

**GUIDELINES**

**FOR**

**NATIONAL  
INTEGRATED ENVIRONMENTAL ASSESSMENT REPORT**

**PREPARATION IN AFRICA**

**FINAL DRAFT**

**AFO**  
AFRICA ENVIRONMENT OUTLOOK

**UNITED NATIONS ENVIRONMENT PROGRAMME**

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**LIST OF ACRONYMS**

AEIN	African Environment Information Network
AEO	African Environment Outlook
AEO-2	African Environment Outlook's second edition
AMCEN	African Ministerial Conference on Environment
CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
CITES	Convention on International Trade in Endangered Species
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CSD	Commission on Sustainable Development
DALYs	Disability-Adjusted Life Years
DPSIR	Drivers-Pressure-State-Impact-Response
EIS	Environmental Information System
FAO	Food Agriculture Organization
FCCC	Framework Convention on Climate Change
GEF	Global Environment Facility
GEO	Global Environment Outlook
GIS	Geographic Information Systems
GNP	Gross National Product
HDI	Human Development Index
ICT	Information Communication Technology
IEA	Integrated Environmental Assessment
KSh	Kenya Shillings
MEAs	Multi-lateral Environmental Agreements
NGO	Non Governmental Organization
NIEAR	National Integrated Environmental Assessment Report
PSIR	Pressures-State-Impact-Response
SADC	Southern Africa Development Community
SOER	State of Environment Report
SPIR	State-Pressures-Impact-Response
UNDP	United Nations Development Programme
US\$	United States Dollars
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization

## AFRICA ENVIRONMENT OUTLOOK

## 1.0 INTRODUCTION TO THIS GUIDE

### 1.1 Background

The 8th Session of the African Ministers Conference on Environment (AMCEN) decided that an Africa Environment Outlook (AEO) Report should be prepared to provide a comprehensive scientific assessment of the environment, policies, and environmental management programmes. As a result of the gaps and weaknesses identified with respect to existing data and information the Ministers called on African governments to commission initiatives to establish specific needs in this regard and the magnitude of investments required. They also urged the international community to assist African countries in their efforts to gain access to new technologies, particularly information and communication technologies, and to create conditions for the development of indigenous technologies that are important for enhancing economic development.

AEO-1 was the first comprehensive integrated report on the African environment. It was endorsed at the 9<sup>th</sup> Session of AMCEN meeting held in Kampala, Uganda on 1-5, July 2002 as “a monitoring and reporting tool for sustainable environmental management as well as a framework for national and sub-regional integrated environmental assessment and reporting”. The Ministers also called for the establishment of the Africa Environment Information Network (AEIN) “to promote access to, and harmonisation of data in the Africa region, and act as a basis for tracking environmental changes using quantitative indicators focusing on national needs.”<sup>1</sup>

The overarching goal of AEIN is thus to build national level capacity for integrated environmental assessments and reporting based on good quality information on environmental assets. Modern information management tools and procedures would be used to better characterise environmental resources and understand complex processes and provide a comprehensive analysis of environmental status and trends, integrated with the impacts of policies, legislation, and regional agreements. Linkages would be made among environment and development issues for the purpose of proposing alternative policy options for the future would, as well as recommending concrete actions for follow-up at national and sub-regional levels.

Building on the issues identified in the AEO preparation process and lessons learnt from previous information management initiatives, the AEIN framework establishes a unique approach to production of AEO. It must continue to benefit from participation of a wide range of stakeholders, build consensus on several issues and findings, and cultivate a sense of ownership within the African community. ***More importantly, it must build from the national to continental level.*** This implies that integrated environmental assessment in Africa must have its foundation in national environmental assessment and reporting processes.

***Purpose:*** The purpose of these guidelines is to provide a common reference point for national level institutions and other stakeholders in the National Integrated Environmental Assessment Reports (NIEAR) process. This would ensure the production of high quality and comparable national reports which would provide a basis for preparing sub-regional inputs for the AEO.

<sup>1</sup> Kampala Declaration, 9<sup>th</sup> Session of the African Ministerial Conference on Environment, Kampala 1-5 July, 2002

**Focus:** These guidelines focus on, and are meant to streamline the collection, analysis, interpretation, and presentation of data on environmental conditions, at the national level. They are designed to serve as a resource and provide guidance for those who manage the NIEAR process at the national level, as well as actors who are engaged in various aspects of the process.

**Targets:** Specifically the guidelines target the following players in the process:

- Personnel of national environmental agencies responsible for managing the NIEAR process (identification of issues, selection of consultants, identification of core data sets, etc.)
- National data centers involved in the generation of core data and the relevant information products for the NIEAR process
- National consultants who prepare specialist inputs for the NIEAR



## 1.2 Context

Over the last 3 decades, Africa has witnessed a growing number of challenges with respect to the state and health of her environment and natural resources. The road to sustainable development whose building blocks were set at the Rio conference on Environment and Development in 1992 has been beset with hurdles largely due to increased levels of poverty especially in Sub-Saharan Africa. It is now clear that environment is inextricably linked to the environment, and actions to protect and nurture the environment need to be taken now rather than later. The critical challenges that Africa faces now include the following: the environment continues to deteriorate; social and economic inequality is on the rise; and globalization is sweeping across the world leaving Africa behind. Africa needs to get back on the path to sustainable development. In order to do this, Africa needs to confront the underlying causes of environmental degradation and poverty, and integrate environmental considerations in the mainstream of decision making. Efforts in developing preventive action and a concerted response must be intensified. More importantly broad participation in decision-making needs to be strengthened through ensuring freedom of access to environmental information, and improving avenues for communication between decision makers and other stakeholders.

In 1992, African governments signed the Rio Declaration and endorsed Agenda 21. Agenda 21 emphasizes the role of information in sustainable development. In addition, one of its activities involves the strengthening or establishment of mechanisms to transform scientific and socio-economic assessments into information suitable for both planning and public information. Since then, African governments have signed and ratified a number of international and regional conventions and treaties that call for development in an environmentally sustainable manner. African governments were also full participants at the World Summit on Sustainable Development (WSSD), held in Johannesburg, South Africa in 2002.

The context for integrated environmental assessment and reporting is therefore the effective management of the environment as an asset for sustainable development. This requires reliable assessments of and information on environmental conditions to guide policy formulation and decision making and to create an informed citizenry who feel empowered to act intelligently at their own levels in managing environmental resources for the benefit and well-being of themselves and society as a whole. This represents a fundamental shift from previous environmental reporting approaches.

Against this backdrop the AEO process has been firmly anchored on the highest African environmental policy platform, AMCEN, the supreme continental forum responsible for articulating authoritative perspectives on Africa's environment and its place in the global arena. Through the AEO process AMCEN has taken an effective leadership role towards harnessing the knowledge and understanding of environmental resources as the basis for sustaining development in Africa. AEO has been adopted as the monitoring and reporting tool for sustainable environmental management within the sustainable development policy framework as articulated by African leaders under the New Partnership for Africa's Development (NEPAD). Countries have obligations through the various sub-regional, regional and international environmental agreements, to contribute to this using their individual national integrated environmental assessment reports.

## 1.3 What is Sustainable Development

In its simplest form, sustainable development means improving and maintaining the well being of people and their environments. It has also been defined as an evolving process that

improves the economy, the environment, and society for the benefit of current and future generations. Sustainable development entails integrating economic, social and environmental objectives and making choices among them where integration is not possible. Figure 1.1 illustrates the integration of the three objectives addressing economics, sociology and ecology.

Therefore, we can infer from the above that at whatever level of geographical coverage, sustainable development must be viewed as a concept that addresses many dimensions. Sustainable development encompasses not only the economic and social aspects of activities in a given area, but also those related to population, the use of natural resources and the management of the environment. The principle of sustainability requires that explicit recognition must be given to existing interrelationships between people, resources, environment and development.

**Question:**

Does your country have a National Development Strategy/Plan? If yes, to what extent does it integrate environmental considerations? Does it recognize the Principle of Sustainability?

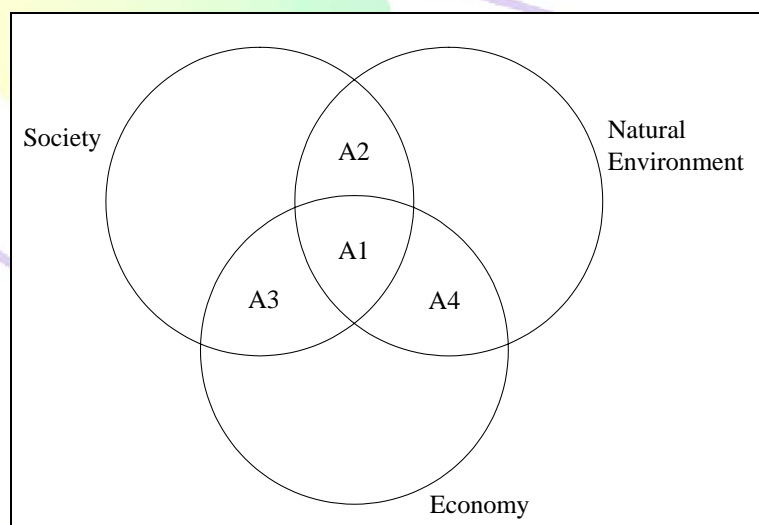


Figure 1.1: The diverse realities and perspectives under a holistic view of sustainable development

**Note:**

- The various points where the three circles merge represent various approaches to the problem of what to integrate and how. At the points where two circles merge, broader-based specialties (socio-economics, environmental economics, social-ecology/indigenous knowledge) develop.
- The point of complete integration (A1) is where all three circles overlap. This indicates the point of an approach that integrates all social, economic and ecological features and the relationships between them. (However, the circles have been quite deliberately placed partially apart).
- A truly holistic perspective would regard all the specialist approaches and their combinations as being as important as the multidisciplinary perspective, which draws them all into an integrated system view. In society at large, it is the

juxtaposition and polarity of ideas, and all the realms of specialization and overlap, which provides the diversity of elements that are essential to a dynamic system which can evolve successfully and maintain a balance.

*Adapted from Spooner et. Al (1994)*

#### **1.4 What is a State of Environment Report (SOER)?**

A state of environment report covers a pre-defined geographical area (Regional, National, Sub-national, City, Watershed, Ecosystem, etc.) and is a document that describes the status and trend of the area's environmental system. An environmental system consists of biophysical, economic, social and demographic components.

Prior to the 1960s, State of environment reports were virtually non-existent. The United States and Japan pioneered preparation of SOERs in the early 1970s, variously referred to as Environment Quality and Quality of the Environment reports. Since the Earth Summit in Rio in 1992 countries of the world committed themselves to preparing regular state of environment reports. Further elaborating upon the provisions of Agenda 21, some countries in Africa have made it a legal requirement for environmental management institutions to produce SOERs on a regular basis. State of the environment reporting has in the past represented the systematic acquisition, analysis and presentation of information on environmental conditions and trends. The underlying theme of state of environment reporting has been the link between human activities, natural processes and environmental conditions.

#### **1.5 What is a National Integrated Environmental Assessment Report (NIEAR)?**

In the late 1990s, there was a deliberate paradigm shift that saw the style of reporting move away from only assessing trends and conditions, to analyzing and integrating these with assessment of key driving forces and policies that cause or influence the environmental trends that are identified. This approach is now popularly referred to as integrated environmental assessment and reporting, which is simply defined as *"a process of producing and communicating policy-relevant information on key interactions between the natural environment and human society"*. It has also been defined as *"an interdisciplinary and participatory process that combines, interprets and communicates knowledge from different disciplines to allow a better understanding of complex phenomena"*. The integrated analysis also enables policy to be analyzed in relation to specific environmental issues, to show positive and negative policy impacts on the environment and how the environment can drive policy, both retroactively and proactively. Special focus is normally placed on impacts of public and private sector policies, and regional and global policies, including Multilateral Environmental Agreements (MEAs). The assessment takes into consideration not only environmental policies, but also the impacts of general policies on environmental issues, such as the broader economic investment policies with repercussions on the environment. Thus, the key message is that integrated environmental reporting should incorporate policy assessment for the whole system. The resulting information is then supposed to be integrated into sustainable development decision- making.

The concept of integrated environmental assessment and reporting can be applied at national, municipal (city) or district (sub-national) level to produce reports relevant at those levels. A National Integrated Environmental Assessment Reports (NIEAR) is simply an IEAR produced at the national level. The NIEAR describes the quality of the environment for a given country through the systematic acquisition, analysis and presentation of

information on environmental conditions and trends, and the assessment of key driving forces and policies that cause or influence environmental trends in that country. Understanding the target audience and having a well planned and executed communications plan are key to the success of the NIEAR effort.

### 1.6 Why Produce a NIEAR in Africa?

In many areas of environmental reporting, Africa has only made modest progress. NIEARs are important to Africans because these documents will allow them to know the conditions, trends and key driving forces and policies influencing the environment in each of their countries. In other words, they allow for analysis of data and generation of policy-oriented and targeted environmental information, and for integration of such information into sustainable development decision making (Figure 1.2).

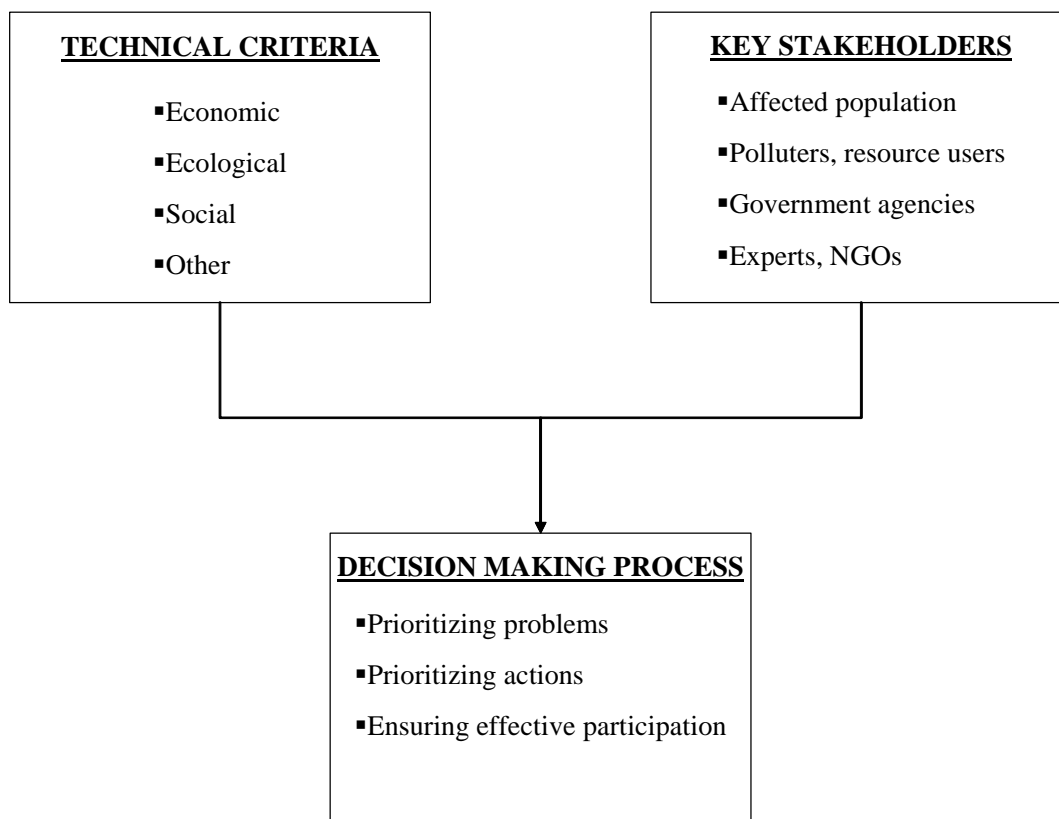


Figure 1.2: Analyses and Participation in Decision Making

As illustrated in Box 1.1, there are several reasons why one would want to prepare a national integrated environmental assessment report; and when such a report is the first issue, it acts as a basis for future reporting.

#### ***Policy and legal basis for NIEAR***

Principle 10 of the Rio Declaration on Environment and Development emphasizes the right of access by the public to information concerning the environment that is held by public authorities. It also goes further to provide that states shall facilitate and encourage public awareness and participation by making information widely available. Chapter 40 of Agenda 21, the action plan for the 1992 Earth Summit, emphasizes the importance of making decisions based on credible information. It also states that integrated

management of natural resources is the key to maintaining ecosystems and the essential services they provide.

### **Box 1.1**

#### **WHY PRODUCE A NIEAR?**

There are three main reasons why a country would want to produce a NIEAR, namely:

- To improve upon knowledge on the state of its environment and the changes over time, in order to better assess the results of past actions and contribute to the development and harmonization of environmental and other related policies;
- To more fully integrate environmental considerations in sustainable decision making (influence decision making); and
- To improve public information on the state of the country's environment through wider stakeholder participation.

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The rational management of any system (physical, social, economic, policy and others) must, especially at the initial stages, start from a baseline describing the status of such a system. A first time integrated environmental assessment report would, therefore, provide:

- Baseline against which future changes in the environment can be judged;
- Documentation of progress in dealing with environmental issues;
- Identification of opportunities where further effort could be expected to have significant results; and
- An illustration of the interrelationship between people, resources, environment and development and, therefore, the importance of including environmental considerations as an integral part of the socio-economic planning and policy processes at national level.

Currently in Africa, states have prepared National Development Initiatives that promote the sustainable use of natural resources. Others have been through visioning exercises whose results indicate the continued reliance of countries on natural and environmental resources. The implication of this is that states must initiate integrated environmental assessment and reporting if their natural resources are to continue to be engines of development.

African states which are signatory to Multilateral Environmental Agreements (MEAs) have reporting obligations that can be sufficiently addressed through NIEARs. Global conventions and protocols that are relevant to NIEAR include the Convention on Biological Diversity (CBD), the Basel Convention, the Convention on International Trade in Endangered Species (CITES), the Montreal Protocol on Ozone Depleting Substances,

United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, Convention to combat Desertification (CCD), and the Law of the Sea. Other development initiatives in Africa such as New Partnership for African Development (NEPAD) and the Millennium Development Goals (part 7: ensuring environmental sustainability) call for regular reporting on the state of the environment. AMCEN serves as the platform for implementation of the environmental component of NEPAD, including its assessment and reporting activities.

Apart from Agenda 21, soft laws that are relevant to NIEA reporting include the Global Environment Facility (GEF), codes of conduct such as the FAO Code of Conduct on Responsible Fishing, and action plans like the Global Action Plan for the protection of the Marine Environment from Land Based Activities. Reporting requirements for institutions such as the World Trade Organization (WTO) and the Commission on Sustainable Development (CSD) could also be met through NIEARs.

Another reason why NIEARs are important is their value as sources of environmental education and public awareness. An NIEAR is basically produced to confront the public and policy makers with environmental quality indicators so that the former appreciate the consequences of their own actions while the latter understand what needs to be done and where.

More importantly, most African countries have incorporated in their national policies and legislation the requirement for regular reporting on the state of their environment through the production of NIEARs. In the majority of cases, institutions mandated to oversee environmental management in the country are required by law to produce NIEARs on a regular basis. These mandated institutions are either a Ministry of Environment, a National Environment Agency/Authority, or their equivalent. Even in cases where these institutions may not produce the reports themselves, they are at least required to spearhead the process. For example, the Ugandan National Environment Management Authority is required by law to produce a National State of Environment Report once every 2 years. There are a few cases where development partners using northern academic institutions or consultancy firms have assisted some countries to prepare NIEARs. However, the long-term capacity for the national institutions to carry forward this process has remained in question as capacity building considerations were not treated as a key pre-requisite.

The production of NIEARs represents a new undertaking for some African countries. For those with no prior experience in producing these reports, the first edition should be carefully prepared so that it captures the baseline information on which subsequent reports will build.

The production process should be well synchronized and harmonized, if it is expected that NIEARs will feed into and act as building blocks for the production of the African Environment Outlook (AEO). It is imperative, therefore, that the *capacities of all African states to produce* accurate and timely NIEARs must be assessed and deficiencies addressed. In addressing deficiencies in institutional capacity at the national level, the *issue of sustainability* must be dealt with. At the minimum, the mandated institution in a state *must have the capacity to guide preparation of the report*.

### **1.7 Who needs NIEARs?**

Notwithstanding the requirements that may exist in national legislation, MEAs, and important development plans of action, NIEARs should not be viewed as an academic

exercise and because they are intellectually stimulating. The preparation of NIEARs represents the commitment of sizeable resources and should therefore be undertaken because there is an audience for the products.

