3c). This leads to a total of twelve combinations (2 _ 2 _ 3 = 12), and thus twelve possible scenarios.

This is a large number of scenarios, and it probably will not be possible to elaborate and clearly present them all. Thus, it generally makes sense to pare the possible scenarios down to a number that is manageable given the time, resources and intended audience. In many cases, some of them will likely be less coherent than others. For example, if in the case described above a third critical uncertainty ere to be the general rate of economic development, defined as low, medium and high. Many people would argue that high rates of economic development are not plausible in a world of technological stagnation; thus any combination of the two would not be worth pursuing.

Exercise:

In plenary, do one of the following: a) select two of the critical uncertainties identified above and create a scenario framework, or b) group the critical uncertainties identified above into two clusters (e.g. technological developments and external policy decisions) and use these clusters to create a scenario framework

Step 3: Developing and testing Scenario

(g) Elaborating the scenario narratives

The Purpose is to create a detailed, compelling description of the scenario and the output is a scenario narrative.

Steps

For each scenario do the following steps.

1. **Current state and trends**. Lead a discussion among the stakeholders of aspects of today's world that seem to represent characteristics of the particular future scenario being developed. Explore each to identify as many "seeds of the future" as possible. These will help flesh out a plausible picture of how our current world could evolve into the future depicted in the scenario.

2. **End picture**. Lead a discussion among the stakeholders of the end vision of the scenario. Once the critical uncertainties have been resolved, what would the world look like? Add detail and texture that will help round out the end vision of the scenario, and create an integrated, self-consistent snapshot of the end state. Consider each theme and driver, and provide some detail. Consider what aspects of life have changed for better or worse. Consider what challenges have been resolved, and what challenges have emerged and still lie ahead.

3. **Timeline**. Lead a discussion to connect the current state to the end picture through a plausible historical route. Consider the interactions among the themes and how they would evolve together in a self-consistent manner. You might want to draw on a poster paper or whiteboard a timeline spanning the period from present to the time horizon of the scenario, and have the group brainstorm events occurring at specific times. Consider each theme and each driver. (You might want to draw several parallel timelines to keep track of different themes or drivers.) Consider the challenges that have been resolved or that have emerged, and reflect these in events on the timeline.

4. **Using the current state**, the end picture and the timeline, your group can now expand these to create a coherent narrative. Add detail and texture that will help round out each scenario and create an integrated, self-consistent and compelling storyline. Your group might want to consider describing crises and shocks, or branch points where two scenarios diverge because of different societal decisions or key events. Your group might also want to use novel and compelling ways of presenting information within the narratives, such as news stories, advertisements, memoirs and "day-in-the-life" vignettes.

5. While developing your scenario narratives, **create a name for each scenario**. Try to find a name that captures the essence of the scenario and differentiates it clearly from the others. It is also useful if there is some link across the set of names that helps to capture the key differences between the scenarios.

Exercise

In four groups, develop plausible short stories for each of the scenarios defined by the scenario framework specified in the previous exercise. The stories need to present the situation at the endof the time horizon as well as the path between the present day and that time. What happens with the critical uncertainties, inevitables, and main themes needs to be clear in the stories. In addition, the stories need to provide information on policies, goals, and targets identified in earlier exercises. Present these short narratives in plenary and consider their main differences.

(h) Undertaking the quantitative analysis

The purpose is to enhance and elaborate the scenario narrative with quantitative information. The expected output is “specific, scientifically defensible quantitative information”.

Steps

The quantitative analysis supports and complements the scenario narrative, and can help highlight and remove internal inconsistencies within these. Steps in a quantitative analysis are:

1. Determine the approach to be used for quantification (e.g., which tools and models to use, how these will be linked to each other, and how these will be informed by/inform the narratives).
2. Assemble the necessary data and relationships.
3. Use the tools and models to produce the quantitative estimates.