NIEARs can be considered to have four major groups of users, namely:

- Scientists and resource managers;
- The general public, youth and community groups;
- Decision makers in the private and public sectors; and
- The education community

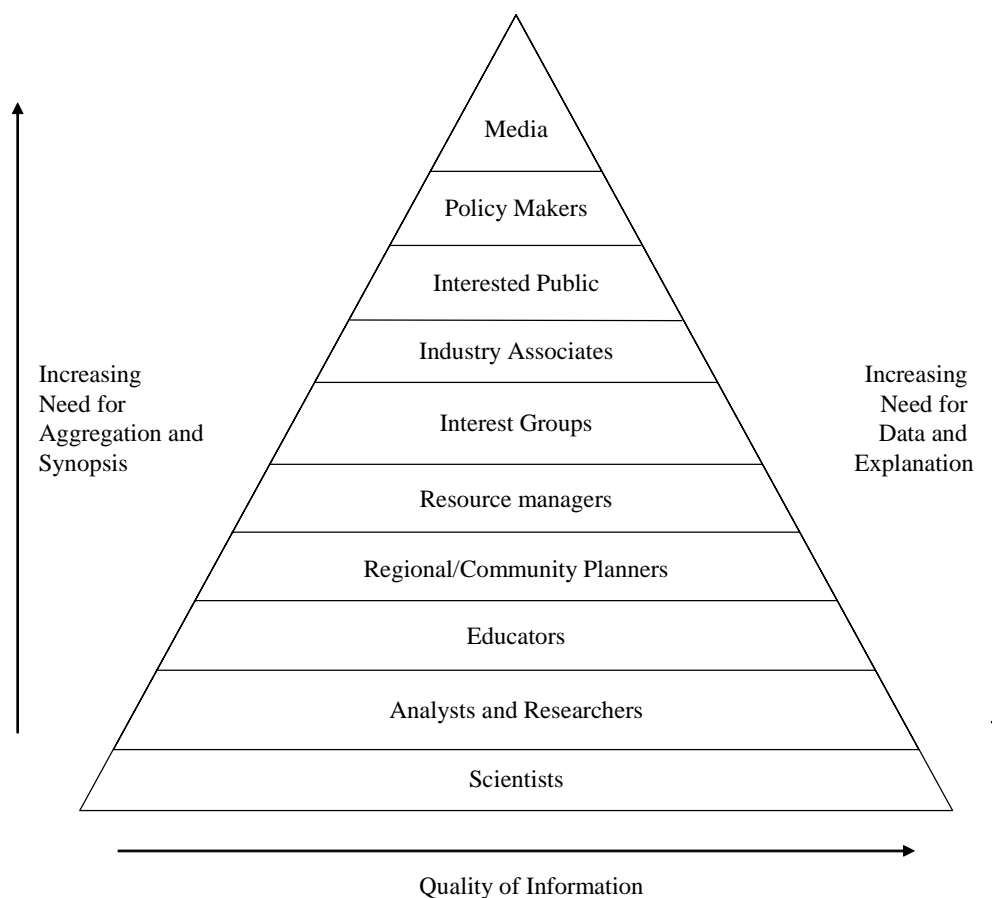


Figure 1.4: Information Requirements of Various Users

## 2.0 THE PRESSURE-STATE-IMPACT-RESPONSE FRAMEWORK

### 2.1 Society and the Environment

The interaction between society and the environment can be categorized as **Drivers** that are responsible for the state of the environment. They explain the existing framework in which a country is operating and how this impacts on the environment. These are usually defined as economics, the policy environment (regime), and the demographics. Then there are the actual **pressures** people put on the environment, the resulting **state** or condition of the environment, the **impact** representing the effect of the state or condition of the environment on human health and well being, and the **response** of society to environmental conditions.

These four categories are the basic components of the **Drivers-Pressure-State-Impact-Response (DPSIR) framework or model**. Some of these terms can be put in more than one category depending on the relationship analyzed. For example the common practice is to combine Drivers and Pressures with the result being the Pressures-State-Impact-Response (PSIR) framework. In the majority of cases, it is the state of the environment that elicits an assessment of what is happening to the environment. Consequently, some reporting processes begin by assessing the state of the environment. They then follow through by establishing an understanding of the driving forces and pressures that have caused the observed change in the state, the impact this is having on human health, the ecosystem and the economy, and finally the societal response aimed at restoring the integrity of the environment. This is referred to as the SPIR framework. It may be used interchangeably with the PSIR framework described above. Frameworks like these should be used for analysis rather than rigid categorization.

## 2.2 The Framework

For purposes of this guideline, it will suffice for countries to use the basic pressure-state-impact-response (PSIR) framework. Thus according to the African Environment Outlook guidelines:

**Pressures** are the activities and processes, which act on the environment and bring about environmental change. They are often classified into root causes and driving forces such as population growth and industrial expansion, emission levels of pollutants, consumption or poverty. Pressures can be seen as a sequence of events, each of which will have an effect on the state and trends of the issue in question. The pressures on the environment are often considered from a policy perspective as the starting point for tackling environmental issues, and, from an indicator viewpoint, where they tend to be more readily available since they are derived from socio-economic databases. Pressures can be grouped into four basic types:

- *Societal developments* such as changes in demographics, introduction of new technologies, wars, mass migrations, and others. All these are examples of societal pressures that can affect the state of the environment. Pressures can also be described and measured using indicators.
- *Policies with unforeseen, unintended and negative consequences for the environment:* In the past three decades policies within a broad range of sectors have been developed, some of which have had negative consequences on the environment. These include a number of agricultural and corporate policies. Those identified as being pressures on the environment are likely to be more specific expressions of the societal developments mentioned above.
- *Natural processes* such as storms, earthquakes, droughts and others that have a devastating effect on the environment. For example, droughts exacerbate problems of land degradation.
- *Environmental policies* that exert positive pressure on environmental change (those that mitigate negative trends or help contribute to positive trends)

The **State** refers to the condition of the environment resulting from the pressures outlined above; for example, the level of air pollution, land degradation or deforestation. Trends are changes in the state of the environment over time. An understanding of environmental

trends reveals whether the state of the environment is getting better or worse. It also gives an indication of how quickly any changes are happening (rate of change) and whether such rates are increasing or decreasing. Knowledge of both the state of the environment and its indirect effects is critical to decision makers and the public.

The **Impact** refers to the effect of the state or condition of the environmental issue under consideration on human health and well being, the economy, the ecosystems, as well as other environmental sectors. For example, increased land degradation may lead to one or a combination of the following: decreased food production, increased food imports, increased fertilizer use, malnutrition, clearance of more land, siltation of waterways, and so on. High nutrient levels in coastal waters (environmental state) can lead to increased occurrences of algal blooms, and increased shellfish poisoning in coastal communities (impact).

The **Response** component of the pressure-state-impact-response model corresponds to societal action taken collectively or individually to ease or prevent negative environmental impacts, correct environmental damage, or conserve natural resources. Responses may include regulatory action, environmental or research expenditures, public opinion and consumer preferences, changes in management strategies, and providing environmental information. There could similarly be a set of responses to positive changes in the environment. The transfer of species under the CITES agreement from list 1 to list 2 as their status improved due to successful conservation measures would be an example of such a response. Satisfactory indicators or measurements of societal response tend to be the most difficult to develop and interpret.

*Simply put: Social and economic developments exert pressure on the environment, and, as a consequence, the state of the environment changes. These changes then have impacts on the social and economic functions of the environment, such as the provision of adequate conditions for health, resources availability and biodiversity. Finally these impacts may elicit a societal response that feeds back on the driving forces (or on the state or impacts directly), through adaptation or curative rather than preventive action (see Figure 2.1).*

Identifying emerging environmental issues is the final component in the environmental reporting framework. In so doing, we are also trying to answer the following questions:

- What is happening now that might affect the environment in the long term?
- What are we doing to monitor the status and urgency of this issue?
- What are we neglecting that could turn this issue into a crisis?

As the world progresses, new environmental issues will continue to emerge. Detecting these issues early in time is important because then we can take action before they reach crisis levels.

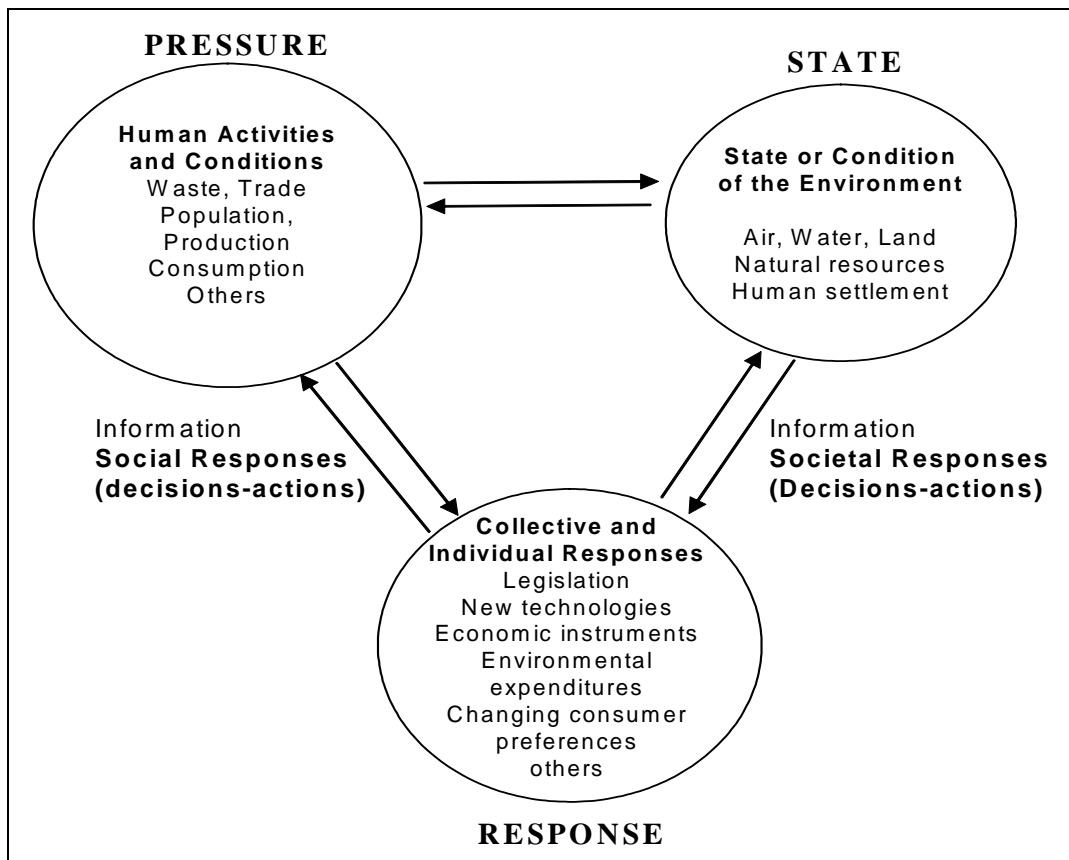


Figure 2.1: An example of the Pressure-State-Response framework.  
 (Modified from Australia Department of the Environment, Sports and Territories, 1994 reported in Rump, 1996)

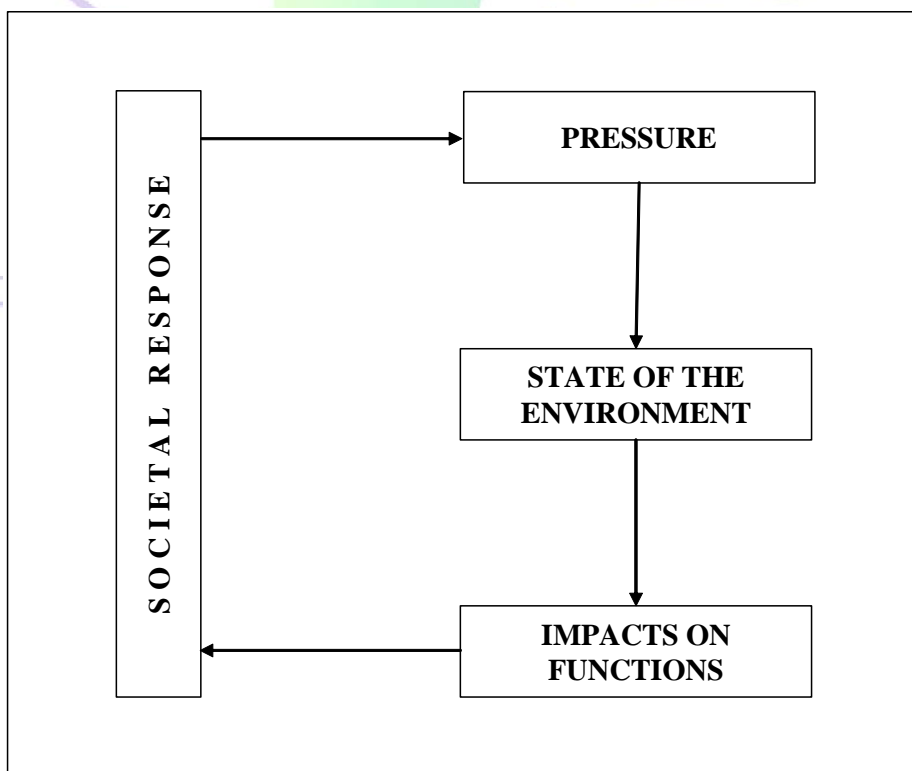


Figure 2.2: A simple representation of the Pressure-State-Impact-Response framework  
 (Source: Swart and Bakkes, 1995)

However, this task is made challenging by the following:

- a) We sometimes tend to think about the state of the environment as a static entity at a moment in time. This is not correct. It is more realistic to think of the environment and global systems as a series of dynamic and interconnected processes changing and interacting over time. This is hard to imagine since time scales are often so large that change within an individual's lifetime is often not perceivable.
- b) Environmental issues in the world and indeed in Africa have been recognized over a very short period of time (about 20 years ago is when Africa started seriously addressing environmental concerns). There has been little practice and a few opportunities to learn from theories and our mistakes.
- c) This is an area of uncertainty. We do not always work with hard facts, but often with controversial or insufficient evidence and testimony.
- d) As with all attempts at forecasting, there are always surprises!

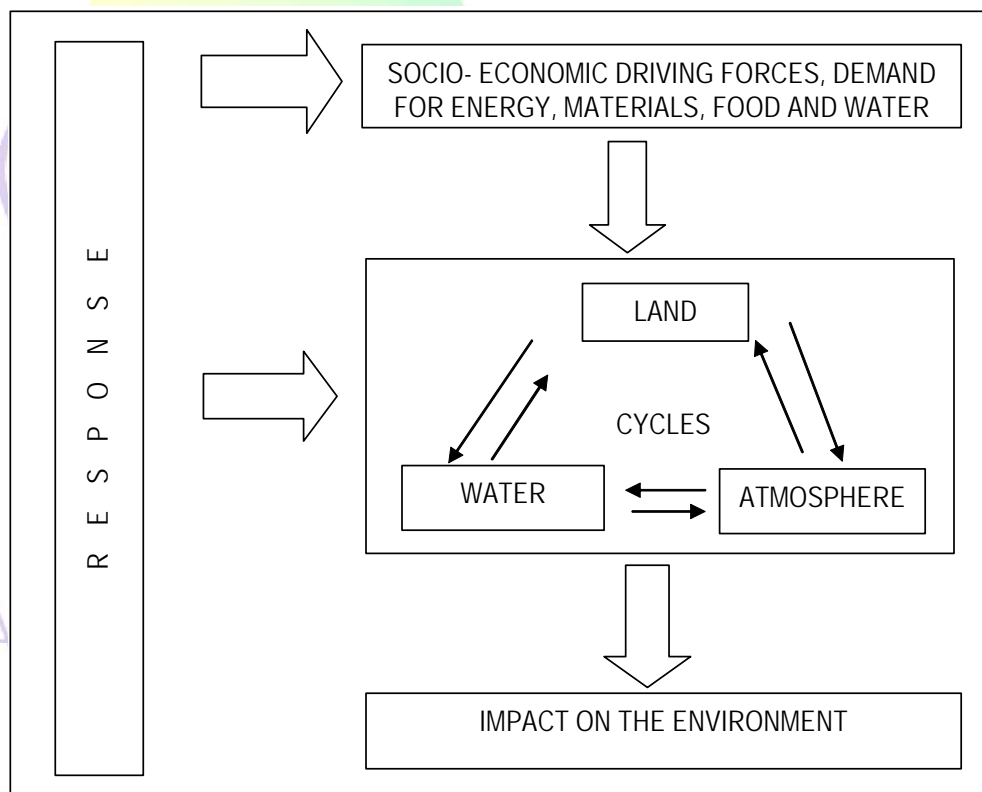


Figure 2.3: Basic elements of the Pressure-State-Impact-Response framework  
(Source: Adapted from RIVM/UNEP (1997))

### ***What are emerging environmental issues?***

An emerging environmental issue can be defined as an issue (positive or negative) that is not yet generally recognized but which may have significant impact on human health, ecosystem integrity and the economy. Some of the driving forces or causes that lead to new environmental trends and issues are natural, while others are caused by human society. Changes in the nature and scale of human activities may give rise to emerging environmental issues. For example:

- New technologies in crop production (e.g. Genetically Modified Crops).
- Emergence of new economies.
- Changing attitudes of the business community.
- Increase in global tourism

Environmental issues that may become priorities in this century can be clustered into three groups: unforeseen events and scientific discoveries; sudden, unexpected transformation of old issues; and well-known issues for which the present response is inadequate (although their long-term consequences are known).

In hindsight we can identify examples from the past that had few, if any, foreseen consequences, such as the following:

- Effects of pesticides on birds (1950s)
- Long-range transport of atmospheric pollutants (1960s)
- Elimination of guinea worm through water management (1980s)
- Pollution of fresh water lakes through agricultural intensification (1990s)

For each of the above issues, there was a period, sometimes a decade or longer, when only a few researchers and others were aware of the potential significance of the issue for the environment, while most others, including decision makers, did not.

#### ***Why consider emerging environmental issues?***

Identifying and reporting on emerging environmental issues is a difficult and resource-intensive process. The specific reasons why this is done include the following:

- Raise awareness of the issues.
- Start timely policy and management actions before the issue reaches crisis level.
- Guide environmental research, data and information collection.
- Increase understanding of ecosystem dynamics and the effects of human activities.
- Promote learning and proactive management in society.

Examples of recently identified emerging environmental issues include the following:

- Global trade and its effects on the environment
- Antibiotic resistance
- Hormone disrupters
- Climate change
- Damage to the ozone layer
- Loss of biodiversity
- Unintended genetic transfers
- Invasive species
- Coral reef bleaching
- Decommissioning of military installations
- Weapons as waste

Although the examples given above are general in nature, each country in Africa should be able to identify an emerging environmental issue in its own context (even if it has been a common issue elsewhere).

## 2.4 Future Outlook Analysis

It has been emphasized throughout the Guide that current approaches to the integrated environmental assessment and reporting process include the need to report on the current state of environment and past environmental trends, as well as *providing visualisation of alternative development paths for the future* to support the policy-making process, to further public awareness, etc. This assessment of the future state (forecasting) helps us to answer the questions: *where are our policies taking us? Is this where we want to go? What other policies could be more useful?* Therefore, this section addresses the last part of the environmental reporting framework, which asks the question: *What will happen if we do not act now?* This assessment provides a stimulus for action by highlighting critical intervention points.

An integrated and *forward-looking “outlook”* builds on the analysis of environmental trends and human-environment interactions, and a series of scenarios for the future. A scenario is a story, told in words and numbers, concerning the manner in which future events could unfold, and offering lessons on how to direct the flow of events towards sustainable pathways and away from unsustainable ones. Development scenarios are alternative stories about the future with a logical plot and narrative. Scenarios usually include images of the future — snapshots of the major features of interest at various points in time — and an account of the flow of events leading to such future conditions<sup>2</sup>.

## 2.5 Reasons for conducting forward-looking Policy Analysis

Although the future is inherently uncertain and unpredictable (and therefore no one can predict it with absolute certainty), it is important that society considers the range of policy choices available and the range of policy outcomes associated with alternative policy paths.

Forward-looking policy analysis reduces the risk of unpleasant surprises and broadens the perception of the public and policy-makers in at least the four following ways:

- Consequence assessment: assessing the implications of present actions, decisions and policies.
- Early warning and guidance: detecting and avoiding problems before they occur.
- Proactive strategy formulation: considering the present implications of possible future actions.
- Normative scenarios: envisioning aspects of possible or desired futures.

Assessing alternative development outcomes or scenarios is about destinies and choices; about destinies because the range of possible futures is limited, and about choices because the difference between potential futures can be vast even though all start from the same point: the conditions that prevail today.

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<sup>2</sup> Africa Environment Outlook — Past, present, and future perspectives, UNEP 2002, p. 306

Examining policy options holistically will help to identify those options and their consequences for the decision-makers. Such consequences may not otherwise be identified if analyzed in isolation. Alternative paths that arise from sequences of policy decisions and events and are looked at in a whole system setting are called scenarios. The broadening range of policy outcomes has been referred to as a scenario funnel (see Figure 2.4).

## 2.6 Framework for assessing policy options and scenarios

There are a number of approaches that can be used to assess policy options and futures. However, they all have the following in common:

- Define the major environmental issue and policy question.
- Define the current situation (data conditions, trends and existing policies).
- Estimate the consequences of the current situation on the environmental issue.
- Define the policy options.
- Estimate the changes in impact (for each option).
- Draw conclusions about the range of possible outcomes.

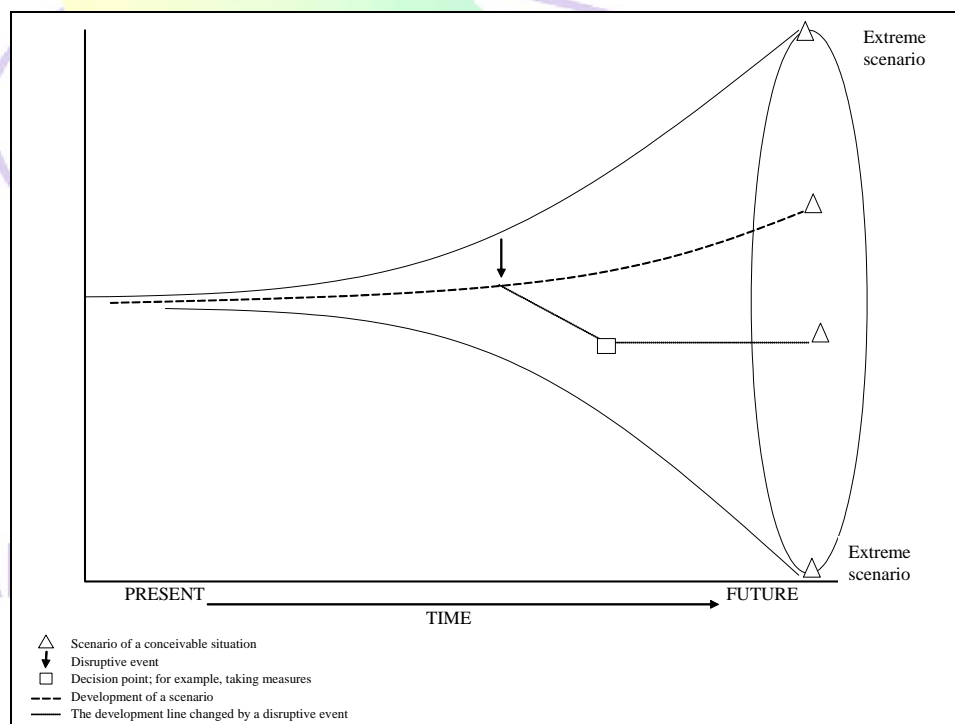


Figure 2.4: Conceptual diagram showing the effect of a disruptive event on the range of possible scenarios.

(Source: Reibnitz, 1988)

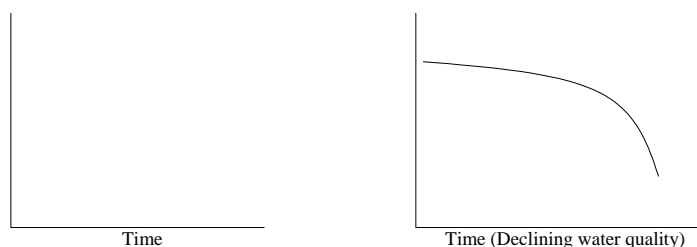
The sequence to be followed in the above framework depends on the information available. Balancing the simplicity of scenarios with credible scenario paths is a critical and often difficult task. Simplicity is important if only to enable communication of the scenario to non-technical stakeholders during and after the NIEAR exercise. However, making the scenarios credible is important since the projections related to them are often a subject of serious debate. Several stakeholders have different interests in the debate about which scenario policy modification should support.

The assessment of alternative futures derived from current driving forces and emerging issues requires basic data on the *environmental situation and trends*. Such information is used to estimate *impacts on humans and ecosystems* in terms of potential health risks or biodiversity loss. Assessments of the *future environmental situation* require information on the *causes and driving forces of environmental change*, such as consumption patterns, economic growth, population change, urbanisation, trade developments and land cover/use changes (including, e.g., loss of biodiversity, deforestation, desertification, air and water pollution, toxic wastes etc.). This information is used as a reference point for constructing potential future scenarios, not only in cases where current trends are continuing, but also for alternative situations where policies, laws, or changes in behavior curb negative trends and allow for a more favorable environmental situation, or even sustainable growth. For the estimation of *environmental impacts and for scenario analysis*, information is also needed on the *vulnerability of ecosystems and humans*.

In constructing scenarios, the most difficult task is achieving effective communication between technical experts that construct the quantitative structure of the scenario and policy-makers, the ultimate audience of the results. The role of the NIEA reporting team is critical: it can serve as a mediator between the two, ensuring that on the one hand scenarios remain policy relevant, and on the other, that policy-makers understand the weight of the assumptions and uncertainties.

## 2.7 Practicing scenario Analysis.

In presenting scenarios, it is necessary to understand what issues are demanding priority action and present them appropriately.



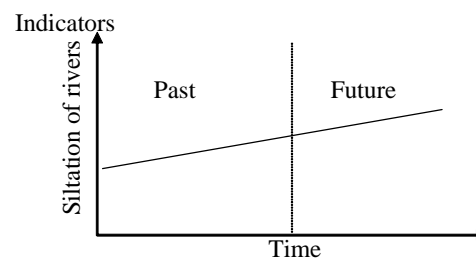
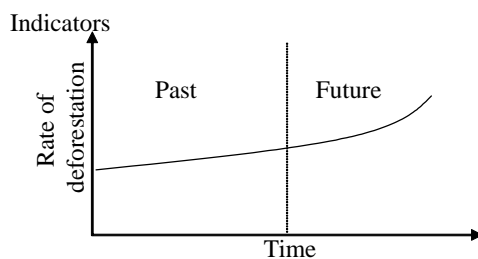
The next stage is to develop scenarios surrounding specific policy options and their outcomes. Start by imagining at least three policy options that are possible given the current situation. Use the current analysis of environmental conditions and driving forces to list outcomes these options could have on the environmental issues. The policy currently in place is usually referred to as “business as usual” or “baseline”. This policy is partly responsible for the environmental problems that have been identified. In view of this, describe two other policy options. Such options may lead to a modification of the policy currently in effect or the introduction of new policies. Once the policy options are identified, describe the possible effect of these policy options on key environmental issues.

The next stage is to identify some possible indicators that can describe the effect of these policies, and that can also be used to compare policy effectiveness. Plot the approximate trend lines for these indicators, starting with the “business as usual” scenario, then the two selected options using the same indicators. Trend lines should preferably start in the past so that the impact of a policy change on the trend can be illustrated.

**Example:** (Also see Annex YY for GEO3, AEO and other scenarios).

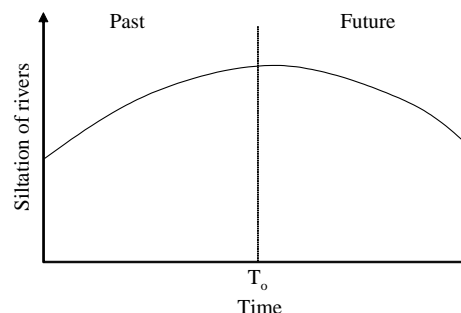
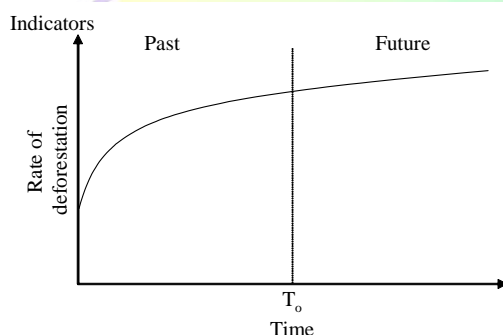
Environmental issue: Degradation of natural forests.

1. “Business as usual” Policies: Export of round timber.



2. Policy options:

- Ban export of round timber.
- Increase recovery in harvesting.
- Invest in plantation forests.



$T_o$  = Time at which there is policy change

Source: Adapted from IISD and UNEP (2000).

### 3.0 DATA QUALITY AND USE

#### 3.1 Requirement

A National Integrated Environmental Assessment should involve a holistic approach. It has three key characteristics, which are essential. These include:

- a) The interpretation, assessment and integration of high quality data to generate meaningful and readable information;
- b) The development of spatial and temporal trend information; and
- c) The linkage between environment and socio-economic considerations within a sustainable development context.

### 3.2 Availability of Data

Basically, environmental and socio-economic data provide the foundation for the analysis and interpretation of the state of the environment. The most up-to-date type of data required should cover the following areas:

- a) Natural resources stocks and environmental conditions.
- b) Human activities impacting on the environment, the emission of pollutants and their effects on the environment, natural events and human responses to environmental change. These are important elements for the assessment of ecosystem interactions.

Data for environmental assessment are not easily accessible or well documented. They are therefore difficult to consolidate. In most cases environmental and socio-economic data tend to be collected independently by diverse agencies using different methods and classifications and for specific purposes.

Data on the environment itself are more often derived from monitoring programmes and interpretation of remotely sensed images. Socio-economic data tend to be collected from statistically designed surveys. Nevertheless, the spatial and temporal dimensions of much of the data are highly limited. Much of the data available relate to individual environmental or human activity components rather than a synthesized ecosystem perspective. For example, databases for commercial forest areas tend to emphasize the production aspect of forestry management rather than adequately reflecting the diverse values of forest eco-zones which include their role in terms of habitat and bio-diversity maintenance, water conservation, and traditional and alternative land uses.

Databases for social, economic, and demographic conditions and trends are relatively developed and integrated compared to environmental statistics. Nevertheless, there may not be adequate and accurate data to answer some basic questions related to sustainability. Data limitations, both in terms of balance and quality severely hinder the quantitative assessment and reporting on the state of the environment. Therefore, data must support the development of more holistic information, understanding, and knowledge.

The barriers and data limitations to such information can be summarized as follows:

- Data quantity and quality;
- Data access and dissemination;
- Data synthesis and integration; and
- Data comparability.

In Africa today, some data on the state of the environment are available. Nevertheless, they may be scattered among institutions and highly segmented. Surveys from which these data can be extracted may be scanty and were perhaps done for a specific purpose. The importance of the need for institutions mandated to prepare NIEARs to collect and store their own environmental data can therefore not be over-emphasized. Where this is not possible, there is need to build information exchange networks with other institution and entities that possess the required data. Some data on the general state of the environment can be extracted from national strategic and action plans, policies and white papers (for example a number of countries have prepared and published Poverty Eradication Action Plans);

sector reports; budget documents; research reports; theses and dissertations; and a large amount of gray literature available in various governments offices.

All these sources will form a basis for preparing the National State of Environment Reports. There is need to build upon existing data and data gathering networks to improve on the access and dissemination of environmental information. Building on the available human capacity is also an important element, if countries are to produce good quality data on the environment.

### 3.3 Data Quality Control

Although high quality data are necessary for credible information, a systematic approach to their generation is necessary. The acquisition, processing, and storage of environmental data is time consuming, expensive and not a priority for many Governments. It also requires specialized training for the personnel to manage it properly. Consequently, there are inadequate baseline and trend data related to the ways ecosystems function and how their components interact. The data that are available are, in most cases, scattered and difficult to obtain.

Ownership and security are factors that can sometimes inhibit dissemination and proper access to data. In many cases environmental and socio-economic, data do not generally exist in a usable and integrated format for reporting. There is often lack of infrastructure and standards to facilitate the easy exchange, interpretation, and correlation of data from different jurisdictions and disciplines.

For the countries where the integrated environmental assessment and reporting is a new phenomenon, a focus on existing monitoring and survey systems will be useful in the short term as a means to evaluate the data available and their suitability for reporting purposes.

Where appropriate, it is recommended that the establishment of a meta-database<sup>3</sup> for the NIEAR will provide guidance to the quality of data available. A useful meta-database could include information on institutions, research, policy, legislation and regulations, excerpts and available reports. For a good NIEAR it is critical to build a meta-database on environmental and related socio-economic data that quantify the state and changing conditions of the environment. It should be updated on a continuous basis.

Furthermore, updating of a meta-database will require less time and resources than the initial survey.

With the availability of a NIEAR meta-database, the assembly of the actual data can be done. It is recommended that only data required for specific reporting needs or products be acquired. This may require considerable processing or reformatting to obtain suitable data required for interpreting environmental conditions and trends. Remote sensing data, for example, has great potential to detect changes in the environment but requires interpretation, which can be costly. On the other hand, census statistics may readily be available but require processing to generate data for analysis of the state of the environment.

After the establishment of a meta-database, updating is necessary as a quality control measure. In the development of a NIEA database it is useful to determine the core set of

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<sup>3</sup>A database reference system or inventory which provides information on database characteristics such as purpose and content, data acquisition methods, units of measurement, geographic and temporal coverage, update frequency, output format, conditions of use, contact point, etc. It is a database of databases.

data needed as the basis for reporting. The list below gives guidance to what can be considered as core data for integrated environment assessment purposes:



|                                     |                                          |
|-------------------------------------|------------------------------------------|
| Land use/land cover                 | Cultivar availability                    |
| Topography                          | Production technology                    |
| Soil                                | Agrochemical pesticide use               |
| Management of protected areas       | Biomass availability                     |
| Hydrology                           | Energy resource inventory                |
| Economy                             | Energy production statistics             |
| Land tenure/cadastral information   | Conversion efficiency                    |
| Demographics                        | Sectoral energy consumption              |
| Administrative/political boundaries | Pest control                             |
| Infrastructure                      | Energy cost                              |
| Natural disasters                   | Sector availability                      |
| Water quantity                      | Energy supply/demand balance             |
| Water quality                       | Emissions/effluents/radiation levels     |
| Hydrogeology                        | Geology                                  |
| Meteorology                         | Species distribution                     |
| River discharge                     | Species ecology                          |
| Use (land)                          | Pollution                                |
| Habitat type/vegetation             | Harvesting/use                           |
| Bathymetry                          | Mineral resources                        |
| Water management issues             | Environment/human conservation practices |
| Disease prevalence                  | Pollutant absorption capacity            |
| Health service information          | Agricultural practices                   |
| Disease control                     | Soil fertility                           |
| Air/water/chemical conditions       | Ground water                             |
| Waste production                    | Soil degradation                         |
| Recycling                           | Air chemistry                            |
| Agricultural statistics             | Air particulates                         |
| Food balance                        | Costs of environmental protection        |
| Per capita consumption              | Epidemics of diseases                    |
| Crop yield                          | Vector biology                           |
| Crop market                         |                                          |

***Climatology*** – includes meteorological records, charts, and statistics

***Demographics*** – include census, birth/death, and migration information

***Economy*** - includes consumption and production, and supply and demand statistics

***Hydrology*** - includes information on water location, quantity, and flows

***Infrastructure*** - includes cadastral and land tenure records, transportation,

*communication, and energy flow networks*

*Soils – includes fertility, acidity, and loss/formation relationships*

*Topography – includes hypsography, hydrography, and political administrative boundaries*

*Water and Air Quality – includes information on point and non-point source pollution and particulates.*

- ❑ **Relevance:** This should be judged against the objectives, conceptual
  - framework and priority issues recognized by the NIEAR
  - programme.
- ❑ **Validity:** The data selected must be valid for the phenomenon being described.
- ❑ **Reliability:** Information from the meta-database on the data source, data collection methods, bias and error estimates, consistency and definition will help to provide a reading on reliability.
- ❑ **Comparability:** Careful comparison between data sets showing different results will be essential to obtain the most credible source.

Overtime it will be necessary for mandated institutions to think of new approaches to provide qualitative and integrated data required to adequately assess and report on ecosystem sustainability. Two avenues for improving the data can be explored. These include remote sensing and integrated monitoring. This should of course be done through partnership and collaboration. At the national level, remote-sensing data can be used to selectively fill the gaps in the available information.

Integrated monitoring assists in the understanding of ecosystem dynamics, integrity and health. It implies the measurement of a wide range of co-located and synchronous parameters related to ecosystem components allowing greater harmonization of data, analysis of linkages and changes and consistent reporting. Integrated monitoring should be seen as a complement rather than a replacement to sector monitoring.

Spatially referenced data is useful for environmental assessment and reporting purposes. In the case of socio-economic statistics, spatial referencing of census data facilitates mapping the environmental impact of human activities. Currently, maps are regarded as an essential tool for assessing the state of the environment and progress towards sustainability.

To date, static maps and atlases have evolved into Geographic Information Systems (GIS). This technology offers the capability of storing, retrieving, analyzing, manipulating, integrating and displaying large amounts of environmental and socio-economic data in a single system.

The following is a list of activities which GIS facilitates:

- a) Overlays of data for purposes of integration and comparison.
- b) Updating of data to illustrate changes overtime.
- c) Accommodation of a variety of scales.
- d) Manipulation to produce new interpreted information.

- e) Incorporating of remotely sensed data and analysis and modeling capability.

The most important features of a GIS are its ability to portray tabular and numerical data in maps and graphic format. Spatial datasets can be converted to the same scale. Such harmonization facilitates overlay of different datasets for the analysis and interaction of many parameters that are typically relevant to many environmental issues. For example, soil capability, slope, rainfall, land-cover and land-use can be used to derive a map of soil erosion.

Nevertheless, GIS systems are highly specialized and require specialized personnel to be able to manage them. This capability is probably available in all African countries at the moment.

### **3.4 Data Uses**

The development of a data network and management infrastructure is a pre-requisite in bringing together integrated monitoring and databases, remote sensing and GIS capability, quality control and standard setting, and the communication networks for data sharing and access. Such an Environmental Information System (EIS) should be based on geo-referenced and systematically stored data for rapid access and use, development of integrated databases, infrastructure management to set standards, and to ensure compatibility of hardware and software.

The major function of such an information system in a NIEAR context should be to facilitate public access to environmental information and data sharing; promote the integration and harmonization of data through the use of GIS and other means; and to improve the consistency and efficiency of responses to requests for data from all levels including sub-national, regional and international reporting. The establishment of such a system means that there will be necessity to designate an institutional center for management and coordination purposes. During the development of the EIS, the design and content of the system must be driven by NIEAR requirements for data rather than the available data supply.

The system should not independently develop to maintain a large number of data sets. This focus is possible if the EIS has the scope to establish meta-databases, provide referral linkages between existing data systems and incorporate and integrate core data sets using ecological and administrative spatial frameworks. The core database should contain only selected processed data integrated at a level of aggregation appropriate for the NIEAR. As this system develops then it can incorporate additional data sets generated for specific IEA projects for future trend analysis.

In order to achieve the required data quality, consistency and comparability, the institution mandated to prepare NIEAR working together with other stakeholders, should develop mechanisms for quality control and standards setting of the data sets.

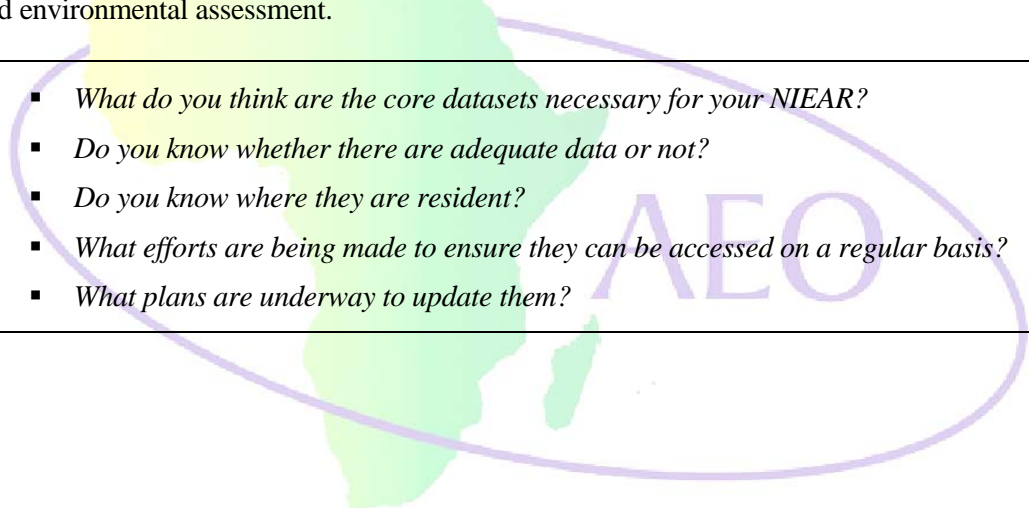
It is recommended that while developing an EIS for the NIEAR, a staged approach should be used. The starting point is to build on existing systems to take advantage of investments already in place. The development of an EIS prototype for NIEAR would benefit from an adaptive and learning-oriented approach.

It would promote consensus building while providing focus to priority areas. The basic components of such a prototype could be a meta-database referral system, the initial core database developed for a specific NIEAR product, a GIS system, and a management

capability system for development and quality control. Subsequent stages can extend the core database, provide services, and widen the network.

In summary, it is necessary to emphasize that the development of a data management system should proceed in stages starting with the basic knowledge of what data are available. As a first step, there is need to make an inventory and evaluate existing data and data sources. This will provide the basis for establishing a database network and a database for reporting purposes. Initially, the core database will probably be statistical in nature, based on the comparative abundance of socio-economic data. The next logical step is the development of a spatial database related to environmental quality, natural resources and socio-economic parameters. The development of the GIS will provide for the analysis of environment and socio-economic linkages.

Further development of capacity in reporting the availability of a core database and linkages to other data providers will enable the focus on data to support development of environmental indicators. In addition, gaps in data will become evident. The country can then begin to work towards the acquisition of new data through improved surveys, integrated monitoring and remote sensing. The development of an information system will therefore provide a holistic framework for data development and its interactive access for reporting and environmental assessment.

- 
- *What do you think are the core datasets necessary for your NIEAR?*
  - *Do you know whether there are adequate data or not?*
  - *Do you know where they are resident?*
  - *What efforts are being made to ensure they can be accessed on a regular basis?*
  - *What plans are underway to update them?*

## AFRICA ENVIRONMENT OUTLOOK

## 4.0 DATA COLLECTION AND INDICATOR DEVELOPMENT

### 4.1 Why collect Data?

Data are usually collected in order to measure environmental performance. Measuring environmental performance is important for a number of reasons, namely:

- To provide feedback on system behavior and policy performance.
- To improve chances of successful adaptations;
- To ensure movement towards common goals;
- To improve implementation; and
- To increase accountability.

What is measured stands a good chance of getting done. In addition, a NIEA report needs to be supported by reliable data and relevant indicators.