Comments

For quantification, it is best to use models that are as simple as possible without being simplistic,

are transparent, rely on widely available data, and can be applied and compared across widely differing circumstances. Quantification ideally will provide much more policy-relevant information than qualitative descriptions alone. Models that can be used interactively are advantageous because they can be used in working sessions to provide quantification, leading to a revision of the narrative and a next round of quantification. In any case, interactions between storylines and models are an important part of a scenario process including quantification.

The selection of models to be used in the quantification depends on the issues emphasized in the

scenarios. For GEO-3, for example, initial quantification for two of the scenarios was done using

the PoleStar software tool (Raskin and others 2002). While PoleStar offers a flexible and easy-touse accounting framework for organizing economic, resource and environmental information for alternative scenarios, the scenario authors agreed that the analysis needed to be complemented by further information on environmental impacts. This could only be provided by other, more spatially explicit and process-oriented modelling tools. Therefore other models (i.e., IMAGE from RIVM, WaterGAP from CSER, AIM from NIES) were introduced to make the data more consistent across regions and with the narratives, and to harmonize input data (e.g., growth rates of GDP per capita). Bakkes and others (2004) show how the quantification of the GEO-3 scenarios was carried out and describe the tools that were used. This is also in line with what was done in the Millennium Ecosystem Assessment and has been done in GEO-4.

(i) Exploring policies

The Purpose is to explore the feasibility, appropriateness, effectiveness and robustness of various policies. The output included identification of further potential policies beyond those elaborated in step c (Identifying Themes, Targets, Potential Policies and Indicators), and information about the feasibility, appropriateness, effectiveness and robustness of particular policies (including combinations) in shaping and/or coping with the range of scenarios.

Steps

As discussed in the previous section, the nature of policy analysis can differ markedly across and sometimes within scenario exercises. In some cases, the introduction of policies into the scenarios will occur at a very early stage, e.g., they may represent one or more of the key uncertainties defining the scenarios. In other cases, the exercise may involve developing scenarios which, from the standpoint of the users, are 'incomplete' in that they do not include specific policy assumptions, and are only finalized with the introduction of potential policies. In either case, it is important to reflect upon and analyse the feasibility, appropriateness, effectiveness and robustness of particular policies. This should be done, in part, by comparing the scenarios as defined by key indicators, against key goals and targets, with and without the inclusion of specific policies.

Exercise: For the scenario narratives developed above, discuss in groups the particular policy areas that would be most relevant for inclusion in the scenario.

- Which new policies would be critical to reach the defined endpoint?
- Which existing policies would need to be modified to reach the endpoint?

More advanced users can try to implement some basic aspects of their own scenario narratives in International Futures (IF). Discuss the results in plenary.

7. Communications and Outreach

The entire resource book is designed to provide capacity building in environmental and sustainable development assessment processes. Moreover, there are special issues related to communication, outreach and capacity building that are of particular importance to scenario development.

Communication of scenarios is particularly important if the scenarios are to succeed in inspiring new visions of the future. Note, for example, the success of the Mont Fleur scenarios, which were published first in a newspaper and thus, widely communicated (see section 4, above). This kind of communication obviously needs a language and style of presentation that is suitable for a broad audience.

Outreach is also important in order to generate a discussion with all stakeholder groups about the content and implication of the scenarios. This provides "buy-in" to the results of the scenario exercise from a group much larger than that involved in development and analysis of the scenarios. It also can provide valuable feedback on the results. This can be achieved through a series of workshops in which the scenarios are presented and discussed.

Finally, communication and outreach should take place throughout the scenario process, and should not merely occur at the end of the scenario development process. The involvement of a range of stakeholders in the various stages of the process should be seen as part of the communication and outreach effort. In fact, experience would indicate that such engagement is potentially the most effective form of communication and outreach.

Module 7 Monitoring, Evaluation and Learning For Increased Impact and Improvement of the IEA Process

1. Introduction and Learning Objectives

Monitoring and evaluation of an IEA process and its impacts focuses on how the assessment process has been organized to have a desired impact on policy making.

Monitoring is a planned, systematic process of observation that closely follows a course of activities, and compares what is happening with what is expected to happen. Monitoring the IEA process makes sure the environmental assessment meets its goals, while working within the scope of allocated resources (i.e., time, financial, human, informational and technical).

Evaluation is a process that assesses an achievement against preset criteria. Evaluations can have a variety of purposes, and follow distinct methodologies (process, outcome, performance, etc). Evaluation of the IEA process determines the extent to which achievements (outputs, outcomes and impacts) are comparable with the originally intended purpose, and what lessons can be learned for the next environmental assessment and management cycle. The evaluation of the process is, first and foremost, a capacity-development opportunity.

Table 1: Comparison of Monitoring and Evaluation

Attribute	Monitoring	Evaluation
Main focus	Collecting data on progress	Assessing data t critical stages of the process
Sense of completion	Sense of progress	Sense of Achievement
Time focus	Present	Past – Future
Main question	What needs to happen now to reach our goal?	Have we achieved our goal?
How can we do better next time?		
Attention level	Details	Big picture
Inspires	Motivation	Creativity
Periodicity	Continuous throughout the whole process	Intermittent; at the beginning or end of significant milestones
Supports	Implementation of a plan	Designing the next planning cycle
Skills required	Management	Leadership
Output processing	Progress indicators needs to be closely monitored by a few people	Evaluation results need to be discussed, processed and interpreted by all stakeholders

Successful completion of this module will allow trainees to do the followings:

- explain the importance of monitoring and evaluating;
- recognize monitoring and evaluation as learning opportunities for improving the IEA process; and
- develop a draft plan for monitoring and evaluating your national IEA process and its impact.

Exercise 1: In small groups, participants to point out areas of the IEA process where their organizations could have constraints that could limit M & E. (5 mins)

2. Foundation of effective monitoring and evaluation

2.1 Purpose

The purposes of conducting monitoring and evaluation are to render judgment by setting clear criteria and standards in order to increase the credibility of an IEA process, to encourage improvement involving changes in behavior and change in the state of environment, and to generate new knowledge needed for a pressing decision.

2.2 Users

The primary users of the evaluation may include IEA core team including policy-makers, and evaluation team. The qualification of individual users are who can revise the IEA process with mandate, knowledge and skills and who has both the willingness and a vested interest in influencing the design and implementation of the IEA process.

Identifying the users is perhaps the single most important step for getting the evaluation utilized. If you know who the users are, what decisions they have to make, and how the evaluation results can support their decisions, you can attract the users' attention and increase the uptake of evaluation outcomes/results.

Exercise 2: In small groups, participants to list names, positions and department of potential primary users of the results of M&E. Make a record for further discussion (5 mins)

2.3 Evaluators

Evaluators may include a small internal evaluation task force (including the IEA core team), and external evaluators (consultants and internal evaluators of another IEA). In reality, ministries are often chronically understaffed or challenged by the lack of capacity, and forced to use external evaluators. In this case, regular contacts between the external evaluator(s) and the IEA core team are essential throughout the IEA cycle. Evaluators are selected by the IEA core team. They should have a good understanding of the IEA process, its intended impact and societal contexts.

3. Framework, attributes and measures

3.1 Attributes of effective assessments

This framework takes a look at key attributes that enhance the IEA report's effectiveness in influencing policy-makers. The notions of **saliency, credibility and legitimacy**—as key attributes of effective assessments—arise from earlier academic research that focused on better understanding the factors that determine the effectiveness of assessments.

The saliency-credibility-legitimacy attribute triad acknowledges that the process is subject to political interests. Saliency is "What users consider useful relevant, hot, and significant: what make users use the assessment". Credibility is "Trustworthy, rigorous in scientific terms, believable and plausible". Legitimacy is "Lawful and justifiable". Need to attract political attention is emphasized when legitimacy and credibility are not convincing enough. It also implies that without credibility and legitimacy, political saliency is not enough to attract and maintain attention. Finally, it is recommended to involve key policy-makers and decision-makers who can develop a sense of saliency in addition to being assured of credibility and legitimacy.