Data are the basic units of information, for example the size of a deforested area, collected through monitoring programmes. Data usually require processing to create a suitable indicator, for example the rate of deforestation, to make them more understandable or relevant for decision-making, evaluation and communication. Indicators help to support integrated environmental assessments, but are equally essential in policy evaluation. Indicators, therefore, have a role in all phases and components of environmental reporting.

### 4.2 What are Indicators?

Indicators can be defined as measurements /statistical parameters that help us to present a meaningful picture of what is happening with the environment. They are useful in assisting us to track changes over time (identifying trends). They have also been defined generally as system variables that express and communicate important information to an audience. Indicators vary depending upon the audience, and the geographic, political or social context. Selecting indicators that are appropriate for a given context is important: one cannot simply adopt indicator sets developed elsewhere.

Indicators can be based on physical, chemical or biological measures associated with environmental quality or natural resources. Process indicators can also be used to measure the level of response.

For purposes of clarity, it needs to be fully understood that some indicators measure the physical, chemical or biological changes that have resulted from an intervention. Other indicators refer to the activities that lead to such changes. In order to capture the full picture, physical, chemical or biological changes, process activities, and the results of the process should be measured.

An example of this is the following: As a result of increased awareness and concern on the effects of pollution on the environment, 100 representatives from (100) existing industries were trained in pollution control, environmental monitoring and compliance strategies (process indicator). Following this, 45 of them developed their own self-monitoring programmes (process result). In the end, this resulted in a 25% reduction in pollutants entering the lake (Physical indicator).

Indicators make more sense when compared with a reference value, for example national targets, regional averages, or recommended international standards.

This comparison will enable the country assess where it stands with respect to environmental performance among neighbouring countries, regionally or internationally.

Decision-makers and analysts working at different scales require information at different levels of grouping. Aggregate or composite indices, as they are sometimes called, are those at the highest level of grouping. They are few and incorporate many, often very different, sub-variables. The United Nations Development Programme's (UNDP) Human Development Index (HDI) is one such example. Another common aggregate index used in many countries is the Gross National Product (GNP).

Although highly aggregated, indices are attractive because of their relative simplicity. However, they also carry risks. In particular, aggregates tend to mask real-life complexity and detail so relevant for policy making. Highly aggregated indices are important in making high-level decisions and giving an overall view of progress, but serve their purpose only if their calculation and underlying assumptions are well understood. The index should be readily disaggregated to its components that may help find the specific reasons for it going up or down, and also answer questions of interest to lower level decision-makers.

Indicators are found further down the hierarchy. They require numerical data, preferably time series, to express trends. Data are the primary raw output of monitoring systems, surveys, etc. They normally require analysis to be meaningful to the audience. All environmental assessment and reporting processes ultimately depend on data, but in most cases very few environmental institutions in Africa have access to the resources and capacity to collect primary data. Therefore, data collection usually requires getting it from existing sources, and typically many different ones.

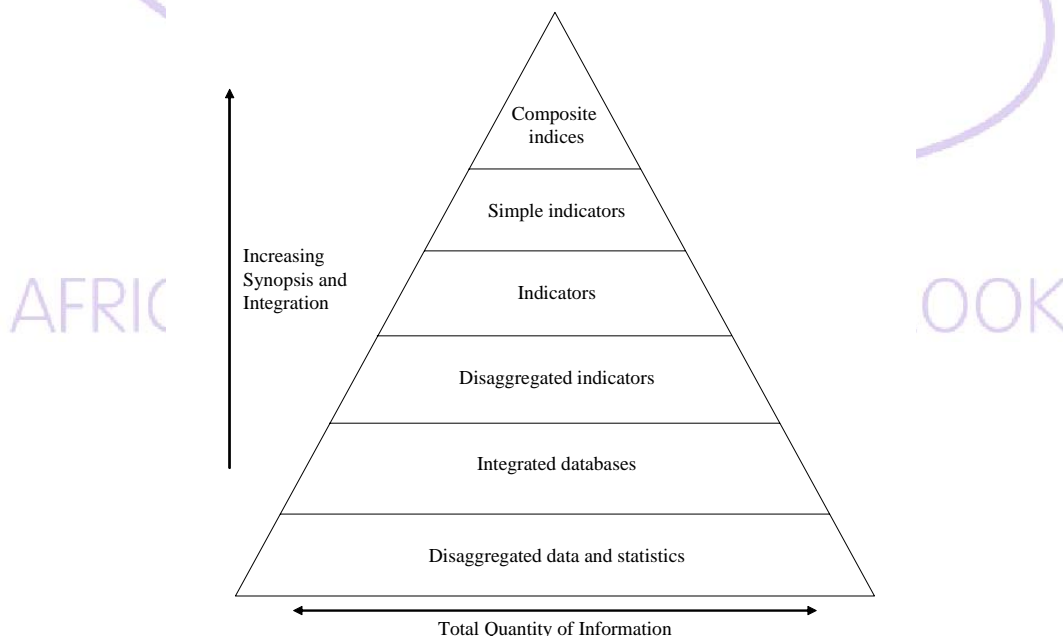


Figure 4.1: Relationship between data, indicators and indices

Source: Australian Department of the Environment, Sports and Territories, 1994

Data for NIEA reporting may be map-based or from Geographical Information Systems. Gathering such data presents unique challenges since it may not be readily available, or at the desired scale. However, it is clear that most environmental issues have a spatial

dimension, and understanding the links requires analysis that takes the spatial aspect into account. Spatial analysis helps one to recognize the following:

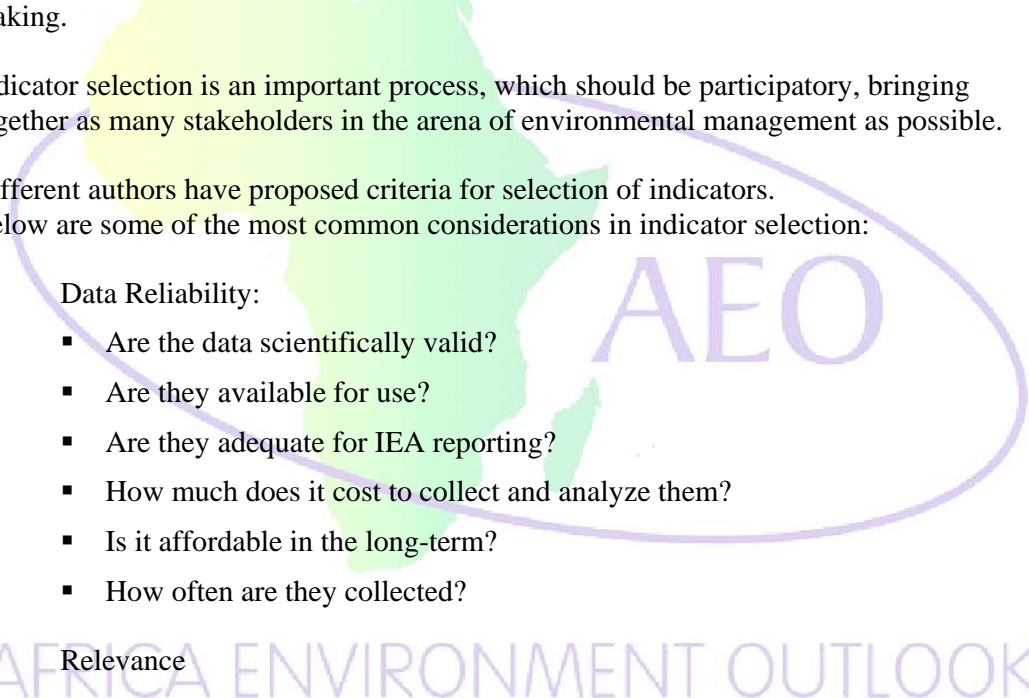
- Transparency issues;
- The importance of spatial scale;
- Functional links between pressures, states, impacts or responses;
- Cumulative effects; and
- “Hot-spots” – areas with high sensitivity and high pressure increase the risk of degradation.

### 4.3 Indicator Development

Normally indicators are developed based on available data, the information needs of decision-makers and of key policy priorities. In other words, indicators express information in ways that are directly relevant to the decision-making process. They are very powerful tools for creating change because they operate at the center of decision-making.

Indicator selection is an important process, which should be participatory, bringing together as many stakeholders in the arena of environmental management as possible.

Different authors have proposed criteria for selection of indicators. Below are some of the most common considerations in indicator selection:

- 
- a) Data Reliability:
    - Are the data scientifically valid?
    - Are they available for use?
    - Are they adequate for IEA reporting?
    - How much does it cost to collect and analyze them?
    - Is it affordable in the long-term?
    - How often are they collected?
  - b) Relevance
    - Are they representative enough?
    - Do they provide adequate coverage for the country?
    - Do they lend themselves to trend analysis?
  - c) Use of Data
    - Are they relevant to the task at hand?
    - Are they understandable by the target audience?
    - Are there historical data that can be used for reference
    - (For comparison) or can existing data be used?
    - Can they be associated with given trends?
    - Can one predict future trends with them?

- Can they be compared with data in the same realm (domain)?

Criteria such as these are useful, but they do not guarantee that the indicators selected will be the most meaningful to any given audience.

#### 4.4 Use of indicators

Selecting the right indicators is an important step, but they need to be used appropriately in assessment and reporting. Misusing available information and indicators in decision making can be just as damaging as not having the required information at all. Indicators can be powerful tools to help identify and support pressure-state-impact-response relationships for both the NIEA report and subsequent policy analysis.

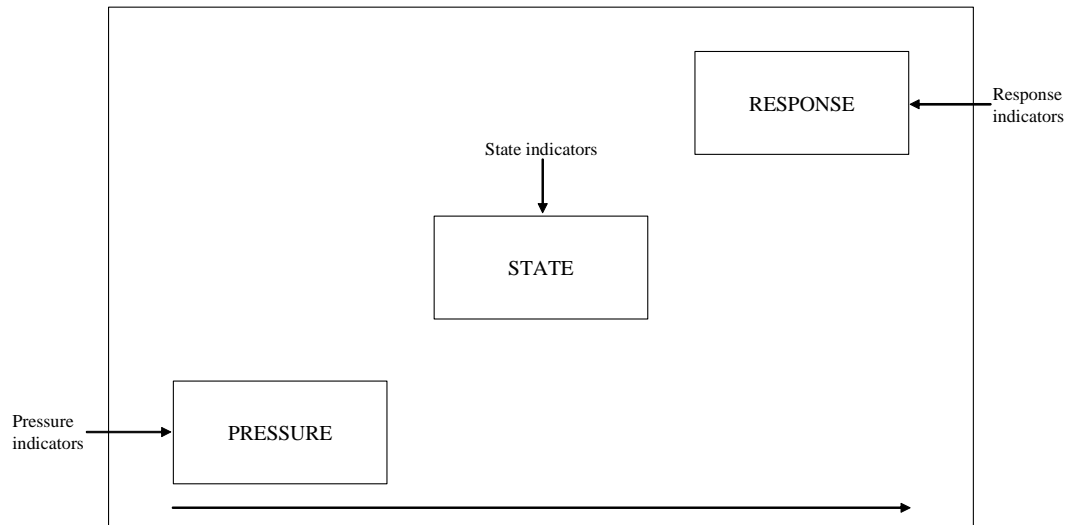


Figure 4. 2: An example for linking Pressure- State- Response indicators.  
Source: Adopted from Hardi and Pinter, 1995

Indicators can also help with overall analysis in the following areas:

- Performance evaluation: indicators help evaluate performance if a basis for comparison is clearly identified; for example, a target specified in a benchmark.
- Thresholds: Thresholds are unique and perhaps the most important bases for assessment; in general, crossing a clearly identified sustainability threshold should be a clear message to decision-makers and society.
- Causal loops: Indicators are important to support claims for causality, such as the links between pressures and environmental conditions.
- Model construction and scenario analysis: Indicators provide real data and support field-testing of models and future scenarios.

#### 4.5 Presentation of indicators

An indicator should be presented in a manner and with information that helps interpretation. Listed below are some of the important elements in indicator presentation:

- A clear title and a place for the issue discussed in the indicator framework (see P-S-I-R framework).

- b) A Figure to symbolize improvement, decline, no change or inadequate data.
- c) A rationale for including the issue in the indicator set (why is this an issue?).
- d) An explanation of current trends including their statistical probability (what are the current trends?).
- e) A title providing detail about the chart (or Figure).
- f) A legend.
- g) Targets for the future (normally pre-set).
- h) Different trend lines for comparison (e.g. for Africa, neighboring countries, or a international average).
- i) Time series data (data collected over time).
- j) A clear unit of measure.
- k) A clearly identified data source for future reference and definition of the indicator.
- l) An explanation of the indicator, including its statistical significance and reliability (what do the numbers mean?).
- m) Identification and explanation of policies and processes influencing the indicator, and a link to other issues and indicators (what are the reasons for the observed trends?).
- n) Identification of possible policy directions and alternatives (What are the available options?).

## AFRICA ENVIRONMENT OUTLOOK

## 5.0 THE INTEGRATED ENVIRONMENT ASSESSMENT REPORTING FRAMEWORK

An Integrated Environment Assessment Report endeavors to answer the following four consecutive questions as shown in Figure 5.1

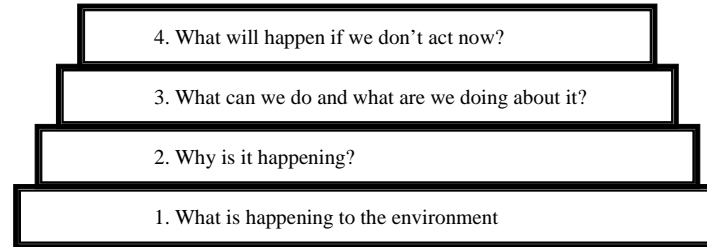


Figure 5.1: The integrated Environmental Reporting Framework.

Source: IISD and UNEP (2000)

- (1) **What is happening to the environment?** That is, what are the environmental conditions, trends, key driving forces, and policies in the country?
- (2) **Why is it happening?** That is, how are policies and actions affecting the state of the environment?
- (3) **What can we and what are we doing about it?** That is, what policies are in place that are intended to deal with the current environmental issues? What are the environmental implications of societal response?
- (4) **What will happen if we don't act now?** That is, where are our policies and response actions taking us? Is this where we want to go? What other policies and actions could be more useful?

To be able to answer the above questions, a NIEAR must go beyond the discussion of environmental issues, description of the biophysical environment and the preparation of environmental data. It has been suggested that a NIEAR should address three areas, namely:

- It should be concerned with the analysis of conditions, trends, key driving forces and policies in the environment and their causes/origin;
- It should assess and interpret implications and impacts of these trends to human health and the economy, and ecosystems; and
- It should provide an assessment of actual and potential societal response to environmental problems in the context of the state of the environment.

The PSIR (or SPIR) matrix should be used to compile available data and information to be used in preparing the report. The following steps will guide you through the reporting process using the integrated environmental assessment approach.

### ***Step1: Identify the key/priority national issues according selected themes***

Here, the key question under investigation is “What are the priority issues for each theme in the country?”

Key issues refer to those that which have noticeably impacted on the environment, or have a high potential for impacting on human health and well-being, ecosystem goods and services, and the economy. The process of selecting priority issues by theme allows for national priorities to be discussed in a more concrete manner, and for each specific theme to be addressed more precisely. Each country should use the internal report production processes and institutional arrangements discussed later in this guide to select the number of themes to cover.

Once the themes to cover have been selected, the key issues under each one of them should be identified. It is advisable to start by identifying the broadest range of issues possible, and then narrow these down to a sufficient number adequate enough to allow a clear understanding of the condition of the theme. Drawing from the AEO experience, it may be of value to reflect on the changing priorities in the country since the Stockholm conference and how these have changed with time. Have these past priorities been effectively addressed and therefore offer important lessons to learn from, or have they been exacerbated by new policy developments and examples of poor response to environmental problems?

The next stage is to prioritize the issues selected resulting in a list of nationally agreed priority issues under each theme. The importance of building consensus at this stage needs to be emphasized. Once the priority issues have been identified and agreed upon by all stakeholders, it is suggested that the following sequence be followed.

1. Prepare a SPIR matrix (see table 5.1 below)
2. Enter the selected theme in column 1 of the matrix.
3. Enter the issues in column 2, next to the theme to which they relate
4. Enter any new emerging issues in column 2
5. Use a separate SPIR matrix for each issue under each theme (see examples in Tables 5.2, 5.3 and 5.4)

## AFRICA ENVIRONMENT OUTLOOK

Table 5.1: Format for typical SPIR Matrix

| What are the issues (problems) |             | What is happening and why                            |                                                                                |                                                                                                   | What are we doing about it and how effective is it        |
|--------------------------------|-------------|------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| 1<br>Theme                     | 2<br>Issues | 3<br>Environmental state<br>▪ Conditions<br>▪ Trends | 4<br>Pressures<br>▪ Societal developments<br>▪ Policies<br>▪ Natural resources | 5<br>Impact<br>▪ Ecosystem functions and services<br>▪ Human health and well-being<br>▪ Economics | 6<br>Responses<br>▪ Formal policy<br>▪ Societal responses |
| Complete                       | Complete    | Complete                                             | Complete                                                                       | Complete                                                                                          | Complete                                                  |



Table 5.2: An example of the Ozone SPIR matrix

| What are the issues (problems) |                 | What is happening and why                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                           | What are we doing about it and how effective is it                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br>Theme                     | 2<br>Issues     | 3<br>Environmental state<br><ul style="list-style-type: none"> <li>▪ Conditions</li> <li>▪ Trends</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4<br>Pressures<br><ul style="list-style-type: none"> <li>▪ Societal developments</li> <li>▪ Policies</li> <li>▪ Natural resources</li> </ul>                                                                                                                                                     | 5<br>Impact<br><ul style="list-style-type: none"> <li>▪ Ecosystem functions and services</li> <li>▪ Human health and well-being</li> <li>▪ Economics</li> </ul>                                                                                           | 6<br>Responses<br><ul style="list-style-type: none"> <li>▪ Formal policy</li> <li>▪ Societal responses</li> </ul>                                                                                                                                                                                                                                                                                                                                |
| Global atmosphere              | Ozone depletion | <ul style="list-style-type: none"> <li>▪ Results in thinning of stratospheric ozone layer</li> <li>▪ Lowers total ozone and create holes in layer</li> <li>▪ Molina and Rowland hypothesised ozone depletion/CFC theory in 1974</li> <li>▪ A seasonal zone has developed over the Antarctic since it was discovered in late 1970s</li> <li>▪ Ozone depletion reached record levels in late 1990s</li> <li>▪ Depleted area in 1998 was 26million km<sup>3</sup></li> <li>▪ Ozone layer predicted to start recovering by 2020 and to pre-1980 levels by 2050.</li> </ul> | <ul style="list-style-type: none"> <li>▪ Production of ODS such as CFC and ODS products</li> <li>▪ Use of ODS by industry</li> <li>▪ Rising living standards and use of ODS products</li> <li>▪ Low cost of ODS products</li> <li>▪ Increased worldwide production of ODS up to 1988.</li> </ul> | <ul style="list-style-type: none"> <li>▪ Adverse effects on human health; skin, eyes, immune systems</li> <li>▪ Increased UV-B affects ecological processes</li> <li>▪ Decline in amphibian diversity has been clearly linked to increased UV.</li> </ul> | <ul style="list-style-type: none"> <li>▪ 1975-1980s-UN and developed country initiatives to address problem</li> <li>▪ Reduction of CFC use banning of CFCs in non-essential aerosols by a number countries</li> <li>▪ Vienna Convention for the protection of ozone layer in 1985</li> <li>▪ Montreal Protocol on ODS in 1987</li> <li>▪ Amendments to Convention</li> <li>▪ Development of alternative substances and technologies.</li> </ul> |

Table 5.3: An example of the Land Degradation SPIR matrix

| What are the issues (problems) |             | What is happening and why                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                      | What are we doing about it and how effective is it                                                                                                                                                                                                                                                                |
|--------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1<br>Theme                     | 2<br>Issues | 3<br>Environmental state                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4<br>Pressures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5<br>Impact                                                                                                                                                                                                                                                                                                                                                                                                          | 6<br>Responses                                                                                                                                                                                                                                                                                                    |
| Land (Africa)                  | Degradation | <ul style="list-style-type: none"> <li>▪ Environmental state</li> <li>▪ Conditions</li> <li>▪ Trends</li> </ul>                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>▪ Societal developments</li> <li>▪ Policies</li> <li>▪ Natural resources</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>▪ Ecosystem functions and services</li> <li>▪ Human health and well-being</li> <li>▪ Economics</li> </ul>                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>▪ Formal policy</li> <li>▪ Societal responses</li> </ul>                                                                                                                                                                                                                   |
|                                |             | <ul style="list-style-type: none"> <li>▪ Africa is worlds second largest continent (30 million km<sup>2</sup>)</li> <li>▪ Only about 6.4% of total land area is used for crop production</li> <li>▪ 17% of land degraded since 1950, including 65% of agricultural land</li> <li>▪ Population density of 249/1000ha is low (442 world average or 1130 in Asia), but ranges from some of the highest, 5,562/1000ha- Mauratious to 19/1000ha in Namibia)</li> </ul> | <ul style="list-style-type: none"> <li>▪ Long-term changes in climate</li> <li>▪ Droughts</li> <li>▪ Population growth expected to almost double between 1997 and 2025 to 1,453million, representing about 18% of predicted world population</li> <li>▪ Continent has poor agricultural practices</li> <li>▪ Deforestation leading to exposure of soil cover, erosion, loss of fertility</li> <li>▪ Poverty and urbanization</li> <li>▪ Inequitable land distribution</li> <li>▪ Unfavourable land tenure and ownership systems</li> <li>▪ Shortage of production land</li> <li>▪ Export oriented policies results in increased consumption of fertilizers, pesticides and water</li> </ul> | <ul style="list-style-type: none"> <li>▪ Soil erosion and degradation</li> <li>▪ Lowering of groundwater tables</li> <li>▪ Degradation of vegetation cover and watersheds</li> <li>▪ Loss of biodiversity</li> <li>▪ Reduced area of arable lands, food production and sufficiency</li> <li>▪ Decline in contribution of agriculture to GDP</li> <li>▪ Increased poverty</li> <li>▪ Rural-urban migration</li> </ul> | <ul style="list-style-type: none"> <li>▪ Government policies to improve agricultural practices</li> <li>▪ Reform of land tenure and land distribution</li> <li>▪ Population policies</li> <li>▪ Removal of agricultural subsidies</li> <li>▪ Implementation of national, sub-regional, etc programmes.</li> </ul> |

Table 5.4: An example of the Marine and Coastal Environment SPIR matrix

| What are the issues (problems) |                                               | What is happening and why                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       | What are we doing about it and how effective is it                                                                                                                                                                                                                     |
|--------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Theme                        | 2 Issues                                      | 3 Environmental state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 4 Pressures                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5 Impact                                                                                                                                                                                                                                                                                              | 6 Responses                                                                                                                                                                                                                                                            |
| Marine and Coastal Environment | Poor Domestic Sanitation in Coastal Districts | <ul style="list-style-type: none"> <li>▪ Environmental state</li> <li>▪ Conditions</li> <li>▪ Trends</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>▪ Societal developments</li> <li>▪ Policies</li> <li>▪ Natural resources</li> </ul>                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>▪ Ecosystem functions and services</li> <li>▪ Human health and well-being</li> <li>▪ Economics</li> </ul>                                                                                                                                                      | <ul style="list-style-type: none"> <li>▪ Formal policy</li> <li>▪ Societal responses</li> </ul>                                                                                                                                                                        |
|                                |                                               | <ul style="list-style-type: none"> <li>▪ Poor domestic sanitation is widespread and pervasive in all 21 coastal districts of Ghana</li> <li>▪ Forecast of domestic sanitation loads by districts show alarming trend to the year 2020 when Ghana is expected to attain a middle level income status</li> <li>▪ By 2020, some 13 districts will attain domestic pollution levels of Accra today if Integrated Coastal Zone Management programmes are not implemented or if the implementation fails to achieve target results</li> </ul> | <ul style="list-style-type: none"> <li>▪ Inadequate sanitary infrastructure and open defecation</li> <li>▪ Low levels of education</li> <li>▪ Poverty, urban growth and development of unplanned settlements High population density Inadequate arrangements for treatment and final disposal of sewage Inefficient drainage systems</li> <li>▪ Financial constraints (Levies and financing)</li> <li>▪ Poor management of sewage treatment infrastructure</li> </ul> | <ul style="list-style-type: none"> <li>▪ High incidences of Water-related infections in coastal communities</li> <li>▪ Disincentive to tourism promotion</li> <li>▪ Contributes to frequent flooding in coastal towns</li> <li>▪ Contributes to water pollution</li> <li>▪ Poor aesthetics</li> </ul> | <ul style="list-style-type: none"> <li>▪ Local Government Act</li> <li>▪ Privatisation of waste collection</li> <li>▪ Education and awareness creation</li> <li>▪ Construction of sanitary landfills</li> <li>▪ Development of guidelines on waste disposal</li> </ul> |

AFRICA ENVIRONMENT OUTLOOK

***Step2: Search for and assemble the data and information on state, trends, pressures, impacts and policy responses related to each issue.***

The key question to answer at this stage is: “What data and information are available to help with the analysis?”

The analysis must be based on reliable data and information on each issue, including:

- Environmental state and trends (retrospectively for as long as existing data allows)
- Pressures on the issue, including environmental and other sectoral policies that were adopted in the past, and the occurrences of natural events and processes that might have had an effect on the environment.
- Impacts on the sustainability of ecosystem goods and services, human health and well-being, and the economy.
- Information on policy responses and their performance.

This step involves a comprehensive search for data and information relevant to the issue, from reliable published sources (e.g. national reports, sector reports, reports to conventions, databases, statistical bulletins, etc). There is also a lot of information available from unpublished sources (such as internal reports). If such sources are reliable and the data based on valid methodologies and approaches, they can be used to supplement quantitative data. Although quantitative data are preferred, qualitative information and descriptive observations can be useful where the former are lacking. The search for data should always be guided by what is needed to analyze the key issues identified and should not be viewed as an exercise to compile a compendium of all datasets. As mentioned earlier, for purposes of trend analysis, data on the issue should be collected from as far back as possible. Spatial data should be collected where the spatial aspects of the issue are important, and if possible capture the indicators rather than raw data that require interpolation.

**Step 3: Carry out the State-Pressure-Impact-analysis**

The key question to answer here is: “What is happening to the environment, and why?”

The data and information obtained in the previous step should be analyzed within the SPIR framework described earlier to give a concise overview of the state and major trends in the issue, in terms of pressures, as well as the impacts (again here, retrospective analysis is useful if data available can allow this).

***Step 3.1. Analyze the environmental state and trends as far back as available data can allow.***

1. Referring to the matrix (Column 3) and using appropriate environmental indicators where relevant, describe the environmental state (condition and trends) related to the issue.
2. Referring to the matrix (Column 4), trace the development and evolution of the major pressures during the time period.
3. If possible, use graphs to show variability in indicators over time.
4. Explain possible reasons for any pronounced changes in the trajectory of the graphs in terms of pressures, including policies and natural processes/events that might have caused such changes.

5. Discuss any inter-linkages that might exist related to the theme or issues.

**Step 3.2: Analyze the impacts of the environmental state and trends in each priority issue (also retrospectively depending on available data)**

1. Analyze the impact that the environmental state and trends in each priority issue have had on human health and well-being, ecosystem goods, services and functioning, and the economy. Use suitable indicators, if available, to describe the impacts.
2. Where possible, use graphs to help illustrate the trends in impacts.
3. Indicate if there are any linkages with other sectors or issues.
4. Describe the spatial dimension of the impacts (sub-national) including factors responsible for the spatial differences.
5. Where possible, draw on existing studies to present an economic analysis for each type of impact.
6. Discuss the anticipated impacts of any emerging issues.

#### **Step 4: Analyze policy responses in relation to state and trends, and assess policy performance.**

Policy analysis is very important in environmental reporting. This is because it is the existing policies that eventually shape the state of the environment. There are national policies, which influence our actions with respect to the resources we use.

If one considers the integrated environmental assessment and reporting structure, assessing environmental policy helps to answer two key questions:

- a) *Why is it happening:* that is, how are policies affecting the state of the environment? Policies can be the driving forces behind either desirable or undesirable environmental outcomes.
- b) *What are we doing about it:* that is, what policies are in place that are intended to deal with the current environmental issues?  
Some policies may have been formulated to influence current environmental conditions, although there may be a lag time before effects are visible.

#### ***But, what is a policy?***

Policy remains a vague concept. Jenkins (1978) defines it as “A set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them within a specified situation where these decisions should, in principle, be within the power of these actors to achieve”.

Policies are formulated in many ways. Three examples are listed below (Figure 5.2):

- a) *Urgent, reactive policies:* The highest priorities of government often require policies outside the normal policy-making process. For example, policies on environmental emergencies, formulated quickly in response to sudden threats can have significant consequences on a wide range of established policies.
- b) *Routine decisions:* Most policies are developed through routine decisions that are made according to well-understood and pre-determined fiscal frameworks and broad policy objectives.

- c) *The gray - zone:* Gray-Zone policies are the ones in the middle, between exceptional and routine ones. Such policies are few, have a high political profile and do not always follow the conventional policy-making process.

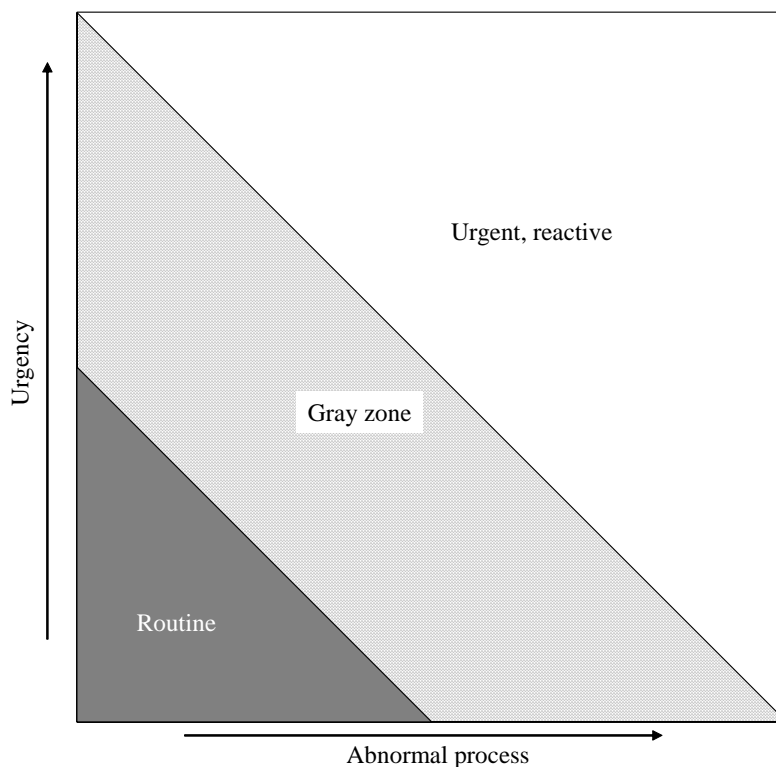


Figure 5.2: Policy formulation contexts  
 Source: Adapted from IISD and UNEP, 2000

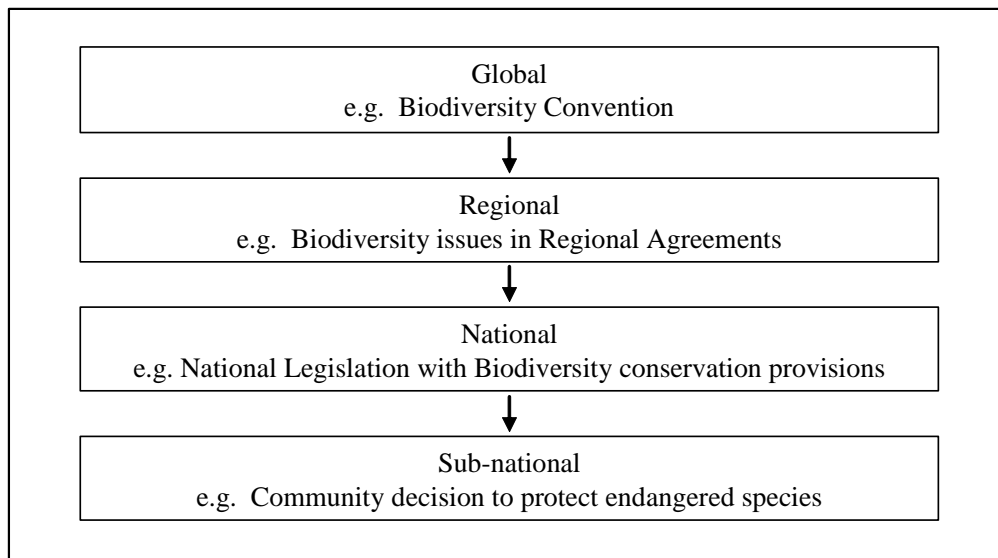
National processes that integrate environmental issues into policy-making can accommodate routine decisions more easily than exceptional ones.

With respect to their attributes, policies may be: general or specific; explicit or implicit; reactive or proactive; evolutionary or revolutionary; independent or integrated with other policies (nested). Also, policies can be anywhere between these extremes.

Explicit policies are clearly articulated and announced. Examples include Presidential pronouncements (including speeches), ministerial statements, legislative statements, regulations, white papers, press releases and laws.

In contrast, implicit policies are not as clearly stated or explained, but can be as equally powerful. Often, policies result simply from the incremental accumulation of decisions made overtime. Although each of these individual decisions may be of limited environmental consequence, together they can produce far-reaching effects.

Policies can exist in hierarchies, i.e., they can be nested, as shown in the example below.



Policies do not exist in isolation. There are many other unintended linkages that exist, both among various environmental policies and between environmental and other types of policies. An example is illustrated below:

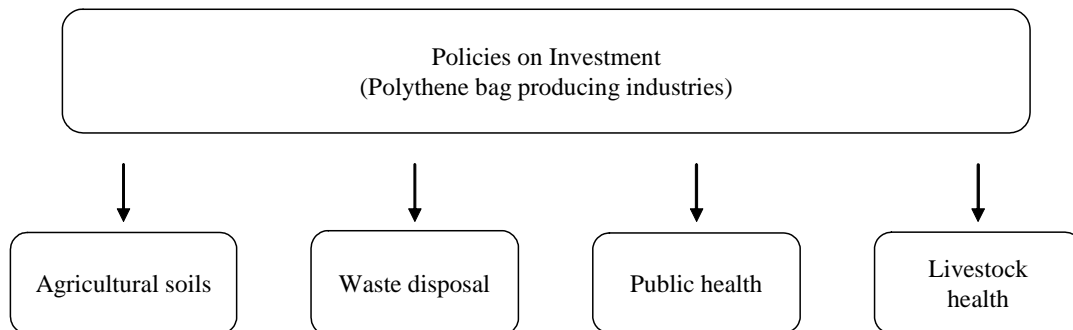


Figure 5.3: Linkages between policies.

## 5.1 Policy and the Environment

The reality of the physical and living environment, including structures created by society, is a key determinant of the policy process and context. Human values, beliefs and ideas are other determinants of policies that govern human behavior.

As environmental conditions and socio-economic priorities evolve, policies need to be continuously evaluated and adjusted. During environmental policy evaluation and analysis, it is important to be consistent and structured. The following steps are recommended:

1. Identify and list current policies and legislation with significant effects on the environment (keep an updated list of national and international policies and laws that fall in this category).
2. Identify performance criteria for the selected policies.
3. Evaluate selected policies.

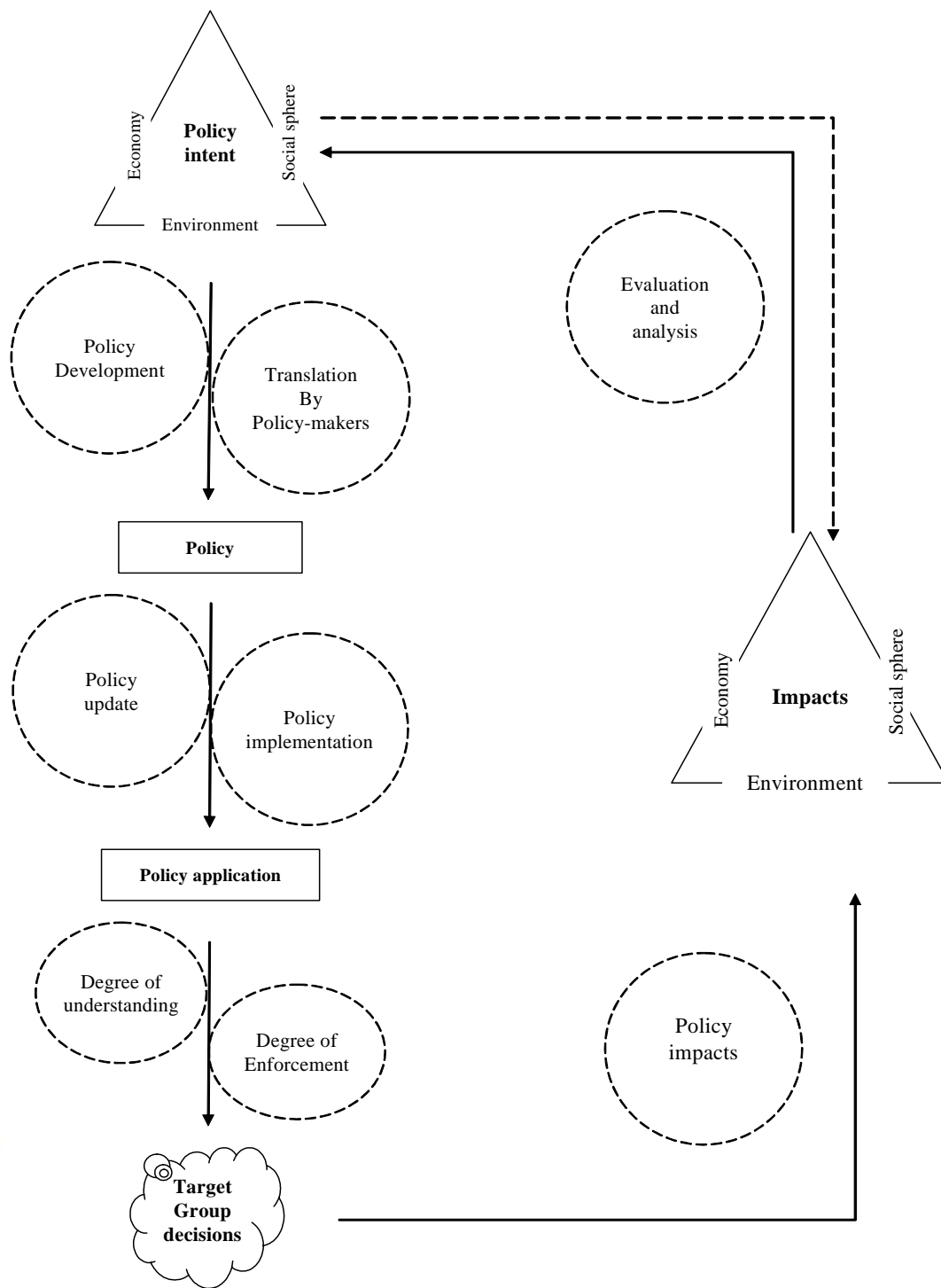


Figure 5.3: An example of the Policy cycle for environmental reporting  
 Source: IISD and UNEP, 2000 (Modified from Boyle, Kay and Pond, 1996)

**Step 4.1: Identify and list environmental policies and legislation.**

The key questions to answer here are the following:

- What types of policies are there to choose from?
- Which policies should be included in the analysis?

The section that describes the State of the Environment in the report can be used as a reference for listing the existing policies. At this stage what is important is to find and evaluate their main policy drivers, whether environmental, economic or social.

Many seemingly unrelated policies have significant potential to adversely affect the environment. Others can have unintended yet beneficial effects on the environment. Thus, it is important to be aware of and to understand the implications of such policies.

Both the causes and solutions to environmental problems can be outside the domain of the environment and environmental policies, just as environmental policies can have effects outside the environmental domain into those of the economy and society. For instance a government can come up with an Investment Policy – simply to attract foreign investments in the country. But this, though successful, may end up having environmental side effects that cannot be ignored. This includes giving investment incentives to firms engaged in production processes that are not environmentally benign, or encouraging investment in production of materials with a high potential for environmental damage, e.g. polythene bags or certain types of chemicals.

In conducting policy analysis, one must select a relatively small number of the most relevant policies. The range of policies with environmental consideration is, of course, broad. However for purposes of guidance, a number are listed below:

- International mechanisms (conventions, treaties and other protocols).
- National (Sector and other) policies promoting sustainable development.
- Sub-national (Local) policies.
- National legal instruments (laws).
- Sub-national (Local) legal instruments.
- Economic instruments.
- Awareness raising and education policies.
- National financial and fiscal policies.
- Voluntary standards and instruments.
- Social policies.

Not all the above policy categories will be of priority to every country. In addition, it should be known that a mix of several policies could be used to achieve the same aim. Also, as earlier mentioned, policy behaviour is influenced by the context of the country and the international community. Cultural issues, the actual policy mix, historical precedents and the like may all have an effect on how well policy works.

The following criteria can be used in selecting policies to include in environmental policy analysis:

- Relevance for the public and decision-makers.
- Link with key environmental priorities identified in the section that describes the current state of the environment in the report.
- Affecting the health, income and well being of a large number of people.
- Importance of policy response to an environmental situation that is: physically severe; changing rapidly; irreversible; related to the country's international obligations; potential of the policy to cause disruption or conflict; potential for

easy and feasible solutions; and uniqueness of current policy initiative for the country.

**Step 4.2: *Identify the Performance criteria for the selected Policies***

Once manageable numbers of high-priority policies have been identified, the next step is to determine criteria that help evaluate their performance from an environmental and sustainable development perspective.

In an ideal situation, policies should have in-built performance criteria and the requirement for evaluation, and the criteria easily associated with routinely monitored indicators. In such a case, evaluation is relatively straightforward assuming that both the indicators and criteria appropriately represent the effects of the particular policy.

However, policies are often designed without clearly defined and specific performance criteria or based on criteria that are not necessarily related to environmental performance.

This is most common with economic policies (refer again to the Investment Policy). Although these have very significant links to environmental issues (they are sometimes the key drivers of environmental change), their in-built evaluation criteria are usually limited to economic performance (e.g. the level of financial investment attracted into a country per year). This makes their evaluation particularly challenging from an environmental and sustainable development perspective.