Example: The assessment of Stratospheric Ozone depletion.

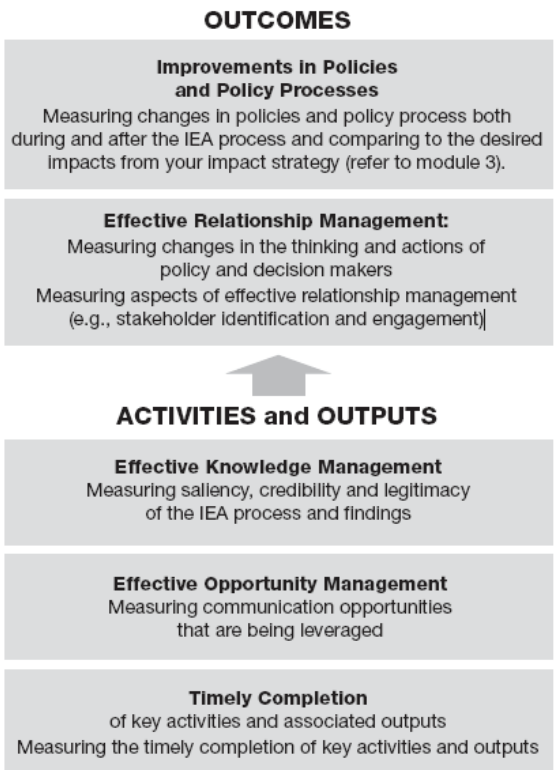
The assessment of stratospheric ozone depletion is a good example, because it was perceived by policy-makers as salient, credible and legitimate:

Salient	Because it addressed a global threat to survival that called for immediate attention and action from decision-makers.
Credible	Because it involved high-profile research institutions from different countries, triangulating their observations and results.
Legitimate	Because of the transparent process, engaging all relevant stakeholders and acknowledging their investment.

3.2 Framework

The ultimate goal is to maintain and enhance the health of ecosystems and the well-being of people. A basic conceptual understanding of how the activities and outputs are linked with intended outcomes and impacts needs to be developed. The intended outcomes of an IEA process are the changes in the thinking and actions of policy-makers that can bring about improvements in policies and policy making processes, which, in turn, can result in environmental improvements.

Figure 1: Framework for M&E the National IEA Process



3.3 Measures

There are five categories of measures, supporting the development of self-assessment matrix.

1) Outcome-based Measures for Improvements in Policies and Policy Processes
2) Outcome-based Measures for Effective Relationship Management
3) Activity-and Output-based Measures for Effective Knowledge Management
4) Activity- and Output-based Measures for Effective Opportunity Management
5) Measures for timely Completion of Activities and Outputs

3.3.1 Outcome-based Measures for Improvements in Policies and Policy Processes

Attributing improvements in policies and policy processes to your IEA process will, in most cases, be a difficult or impossible task. It is not critical for these measures that you be able to attribute sole credit for the change to your IEA; what is most important is that the change occurred. Your measures for effective relationship management might still help you better understand the role of your IEA in higher-level policy improvements.

3.3.2 Outcome-based Measures for Effective Relationship Management

Relationships among people jointly processing and communicating ideas are what initiate change. Module 3 called decision-makers, whom should be made relationship with other target audience such as civil society, academic community, research institutes, and media for supporting, reinforcing, influencing and

strengthening recommendations and outputs from IEA process. Possible measures to monitor and evaluate for effective relationship management include:

- Number of key persons identified for each relationship group. Including specific names from each of the potential audience categories identified.
- Behavior observed (important changes in thinking and actions of key actors)

3.3.3 Activity- and Output-based Measures for Effective Knowledge Management

Knowledge needed by policy-makers and decision-makers was generated from Modules 3, 5 and 6 in order to improve the policies and policy making processes. Measures of effective knowledge management could include:

- Views of decision-makers on their thought on the key issues
- Availability of required types or forms of information
- Identified list of reviewers
- Reviewed data and analysis
- Participation of Multi-stakeholders in identifying key issues and review the analysis

3.3.4 Activity- and Output-based Measures for Effective Opportunity Management

Module 3 brings out challenges to leverage opportunities for getting information and knowledge generated into hands of decision-makers and policy-makers. Possible measures for effective opportunity management include:

- Number and type of unique communication outputs for each stakeholder and audience,
- Development of interim products,
- Scenario exercise and its feedback,
- Numbers of stakeholders represented.