Performance criteria can range from the general and descriptive (e.g. whether a policy is in compliance with broadly defined principles), to the specific and quantitative (e.g. target value associated with a specific indicator on a specific time scale). In whatever case, they provide a basis for comparison between planned or desirable performance.

Examples of the main types of performance criteria are listed below:

- **Benchmark:** This takes the form of a comparison between the documented best-case performance related to the same variable within another entity or jurisdiction e.g. a neighbouring country or the best performing country in the region with respect to that variable. For example one could use the highest percent of people with access to safe drinking water in a given Sub-regional organization ( For example SADC) as a benchmark.
- **Threshold:** This reflects the value of a key variable that will elicit a fundamental and irreversible change in the behaviour of a system. The policy is then evaluated based on its role in making the system move towards or away from the threshold in any given period. An example here could be the Maximum Sustainable Yield of a forest.
- **Principle:** A principle is a broadly defined and often formally accepted rule. In cases when the definition of the principle does not include a relevant performance measure, the evaluators should try to identify one as part of the evaluation process. An example is that: "The policy should contribute to increased environmental awareness."
- **Standards:** These are nationally (or internationally) accepted properties for procedures or environmental qualities. The policy is useful if it

helps keep performance within limits. An example is water quality standards for human consumption.

- Policy: These are determined in a political and/or technical process taking past performance and desired outcomes into consideration. An example is health spending to be 20% of the national budget.

#### ***Step 4.3: Evaluate Selected Policies***

The ultimate purpose of policy evaluation is to influence decision-making and initiate policy change when and where required. It is also quite clear that a recommendation for a policy shift is more likely to be adopted if those who are to make the move (such as the national environmental management bodies, policy and law making entities in the country) are involved in the analysis from the point where critical environmental issues are identified, indicators and criteria are selected and the link to specific policies confirmed.

Policy evaluation focuses on comparing the actual and expected performance of a given policy based on relevant performance criteria. As neither environmental issues nor policies can exist in isolation, any given environmental trend will be a combined result of interacting policies and natural factors some of which are outside the control of human decision-making. For example, change in water quality can be a result of not only the agricultural policies affecting land-use and run-off as well as policies affecting wastewater discharge, but also seasonal weather patterns. Also, any given policy can have an impact on a range of environmental factors. For instance, policies that lead to increased energy consumption may have implications for air quality, overall material use and waste production, but also global climate change. It may be that a given policy does well with one particular type of environmental impact and criteria, but fares poorly with another.

In conducting this evaluation, the following should be considered:

- What was the policy intended to address? What were the objectives?
- What was the driving force behind the development of the policy?
- How well was the policy implemented and supported?
- Was the policy developed without reference to other priorities or was it too ambitious for local contexts?
- If policy objectives were met (actual versus expected performance).
- If success was achieved, i.e. where policy has had a demonstrable effect on an environmental problem or trend over a selected period of time.
- If policy failed i.e. where policy clearly failed to have any effect on the targeted problem, or even had unexpected negative consequences.
- Factors affecting performance (reasons why policy was a success or failure).
- If policy addressed symptoms or root causes.
- Cost effectiveness of policy instruments.
- Links with key environmental and sustainable development indicators.
- If it was necessary to make major trade-offs.
- If policy was related to the country's international obligations.

- Indicate if any insights were gained and policy gaps identified.
- Indicate where the environment has influenced policy and vice versa.

(See summary in the SPIR matrix, column 6).

***Step 4.4: Analyze the impacts of Major Environmental Actions on the environment***

When analyzing the impacts of policy, a brief assessment of the impacts of Major Environmental Actions that relate to the issues being addressed should be included. The assessment will mainly focus on regional and global conventions, but will also cover soft laws, environmental funding mechanisms and other international environmental mechanisms and bodies as appropriate. The impact of development issues and socio-economic factors (e.g. trade pattern, technology transfer) associated with the implementation of international agreements, as well as linkages with other international agreements that have impact on the environment (e.g. trade agreements) should also be considered in this assessment.

Types of agreements to be considered include:

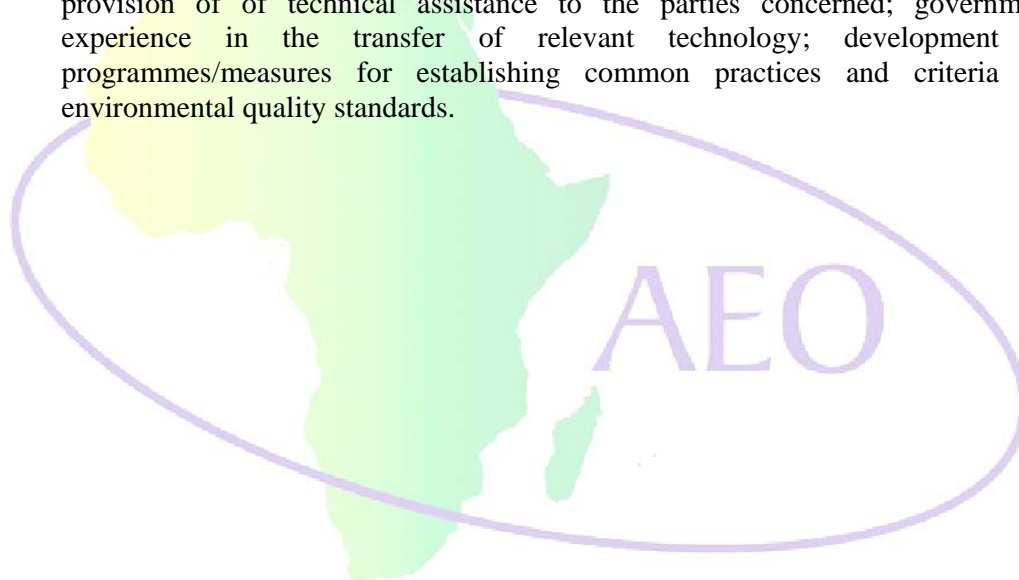
- Major Environmental Actions such as CBD, Basel Convention, CITES, Convention on the Conservation of Migratory Species of Wild Animals (CMS), Ozone Convention; and Protocols such as FCCC, CCD, and Ramsar. Natural Heritage and Law of the Sea can be addressed in this section if relevant to particular countries.
- Sub-regional and Regional binding or non-binding agreements such as: Protocol Concerning Protected areas and Wild Flora and Fauna in the Eastern African Region. Only Major Environmental Actions that have already come into force should be considered here.
- Other selected global/regional agreements such as Agenda 21, codes of conduct like the FAO Code of Conduct on Responsible Fishing, action plans like the Global Plan for the Protection of the Marine Environment from land based activities, mechanisms such as the Global Environment Facility (GEF) and institutions such as WTO, CSD.

It is important to consider implementation and compliance with respect to Major Environmental Actions. Here, the analysis should focus on the measures adopted (policy responses) for the implementation and effective compliance with the provisions of sub-regional, regional and international agreements at national level, such as:

- Signature, ratification and accession: these are proof of political acceptance of the convention and one measure of its effectiveness.
- Awareness building and public information: this refers to the awareness among decision makers and the public on the issues dealt with in agreements and measures already taken to raise such awareness (e.g. reflected in the priority given in the national policy or public support for the need to take action).
- Adoption of national legislative and regulatory measures and their enforcement. Here, when assessing national legislation and regulatory measures, attention should also be given to enforcement measures, both judicial and extra judicial, which can be invoked when such obligations are not respected.
- Development of national institutional bodies: includes coordination of relevant ministries and other government bodies; establishment of local sustainable

development committees; bilateral consultation/cooperation procedures and mechanisms to deal with transboundary issues related to agreements.

- Other measures for the implementation of conventions: these include economic instruments (e.g. subsidies and taxes); tradable permits; debt for nature swaps, and other measures for internalization of environmental costs.
- Monitoring and reporting compliance: should cover the monitoring of compliance with provisions of the agreements by the country. Reporting envisaged under the agreements on the programmes/measures adopted for the implementation of the respective agreements should also be covered.
- Financing: Should cover any financing sources and mechanisms for the provision of commitments outlined in Major Environmental Actions.
- Capacity building and technology transfer: this refers to activities to enhance capacity of governments to implement the requirements set out in the agreements, including financial and human resources; programmes and measures to ensure the use of best available technology and/or scientific assistance and cooperation or the provision of technical assistance to the parties concerned; government experience in the transfer of relevant technology; development of programmes/measures for establishing common practices and criteria for environmental quality standards.



## AFRICA ENVIRONMENT OUTLOOK

## **6.0 RESPONSIBILITIES**

### **6.1 We Need to Know Why**

The key objectives of the NIEAR guidelines are:

- a) To assist African countries build their own capacity to be able to regularly provide the policy and decision makers, and the public with up-to-date, timely, reliable, accurate and accessible information on the state of the environment.
- b) To provide a foundation for improved decision making at all levels, from the individual to national and international organizations.
- c) To facilitate the measurement of progress towards sustainability of the natural resources.
- d) To raise awareness and promote understanding of environmental trends, conditions, key driving forces and policies, and their causes and consequences among stakeholders.

### **6.2 We Need to Know the Tasks Ahead**

The typical generic Terms of Reference for a NIEAR are as follows:

- a) To make an inventory of the available environmental data and information, the sources, and how it is stored in the country.
- b) To provide information on the current environmental conditions within the country.
- c) To provide information on the key driving forces and policies influencing the environment.
- d) To provide analytical information on the state and trends of the environment.
- e) To analyze the impact of existing policies (national/international) on the environment.
- f) To provide information on the human and natural causes of changes in the environment.
- g) To provide information on the implications and impacts of the changes on human health, the economy and ecosystems.
- h) To make an assessment of the actual and potential societal response to environmental problems.
- i) To make an assessment of environmental implications to societal responses.

The key areas where information for NIEAR is required include:

- Human population density, growth rate, death rate, etc.
- The relationship between poverty, natural resources management and socio-economic development.

- The impact of human activities on the environment.
- The available industrial activities in the country and their impact on natural resources.
- Sources of pollution in the country.
- The use of natural resources and the associated problems relating to the use of these resources.
- Available domestic animals.
- The status of wildlife in the country.
- Cultural setting, traditions, values and heritage in relation to the environment.
- Any other information that will be useful for NIEAR, AEO and GEO.

A careful selection of case studies to include under the various sections of the NIEAR is highly encouraged because these tend to bring alive what may otherwise seem abstract to some sections of the audience. Case studies assist in making the information relevant to the public and easily drive the message home.

### **6.3 Managing the reporting process.**

This section focuses on NIEA reporting as a process, and the organizational issues necessary to provide the required leadership see also Figure 6.1. It addresses the following specific questions.

- a) Why is the process important?
- b) Who should manage the process?
- c) Who takes part?
- d) What is the preferred institutional setting?
- e) What is the existing policy and legislative mandate?

#### ***Why is the process important?***

Environmental reporting requires learning both from individuals such as professional colleagues, and organizations. The key opportunities for learning emerge in the process of producing new information by interacting with others. In addition, individuals representing different disciplines, organizations, or more broadly, different social interests, may also have different though equally legitimate views on the environment and the economy that they can bring into the reporting activity.

It is suggested that the process be based on the steps below:

#### ***Step 1 Answering key questions in the sequence (see Figure 5.1)***

The four questions associated with the key steps in Figure 5.1 should be answered in sequence. It is important to first know what is happening to the environment in order to answer why it is happening. One needs to have a clear idea about the driving forces and root causes to talk about what one can do better or potential consequences of inaction.

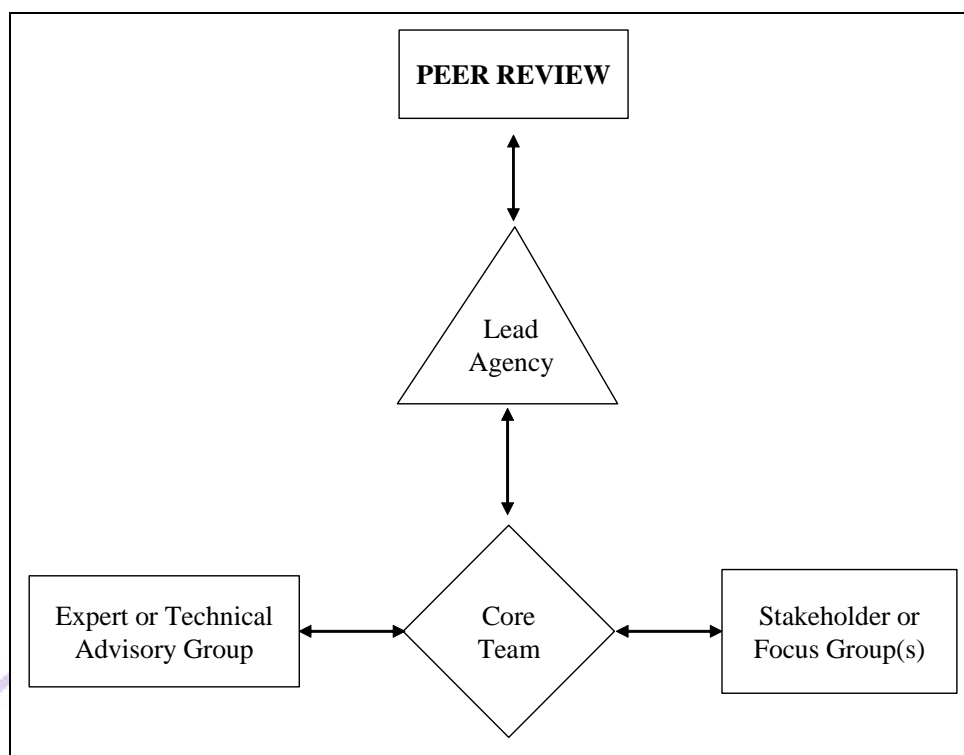


Figure 6.1: General organizational chart to manage the reporting process

### ***Step 2 Dealing with fragmented knowledge by facilitating cooperation***

This step is aimed at bringing together information and insights that usually lie scattered across a variety of disciplines and organizations. Thus, it may involve bringing together people and organizations that do not have a history of collaboration. There is a potential for tension building up along the lines of professions, bureaucracy, politics, etc. Therefore, trust, confidence, and cooperation both between organizations and key individuals are important for success, but can only occur overtime and need facilitating.

### ***Step 3 Ensure strategic Participation***

The purpose of environmental reporting is to improve the understanding of societal and environmental interactions and to help catalyze change. The best way to ensure that insights and recommendations arising from the reporting are seriously considered in the decision-making process is to involve those who need to make those decisions and are affected by their outcome.

### ***Step 4: Making uncertainties and assumptions clearly known***

Participation and cooperation of diverse interest groups throughout the reporting process is essential. Nevertheless, this comes with significant challenges especially with existing uncertainties and the various assumptions made. These need to be clearly known; otherwise they may interfere with the smooth conduct of the process.

## Who should manage the Process and who should take part?

These questions need to be decided upon early in the process. It is expected that the organizational structure to be set up will work throughout the entire NIEAR preparation process. It is therefore important that participants understand the need for long-term commitment. The institutions mandated to produce NIEARs such as Ministries of Environment, Environment Management Authorities, Agencies, or Commissions should be in charge of the process.

Environmental reporting is a tool to aid communication between science and policy. This role is important because institutionalised reporting can provide a forum for continuous dialogue between the stakeholders and society in general. In order to bring science and policy together, a participatory process is necessary. Though participation needs to be representative, the number of participants in this assessment and reporting needs to be limited to keep the process manageable.

The make up and responsibilities of the above groups may be described as follows:

- **The core team:** Preferably not more than five members from key institutions and non-governmental organizations in the country. Other important key stakeholders may be considered.
- **Peer review:** The purpose of the peer review is to ensure that the quality of the report meets the required standards. The process will ensure that data are used correctly and policy analysis reasonably applied. This service may be provided by a group of professionals or institutions such as universities.
- **Lead Agency:** This is the agency mandated by the country to manage/prepare the NIEAR. The chief facilitator may be an individual selected by the said institution. The mandated institution should identify NGOs those entities with the required data and request them to make it available.
- **Expert or Technical Advisory Group:** Participants from various technical institutions and organizations who have specialized knowledge and direct access to primary data.
- **Stakeholder or focus groups:** These are representatives of a variety of social organizations. Their purpose is to inform decision-makers about social preferences, opinions and concerns and to provide decision support for complex policy issues. They include NGOs, businesses, the media, academic institutions, youth groups, indigenous peoples' groups, farmers' groups, women's groups, political party representatives, unaffiliated citizens, the poor and disenfranchised, civil society organizations, etc.

*Question:*

*Who do you think should participate in the preparation of the National integrated Environmental Assessment Report in your country?*

*What is the preferred institutional setting?*

In some cases, responsibility for NSOE reporting may be given to an independent or semi-independent agency. Others may prefer that national institutions only oversee the process, but contract the private sector to undertake the actual preparation of the report (at a fee).

For purposes of reference listed below are the common institutional models for environmental reporting.

Table 6.1: Common institutional models for NIEA reporting

| Type Of Agency                              | Possible Advantages                                                                                                                                                                                                            | Possible Disadvantages                                                                                                                                                                                        |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Existing government department or structure | <ul style="list-style-type: none"><li>▪ Limits proliferation of special agencies</li><li>▪ Existing networks</li><li>▪ Greater collaboration within government</li><li>▪ Access to data and information</li></ul>              | <ul style="list-style-type: none"><li>▪ Not recognized as independent</li><li>▪ Limited public and other stakeholder involvement</li><li>▪ Tends to protect the status quo</li></ul>                          |
| Independent or Semi-independent agency      | <ul style="list-style-type: none"><li>▪ Autonomous</li><li>▪ High profile and visibility</li><li>▪ Potential for innovation and greater efficiencies</li><li>▪ Links to non-governmental stakeholders and Scientists</li></ul> | <ul style="list-style-type: none"><li>▪ Requires formal powers of access to data</li><li>▪ Lack of networks</li><li>▪ Potentially insecure funding</li><li>▪ No authority associated with reporting</li></ul> |

Source: Adapted from Environment Canada (1992), and Pinter et al (2000).

### ***Legal Mandate***

Environmental reporting is a complex task and may not produce the desired results unless the capacity to perform it adequately is permanently retained. This requires that the mandates and capacities to carry out this task are considered as part of the core infrastructure necessary for mandated institutions to produce these reports.

Legislation enables a national reporting agency to play a catalytic and supporting role in building reporting capacity at national and sub-national levels. In addition, the legislation could also be used to encourage data sharing and harmonization of reporting initiatives. Finally, the legislation could set the stage for external consultations and participation, including use of advisory bodies.

As mentioned earlier, some countries have already included the legal requirement for IEA reporting in their national legislation. The development of a good NIEAR product will depend on a network of

institutions and individuals working together in partnership. Such partnership should seek to achieve the following:

- Identify information needs and sources.
- Specify protocols for collaboration including data and information sharing.
- Identify shared reporting and cost-saving opportunities.
- Establish cost-sharing arrangements for data collection and management.

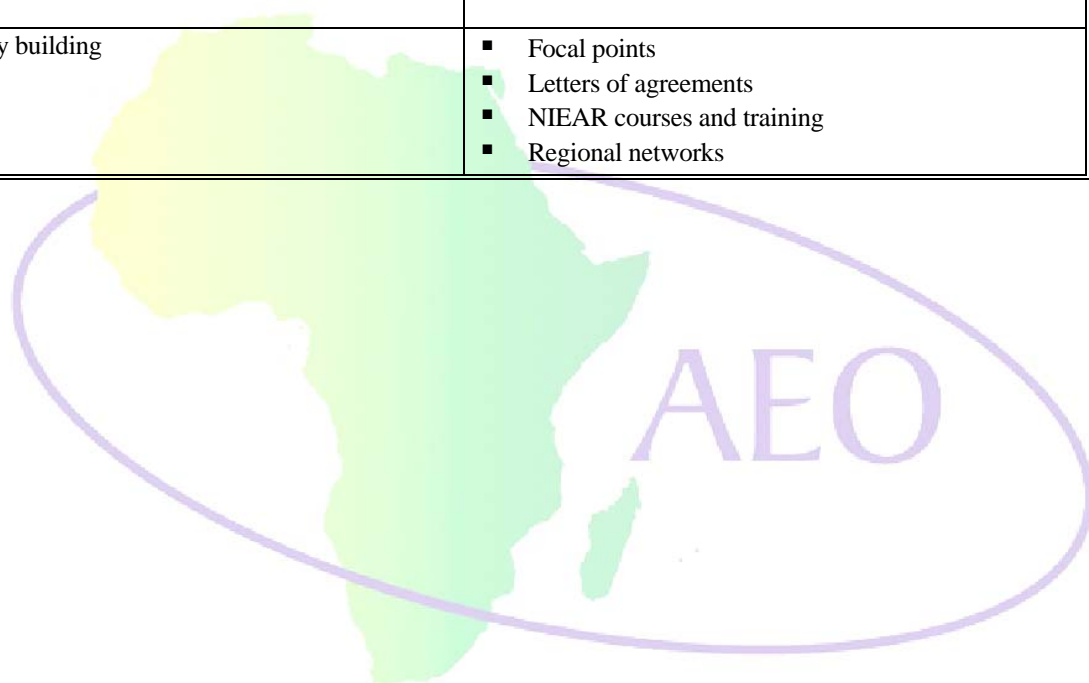
The partnerships relevant to NIEAR can also include the following issues:

- Acquisition of strategic advice and direction.
- The identification of environmental issues requiring reporting.
- The harmonization of data collection and management.
- The development of indicators and cooperative products.
- The satisfaction of special interest group needs.
- Capacity building.
- The provision of expertise to review the draft product.

Table 6.2: Types of Partnership

| <b>Purpose</b>                                | <b>Mechanism</b>                                                                                                                                                                  |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strategic advice                              | <ul style="list-style-type: none"> <li>▪ Advisory committee</li> <li>▪ Discussion paper</li> <li>▪ Workshop for feedback</li> </ul>                                               |
| Programme evaluation                          | <ul style="list-style-type: none"> <li>▪ Advisory committee</li> <li>▪ External review and consultation</li> </ul>                                                                |
| Programme optimization and harmonization      | <ul style="list-style-type: none"> <li>▪ Partner committees</li> <li>▪ Focal points</li> <li>▪ Memoranda of understanding</li> </ul>                                              |
| Data access and management                    | <ul style="list-style-type: none"> <li>▪ Focal points</li> <li>▪ Formal agreements and protocols</li> <li>▪ Networks and communication linkages</li> </ul>                        |
| Product design, development and dissemination | <ul style="list-style-type: none"> <li>▪ Advisory committee</li> <li>▪ Reference groups</li> <li>▪ Peer review</li> </ul>                                                         |
| Product evaluation                            | <ul style="list-style-type: none"> <li>▪ User surveys</li> <li>▪ Commissioned critiques</li> </ul>                                                                                |
| Joint projects                                | <ul style="list-style-type: none"> <li>▪ Collaborating activities</li> <li>▪ Task force/working groups</li> <li>▪ Letters of agreement</li> <li>▪ Consulting contracts</li> </ul> |

| Purpose                            | Mechanism                                                                                                                                                               |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Access to scientific expertise     | <ul style="list-style-type: none"> <li>▪ Expert networks</li> <li>▪ Task forces</li> <li>▪ Peer review</li> </ul>                                                       |
| Indicator research and development | <ul style="list-style-type: none"> <li>▪ Task force</li> <li>▪ Scientific network</li> <li>▪ Contacts with research institutes</li> <li>▪ International fora</li> </ul> |
| Policy Analysis                    | <ul style="list-style-type: none"> <li>▪ Advisory committee</li> <li>▪ Task force</li> <li>▪ Scientific network</li> <li>▪ Peer review</li> </ul>                       |
| Capacity building                  | <ul style="list-style-type: none"> <li>▪ Focal points</li> <li>▪ Letters of agreements</li> <li>▪ NIEAR courses and training</li> <li>▪ Regional networks</li> </ul>    |



## AFRICA ENVIRONMENT OUTLOOK

## 7.0 COMMUNICATION STRATEGIES FOR NIEAR REPORTING

Without adequate communication, work that goes into the national state of environment reporting has little or no impact, and it may become yet another important report that gathers dust on shelves without reaching the target audience.

Voluminous NIEA reports loaded with technical jargon can be intimidating to the non-scientist. Important messages about critical trends and policy options are often scattered through the text. Such reports need communication strategies and plans that make the highlights readily available and understandable to key audiences, a diverse group with different needs and levels of understanding of environmental issues. The people who prepare environmental assessment reports not have to be communications experts, but they should be able to make strategic communication decisions and guide the communications experts who prepare and deliver the messages.

Successful communication is not an add-on in the process of NIEAR preparation. It must be built into the way the mandated institution plans and conducts its work. Communication must be a part of strategic planning if the mandated institution is to successfully articulate its vision and communicate its messages. Communication is a process with its own rules and procedures. One should not blame the audience if one's message is not understood. To be effective, one must set goals, know the audience, prepare the necessary material, and spend the time needed to deliver effectively.

For purposes of these guidelines a flexible communications model is proposed in **Table 7.1** below:

Table 7.1: An example of a flexible Communications Model

1. Management and experts decide there is an issue.
2. A communications plan is built
3. Creates an advisory group: multi-stakeholder, collaborative, solution seeking.
4. Sets long-term goals. Refines the goals.
5. Identifies stakeholders and audiences.
6. Determines their knowledge, beliefs, opinions, where they get information and whom they trust.
7. Researches what communication is currently being used by various parties.
8. Develops first message, based on research. Builds on existing credible messages.
9. Pre-tests message. Does it make sense? Trains communicators at agreed upon fora e.g. workshops.
10. Delivers messages. Helps others to deliver compatible message.
11. Consults, surveys and determines effectiveness of messages. This assessment process establishes a feedback loop.
12. Refines message based on feedback. Modifies messages. Develops other messages as necessary. Retains communicators as necessary.
13. Advises others on their messages.
14. Continues to deliver and modify messages overtime.

Source: IISD and UNEP (2000), 2<sup>nd</sup> edition

## **7.1 Making the message understandable by the audiences**

First, understand the audience being addressed. This can range from fellow experts to policy makers, political and business leaders, teachers, journalists and the average citizen. Aside from environmental specialists, most people are unfamiliar with scientific terms. Therefore, limit the use of scientific jargon, and if you think people may not understand the meaning of a certain technical term, define it in a few words. Choose the appropriate language and method of delivery for each audience.

## **7.2 Making the information relevant to the audiences**

Communication is like a two-way street. It is vital to listen to the audiences, and understand exactly what interests and is of relevance to them, before you tell them what you think they should know. First, find out what they understand, misunderstand, or do not know about. Use this information to shape your communication messages. For example, people's major concerns include health, income, and quality of life.

- How do environmental issues and trends affect these key areas of concern?
- Talk about risks to health and economic well-being.
- Talk about benefits of conserving resources and using them within their natural rates of regeneration.

## **7.3 Shape the delivery system for the audience**

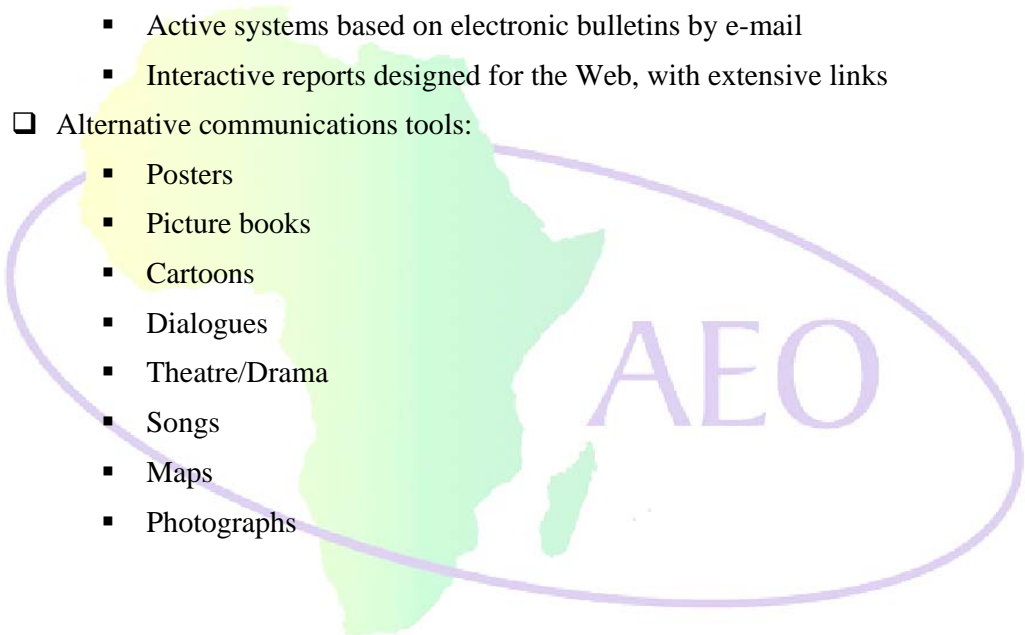
Choose a delivery system suited for each audience. Do not give long, technical reports to people who cannot understand them. Avoid boring people with overly long messages. Keep the initial messages short. Offer more detailed information to those who want it. Ministers and members of the legislature prefer a one or two – page summary.

The media like a one-page press release with a few pages of details, including illustrations. Television stations need moving images. Only specialized audiences have the time and interest to read the full report.

- Develop your own delivery system, using proven communications tools.
- Build working relationships with other message carriers, including other institutions, non-governmental organizations, civil society groups and educators.
- Make use of the new opportunities offered by current advances in Information Communication Technology (ICT) to distribute the message.

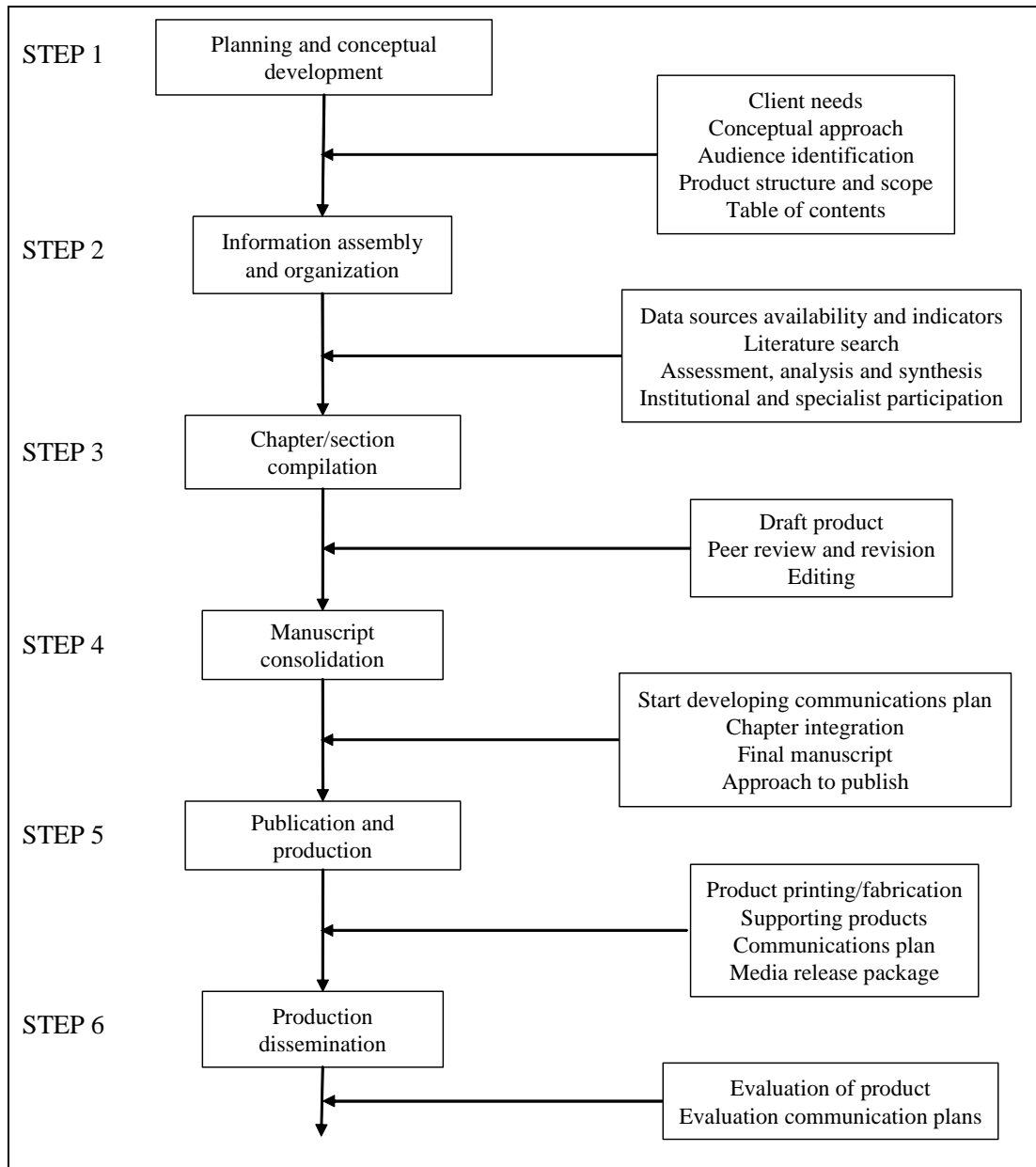
## **7.4 Consider a full range of communications options**

- Those largely oriented to print:
  - State of the environment reports
  - Summary reports with highlights
  - Periodic reports on critical issues
  - Actual Books on the Environment e.g. for school teaching
  - Bulletins on new developments
  - Articles written by experts or professional writers
  - Newsletters / Newspapers

- Policy briefs
  - Fact sheets
  - Thematic briefs
  - Translations into local governments
  - ☐ Radio and Television:
    - Pre-recorded messages
    - Interviews
    - Thematic video scripts
  - ☐ Internet-based reporting:
    - Print reports put on-line in various formats
    - Passive reporting systems available on demand
    - Active systems based on electronic bulletins by e-mail
    - Interactive reports designed for the Web, with extensive links
  - ☐ Alternative communications tools:
    - Posters
    - Picture books
    - Cartoons
    - Dialogues
    - Theatre/Drama
    - Songs
    - Maps
    - Photographs
- 

## AFRICA ENVIRONMENT OUTLOOK

Figure 7.1: Possible flowchart of an ideal NIEAR process.



Source: Modified after Rump, 1996

## 8.0 NIEAR STYLE CONVENTIONS

The following style guide has been prepared to assist in the preparation of various NIEAR sections. They very close to those adopted for AEO and GEO reports. The idea behind this style guide is to ensure that there is consistency within the report parts such that the whole ultimately reflects consistency.

### 8.1 General rules

- Use English spelling not American
- Use Oxford style not Collins (*The Concise Oxford Dictionary is the best reference book*). This means using ‘-ize’ endings as in ‘organize’ not ‘organise’ in nearly all cases (but never after ‘y’, as in ‘analyse’).
- Use the Harvard system for references (Odum 1996a); never number your references.
- Typical style for a book and a journal reference (respectively) are as follows:
  - Ainsworth, M. D. (1996). *Journey across Africa*. Heinemann, London.
  - Tinbergen, N. (1972). Functional ethology and the human sciences. *Proc. R. Soc.* B182,385–7.
  - Note that only the published title (title of a book or journal) takes italics
- Use initial capitals (as in Prime Minister) very sparingly and only when absolutely necessary.
- Use only metric units, with their correct SI abbreviations
- In the text spell out numbers one to ten (unless followed by units), and put numbers higher than ten in numerals (15 lions and 19 leopards); sentences that contain both numbers less than ten and greater than ten should use numerals (‘5 lions and 12 leopards’)
- Do not use a full point after contractions (Dr, Mr, Ms, and so on), only after abbreviations (for example, ed. for editor).
- Avoid Latin words wherever possible; many NIEAR users cannot be expected to know Latin, use the English equivalent (‘among others’ for *inter alia*, ‘for example’ for *i.e.*, and so on).
- Distinguish levels of sidehead carefully: bold caps for level 1, bold upper and lower case for level 2, italics for level 3; try to avoid using more than three levels of sidehead or readers will get lost in the structure.

### 8.2 References

- Use the Harvard system for references (Odum 1996) in text.
- Where you wish to refer to several publications by the same author in the same year, distinguish them in temporal order (Odum 1996a, Odum 1996b).
- Where two authors have the same name, distinguish them by including their initial(s) (Songo, A.L.; Songo, B.N.).

- Where references have multiple authors, include all the names in the first reference to the publication; thereafter use the form ‘Odum and others, 1969’.
- Never number your references (this gives rise to hideous renumbering problems every time you add or suppress a reference, unless you have an automatic system).
- Typical styles for a book and a journal reference (respectively) are as follows:
  - Ainsworth, M. D. (1996). *Journey across Africa*. Heinemann, London
  - Tinbergen, N. (1972). *Functional ethology and the human sciences*. *Proc. R. Soc B*182, 385–7.
- Where the reference is to a chapter in a book with a separate editor, use this style:
  - Ainsworth, A. (1969). *Fighting malaria*. In *Common Diseases of the 19th Century* (ed. B. Foss) vol. 4, pp. 114–5. Methuen, London.
- Note that only the published title (title of a book or journal) takes italics.
- Unpublished papers or personal communications are not published and therefore do not take italics.
- Names of books should be given in full, using initial caps for the major words in the title; names of journals should be abbreviated only where there is an official abbreviation and this is known to you.

### 8.3 Weights and Measures

The metric system is used for all statistical and scientific purposes. Units are abbreviated only when they follow a number; otherwise write out fully (except pH). If necessary, give explanation at first occurrence.

|                                                                              |                   |
|------------------------------------------------------------------------------|-------------------|
| Man-months                                                                   | m/m (tables only) |
| Parts per million                                                            | ppm               |
| Hectare                                                                      | ha                |
| Millimetre                                                                   | mm                |
| Centimetre<br>(Cm <sup>3</sup> , not cu cm or cc -- but a 125-cc motorcycle) | cm                |
| Metre                                                                        | m                 |
| Kilometre<br>(km <sup>2</sup> , not sq km)                                   | km                |
| Microgram                                                                    | µg                |
| Milligram                                                                    | mg                |
| Gram ( <b>not gramme</b> )                                                   | g                 |
| Kilogram ( <b>not kilogramme</b> )                                           | kg                |
| Kilocalorie                                                                  | kcal              |
| Decilitre                                                                    | dl                |

|                               |                       |
|-------------------------------|-----------------------|
| Litre                         | l (write out in text) |
| Metric tonne (tonne, 1000 kg) | t                     |
| Second                        | s                     |
| Minute                        | min                   |
| Hour                          | h                     |
| Day                           | d                     |
| Year                          | a (not yr.)           |
| Volt                          | V                     |
| Millivolt                     | mV                    |
| Kilovolt                      | kV                    |
| Megavolt                      | MV                    |
| Ohm                           | ohm                   |
| Ampere                        | A                     |
| Kilovolt ampere               | kVA                   |
| Watt                          | W                     |
| Kilowatt-hour                 | kWh                   |
| Hertz                         | Hz                    |
| Megahertz                     | Mz                    |

***To modify units of the metric system***

|           |   |            |
|-----------|---|------------|
| Pico (p)  | - | $10^{-12}$ |
| Nano (n)  | - | $10^{-9}$  |
| Micro (m) | - | $10^{-6}$  |
| Milli (m) | - | $10^{-3}$  |
| Centi (c) | - | $10^{-2}$  |
| Dec (d)   | - | $10^{-1}$  |
| Kilo (k)  | - | $10^3$     |
| Mega (M)  | - | $10^6$     |
| Giga (G)  | - | $10^9$     |
| Tera (T)  | - | $10^{12}$  |
| Peta (P)  | - | $10^{15}$  |
| Exa (E)   | - | $10^{18}$  |

Examples: nanometre (nm);  
megawatt (MW)

## 8.4 Numbers

- **No punctuation is used to separate thousands**, a space being left: 1 000; 2 312; 1 550 734 (except in years: 1989; page numbers: p. 1139; genotype names with numbers: 'Across 8047', 1566/1 x L-12).
- **The decimal** is a full point in English (while it is a comma in French and Spanish); numbers of less than one take a zero before the decimal point: 0.05.
- **Spell out 'per cent'** in text but use '%' in tables and Figures. Note the spelling of 'per cent' and 'percentage'.
- **In text, numbers from one to ten** are written in words, not numerals except before units (6 kg, 2 ha, 3 t), before the word million (7 million) although where the number is an approximation, two million, and so on, can be used.
- **Sentences containing Figures** in a fairly close and logical sequence or in a series take numerals: the number of graduates in the three courses were 3, 7 and 9; 25 villages, 10 districts, 3 regions; 4 automatic stage recorders and 9 stop gauges; 3 labourers, 6 foremen, and 4 consultants; the life of the system would be 25 years if built in Africa and 10 years if built elsewhere; in only 4 of 39 trials.
- When a phrase such as three-week course is preceded by another number, adjust accordingly: two 3-week courses; 27 three-week courses.
- **Fractions** are always hyphenated, whether adjective or noun: one-half, two-thirds.
- **Map scales** use the colon: a map at 1:50 000 scale.
- **If a sentence begins with a number**, it must be written out; to avoid awkwardness, it is sometimes better to rephrase the sentence. Numbers written out are hyphenated as follows: one hundred and sixty-seven; twenty-six; one hundred and nineteen.
- **Units** are not repeated: 3 x 5 cm; 0.7 to 1.5 ha; 15 and 21 t.  
Note: between 8 and 9 t; 8-9 t (not between 8-9 t); yield per hectare (not yield per ha); 7 kg/ha, 7 kg per hectare (but not 7 kg per ha)
- **Dates and time**
  - 09.00 hours; 15.30 h (not 09:00 hours, 9 a.m.)
  - from 6 to 10 September, or 6–10 September
  - on 8 May 1990 in Nairobi; or 8 May 1990, in Nairobi
  - 1 January 1990-12 June 1990
  - 1974-75 (period of two years);
  - all dates to be in the form 28 October 1997
  - from 1960 to 1961 (not 1960 to 61)
  - decades: the 1980s

centuries: the 20th century

- **Currencies**

For other currencies such as the United States dollar, use US\$. Note lack of space after \$: US\$120,000.



## AFRICA ENVIRONMENT OUTLOOK

## PART II: STEPS IN PREPARING A NATIONAL INTEGRATED ENVIRONMENT ASSESSMENT REPORT

### 9.0 STRUCTURE AND CONTENTS OF A NATIONAL INTEGRATED ENVIRONMENTAL ASSESSMENT REPORT

#### 9.1 Getting Started

The beginning point in the production process of a NIEAR is to get started. This sounds too obvious but is in fact a critical stage in the process.