3.3.5 Measures for timely Completion of Key Activities and Outputs

Another important aspect is time provided and the desired quality. Time delivery implies efficient and effective use of resources and opportunities. The module has proposed a potential format for monitoring the timely completion of activities and their outputs throughout the IEA process.

IEA Process/Stages	Time proposed	Outputs proposed
Stage 1: Start-up	4-6 weeks	MoUs reviewed
Stage 2: Institutional Set-up	1-3 months	MoUs signed and Established Institutional Framework and stakeholders map
Stage 3: Scoping and design	2-4 weeks	Designed document (structure and outline of the report) and impact strategy
Stage 4: Planning	4-6 weeks	Agreed implementation plan and adjusted impact strategy and communication & outreach strategy
Stage 5: Implementation	10-12 months	Draft report and its results
Stage 6: Communication of results & outreach	1-2 months	Report and complementary products in public
Stage 7: M & E and learning	1-2 months	IEA impacts and recommendations for future

4. Self-Assessment Matrix

Self-Assessment matrix is the key tool for monitoring and evaluating the IEA process. Below are three recommended steps for self-assessment that could be followed.

Step 1: Identify major issues and monitoring questions, and develop specific measures.

MAJOR ISSUES IDENTIFIED	MONITORING QUESTIONS
- change statement	- have the desired improvements in policies and processes identified been realized? - what are other improvements observed during and following the IEA process?
- relationship management	- have perceived changes in thinking and actions of policy-makers observed?
OTHER FACTORS TO BE CONSIDERED	**MONITORING QUESTIONS**
- knowledge management	- Is the right knowledge being generated and is that knowledge salient, credible and legitimate?
- opportunity management	- are opportunities being leveraged for effectively communicating that knowledge to those persons in a position to influence change?
- timely completion and outputs in each stage	- are the key activities and outputs necessary to complete the IEA process being completed on time and at the desired level of quality?

Step 2: Identify sources of data and data collection methods

Measures developed from Step 1 will make possible to identify sources of data and data collection methods for each measure. The data will come from a variety of sources with a variety of data collection methods. In order to select the most appropriate data collection method, it depends on where the data are most likely to be found. The following table provides some guidance.

Step 3: Set priorities and frequency of monitoring and evaluation

There are several kinds of indicators required for this step.

1. Indicators for monitoring progress of the impact strategy that will required less regular and frequent monitoring
2. Indicators for monitoring the process for effective management

Both indicators are required for monitoring for several years after the national IEA report and other outputs have been disseminated.

Exercise 3: Participants to work a group of 4-5 and discuss

Based on the identified issue and proposed indicators in each group, the same group will be gathered. The group will design the monitoring plan to follow the output of the specific issue.

Step 1: major issues and specific measures

1. Change statement
   - government - changes in their political wills to address priority hotspots identified in the report
   - public - public awareness raising of the public's impacts on environment
   - Business – improvement of dialogue between lawmakers and industry that make great compliance with existing laws.
2. Effective relationship management – what changes in the actions of policy & decision makers have you observed ?

Step 2: sources of data and data collection

1. what are sources of data?
2. what are techniques used in collecting data?

Step 3: Set priorities and frequency of monitoring

Based on the first exercise on identifying limitation to M&E and the second on identifying the potential actors, set up process and progress indicators.

5. Improvement opportunities

IEA is a capacity building process. M& E should be considered as a learning opportunity for an organization and increases impacts from the assessment process to improve policy making and human well-being.

Learning is more than knowledge creation and demonstrated by behavior changes. Exchange of information and discussions (processing) are prerequisites for learning opportunities.