During the “getting started” stage, 5 considerations have to be addressed. These have been partly addressed in Chapter 5. They include the following:

- a) Establish the institutional framework
  - Who should lead?
  - Who has the mandate to prepare a NIEAR?
- b) Determine which groups and individuals will participate in the production process
  - Who should be involved?
  - When do the various interests get involved?
  - Which institutions/organizations are expected to play key roles?
  - How can they be involved?
  - What mechanisms best foster their involvement?
- c) Establish or use existing relevant institutional structures to manage the production process:
  - Focal point:** Determine who or which unit in the mandated institution should be the focal point for the process.
  - Policy issues:** Determine who will address policy issues on behalf of the institution.
  - Technical support:** Establish possible sources of technical support.
- d) Determine the budget needed to cover the process including personnel time, travel, equipment and supplies, reporting costs and overheads
- e) Review and study funding mechanism:
  - Institutional funds – is NIEAR catered for in the budget?
  - National sources – Specific funds made available at national level for NIEAR outside the institutional budget?
  - NIEAR sources - cost recovery for second and subsequent editions?
  - External sources e.g. Donor, NGO, other grants?

## 9.2 Steps of Production

The actual production of the NIEAR is a step process as described below:

### Step 1: Preparation

- Inform all stakeholders about the process
- Orientation for all those to be involved
- Identify responsibilities for those participating in the process
- Set up NIEAR Task Force or Committee, identify expert drafters (authors), researchers, reviewers, editors, and establish technical working groups and an Advisory Committee. Bring all these into the process with clear Terms of Reference.
- Skills training (if applicable)
- Consensus building

### Step 2: Planning

- Identify client needs, including defining the readership
- Define conceptual approach and orient task force/committee on concepts
- Prepare report structure and scope
- Develop table of contents

### Step 3: Information Assembly and Organization

- Obtain institutional (other) and organizational cooperation in availing data and information
- Identify data sources and availability
- Identify appropriate indicators (for pressure, state, impact and response)
- Select key policies for analysis
- Carry out literature search

### Step 4: Chapter/Section Compilation

- Produce draft report
- Have draft report peer reviewed by technical task-force
- Revise draft report
- Ensure document flows
- Submit revised report for editing

### Step 5: Report Consolidation

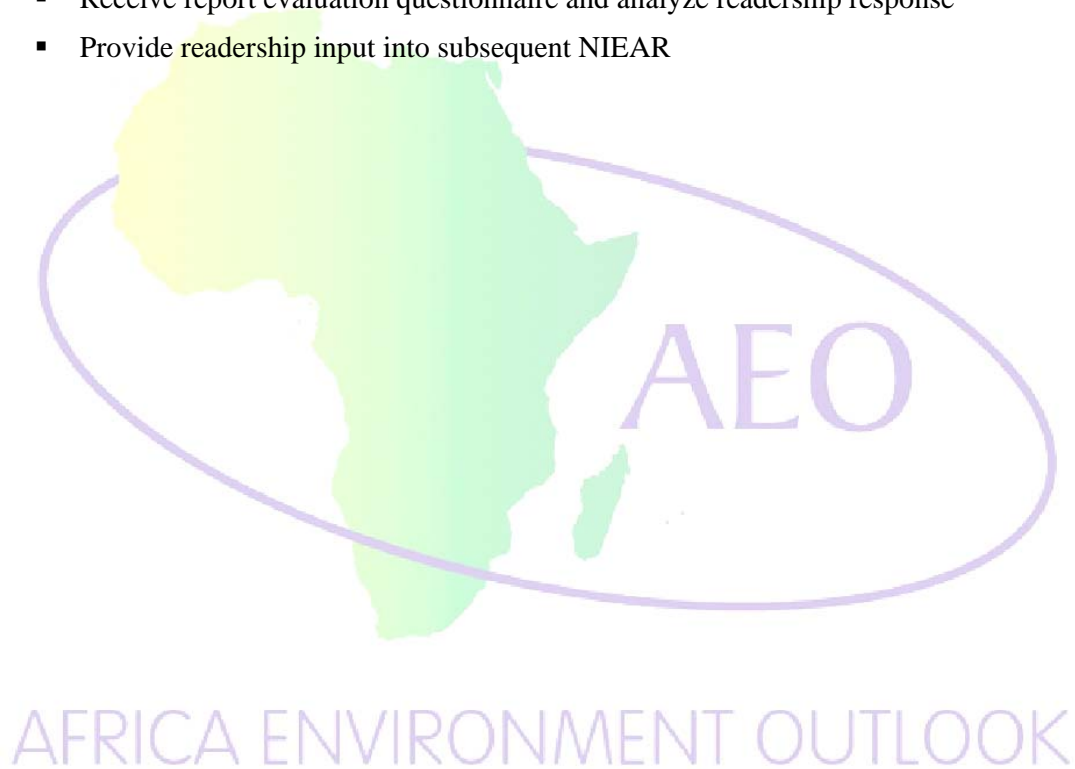
- Carry out chapter integration
- Prepare final report
- Have final report approved by relevant authorities
- Finalize report

### **Step 6: Publication and Dissemination**

- Arrange for printing of NIEAR
- Prepare a communication plan for the dissemination of NIEAR
- Prepare a media release package for the announcement of NIEAR
- Launch the Report
- Arrange for the dissemination of NIEAR
- Arrange for production of supporting products
- (Summary, synthesis, popular versions, youth version, children's version, etc)
- Prepare report evaluation questionnaire and administer it.

### **Step 7: Report Evaluation**

- Receive report evaluation questionnaire and analyze readership response
- Provide readership input into subsequent NIEAR



## **10.0 STRUCTURE AND CONTENTS OF A NATIONAL INTEGRATED ENVIRONMENTAL ASSESSMENT REPORT**

### **10.1 Introduction**

For purposes of making the NIEA reports compatible with the African Environment Outlook (and possibly the Global Environment Outlook), it is recommended that both reports adopt the same structure. This is important because then the NIEARs are the building blocks of the AEO and enrich the latter with national level examples. To the extent possible, countries should also use the same indicators as those applied at regional level. By doing so, countries can easily access useful data and information (about other countries or regional and sub-regional averages) for comparison in their reports.

There are five main components of the NIEAR in the current reporting structures. First is the section on Environment and Development. The purpose of this section is to explore the relationship between environmental stewardship and economic development. It focuses mainly on how environmental resources are the key engine to economic development. It also establishes the basis for the pursuit of the sustainable development paradigm.

The second section discusses the issues of natural resources endowment and management. The coverage here may be by theme or ecosystem. However, for the main reason that the expected response will be through sector institutions rather than ecosystem managers, treatment is usually by sector theme. Only themes that are important to a particular country and the issues therein should qualify for inclusion.

The third section discusses response to environmental change. It is aimed at identifying and describing the different types of responses that are being used to address environmental issues, and also tries, where possible, to assess their success or failure.

The fourth section attempts to look into the future using several scenarios. This is done for two reasons. First, it is evident that present day actions have consequences that reach far into the future. Second, there is need to look at the environmental issues that are likely to require priority attention in the future – those that affect resources irreversibly, or result in having a significant impact on the population.

The fifth section deals with the future outlook and the attendant recommendations. Based on the possible future situation given the current environmental management practices, this section makes recommendations for future action by policy and decision-makers. Looking at the emerging trends in environmental management in Africa, future NIEARs may opt for specific issue focus. Such specific issues should be relevant to the country's development goals, and help to show how environment relates to national policies and programmes. Examples could include Poverty reduction, Environmental impact of armed conflicts and Climate variability.

Thus, not all NIEARs will address the same areas, but each should reflect the country's priorities and cover the five sections of the reporting structure described above.

### **10.2 Structure of a National Integrated Environmental Assessment Report**

The following is a generic structure of a NIEAR from which individual countries may build their own structures.

Table of Contents  
Acronyms and Abbreviations  
Acknowledgements  
Foreword  
Preamble  
Executive Summary

Chapter 1: Environment and Development  
Chapter 2: State of the Environment  
Chapter 3: Response to Environmental change  
Chapter 4: The Future  
Chapter 5: Recommendations

List of Figures  
List of Tables  
List of Boxes  
List of Annexes  
References

### **10.3 Contents of the National Integrated Environmental Assessment Report**

Below are proposed contents of a NIEAR. Under each chapter suggestions of what should be covered and discussed are also presented. Depending on the state of environmental resources in each country, the detail of coverage and areas of emphasis may vary. The suggestions are therefore not exhaustive and neither do they constitute a requirement.

Chapter 1: Environment and Development

- Economic growth and Development in the country
- Linkages between economic growth and the environment
- Poverty and the environment

Chapter 2: State of the Environment

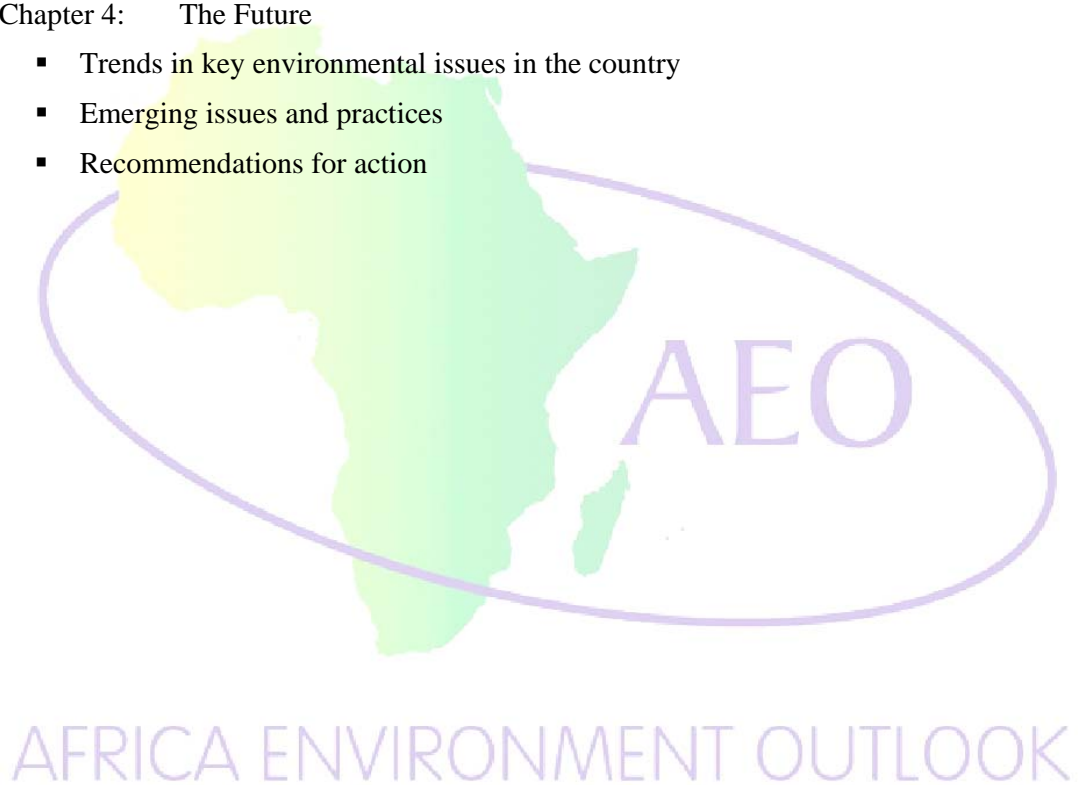
- Land
- Forests and woodlands
- Wetlands resources
- Freshwater resources
- Coastal and marine environments
- Biodiversity
- Urban areas
- Atmosphere
- Social welfare and the environment
- Environmental disasters

### Chapter 3: Response to Environmental change

- Environmental policies and reform
- Legal reforms for environmental management
- Economic instruments
- Local initiatives
- Public participation
- Environmental planning
- Environmental information and education
- Social policies
- Trans-boundary environmental management

### Chapter 4: The Future

- Trends in key environmental issues in the country
- Emerging issues and practices
- Recommendations for action



## **11.0 CONTACTS AND DISSEMINATION**

### **11.1 Contacts**

The main and most important contact for the country during and after NIEAR preparation is preferably the institution mandated to produce the report. A specific focal point office/person may be designated for this purpose. The audience needs to be advised that all queries concerning the NIEA report and its other products should be directed to this focal point. The latter should develop the capacity to respond to such queries. This is important since he/she represents the “face” of the institution and ultimately the report to the readership. The contact address of the focal point should be displayed prominently somewhere in the report.

### **11.2 Product Medium Mix**

There are three basic elements that are related to the dissemination of NIEAR products. First, the product medium mix has to be determined. Second, decisions associated with cost recovery and the price of the product need to be established (if the product is to be sold). Thirdly, communication and marketing aspects should be considered to maximize the reception and impact of the NIEAR information.

Traditionally, NIEAR products have been more often released as printed material in form of reports, statistical compendia, policy briefs or fact sheets. However, information technology involving improved telecommunications and computer networks is advancing rapidly and offers more effective ways of reaching clients. Print products are expensive and time consuming to prepare and disseminate. In addition, they represent a rather static form of information that is fixed until the next update is produced. However, for the majority of the NIEAR readership in Africa, print products are still the ones more accessible.

In Europe and North America, most Environmental Assessment Reports programmes use electronic media such as diskettes, CD-ROMs and net-worked information systems to disseminate information. For many African countries, this means that to change to such selective media, new skills related to computer use need to be developed at local levels. In addition, support for the citizenry to access the technology may need to be considered at national level.

The Internet, as the largest and most familiar global network of computers, offers substantial potential to communicate vast amounts of NIEAR information. All African countries are also connected on this global network and should therefore exploit the advantages it offers.

Visualization of NIEAR information is also an effective aid in communicating messages quickly and effectively. Such communication will be beneficial to societies with high illiteracy rates. A NIEAR can be presented in various forms of graphics including maps, drawings and photographs.

Through GIS technology, the production of stand-alone maps and NIEAR atlases is possible. This can help to strengthen the visualization process. A range of products and media has been suggested in Chapter 6 of this guide

### **11.3 Cost Recovery Decisions**

The decision concerning charging for NIEAR products and services is a matter for individual countries to determine. This will vary from country to country, depending on its laid down priorities. Such decision will be influenced by the concept of public benefit and

freedom of information, existing statutory requirements regarding access to information, and existing policies and practices.

In many developed countries information is increasingly perceived under a user-pay philosophy as a marketable product with revenue potential to supplement production costs. If such a policy is well perceived, re-investments of such revenue in the production of reports provide the potential to improve the quality and scope of environmental information. There is, however, a school of thought, which believes that information materials generated using public funds, should be made available free-of-charge. The freedom of access to (non-proprietary or confidential) information is also ingrained some national and international laws and policies. Nevertheless, the benefits of any cost recovery strategy must outweigh the costs associated with its implementation. Every country needs to give due consideration to this issue.

Cost recovery should not be seen as restricting the public freedom of access to environmental information. Furthermore, there is evidence that full cost recovery is not feasible. In practice, a realistic cost recovery approach aims at achieving the following two objectives:

- The maintenance of efficient and effective public access to environmental information.
- The equitable use of funds by increasing the costs (and therefore revenues) where products and services are provided to individuals or specific groups.

Where environmental information is provided to the population, it is appropriate to provide it free of charge. This would be the case with the dissemination of NIEAR information through the news media and through libraries. Furthermore, sample or promotional materials concerning the NIEAR products should be disseminated free of charge. Where products are individually retained or used by specific groups or customized to meet specific needs, user fees can be justified. Nevertheless, users should be consulted before fees are levied and especially at the initiation of a cost recovery approach.

Special considerations will be pertinent in certain cases. Products used for education purposes should be subsidized under the rationale that education benefits the country in the long run. Similarly it would be unfair not to consider a partner in the production of a NIEAR if there is any cost recovery approach (for example, GIS services and provision of data).

#### **11.4 Marketing Aspects**

The objective of a product marketing strategy is to maximize the access and use of the product to key audiences through the application of appropriate mechanisms. The marketing associated with the release of NIEAR information must be related to the particular purpose, audience and scope associated with individual products (see Chapter 6). With a well-defined user group, a simple strategy by way of press releases and marketing to the client lists may be sufficient for a specialized product.

A more structural and integrated plan may be required for comprehensive national or regional assessment involving a wide spectrum of clients. The target audience of a product determines the marketing strategy. For a big audience, for example, the use of mass media will be necessary. Special interest groups such as non-governmental or professional organizations usually have their own newsletters or journals that can be used for marketing

purposes. Where key client groups are concerned, such as politicians, opinion leaders or decision makers, special briefings to Government/Parliamentary Committees, Councils and Boards may be appropriate. Direct mailing to individual members can also be employed. Where appropriate, questionnaire surveys can be employed to provide information on the development of a strategy. Such surveys can provide guidelines on information needs, perceptions on previous products, suggestions for communication methods, distribution channels and price.

The marketing strategy should focus on the NIEAR product itself, providing an overview of the purpose and results of the assessment. The process used in the assessment is expected to have been relevant enough to gain acceptance and credibility of the product.

This will particularly be important if outside contributions in terms of extensive consultations, collaboration and partnerships have been employed to gain access to new scientific knowledge. Furthermore, it will be beneficial to provide background information on the NIEAR programme.

In terms of distribution channels, the country, through the mandated institution can use avenues normally available. Commercial publishers and media outlets can also be used. Table 11.1 illustrates advantages and disadvantages of different marketing approaches. These can be used in different combinations, depending on the type of product and local circumstances.

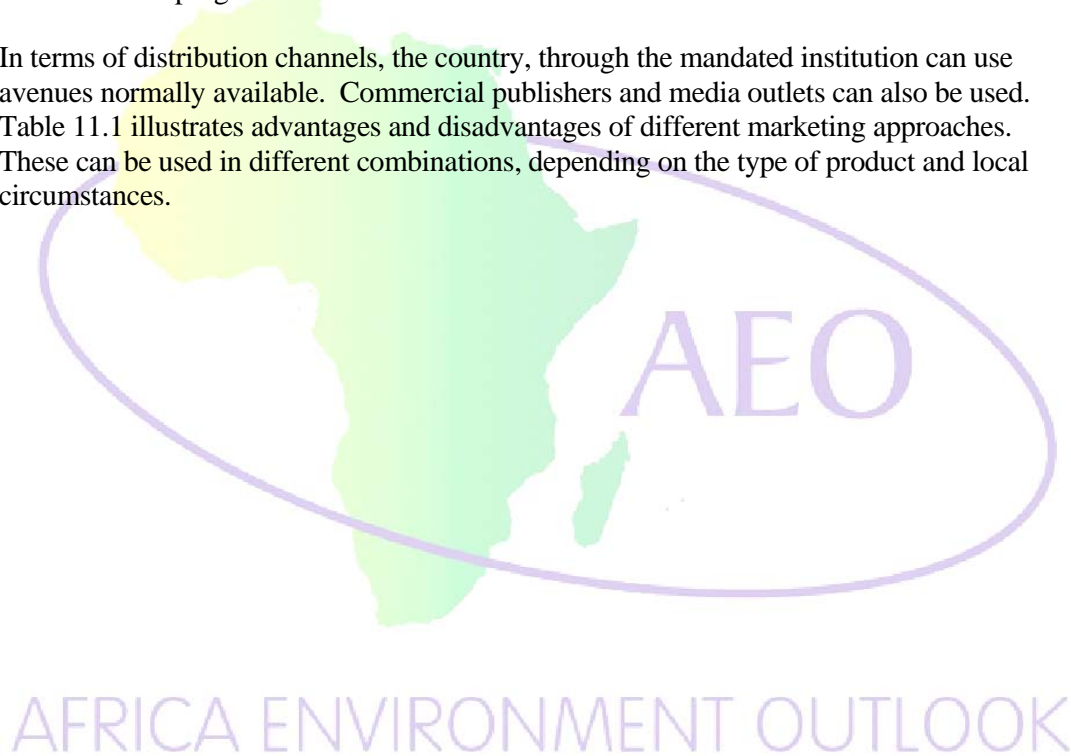


Table 11.1: Marketing Channels

| <b>Communication and Dissemination Channels</b> | <b>Advantages</b>                                                                                                                                                      | <b>Disadvantages</b>                                                                                          |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Direct marketing/ Client lists                  | <ul style="list-style-type: none"> <li>▪ Targeted to known clients</li> <li>▪ Low additional costs</li> </ul>                                                          | <ul style="list-style-type: none"> <li>▪ Ignores potential new clients</li> </ul>                             |
| Selective advertising                           | <ul style="list-style-type: none"> <li>▪ Targeted to specific client groups</li> <li>▪ Appropriate to products with narrow scope</li> </ul>                            | <ul style="list-style-type: none"> <li>▪ Less suitable for comprehensive multidimensional products</li> </ul> |
| Independent endorsements                        | <ul style="list-style-type: none"> <li>▪ Increases credibility and confidence in the product</li> </ul>                                                                | <ul style="list-style-type: none"> <li>▪</li> </ul>                                                           |
| Press release/Press kits                        | <ul style="list-style-type: none"> <li>▪ Focus for actual release</li> <li>▪ Maximize initial exposure</li> <li>▪ Opportunity to involve major contributors</li> </ul> | <ul style="list-style-type: none"> <li>▪ Passive channel, low involvement</li> </ul>                          |
| Press conference/ Product launch                | <ul style="list-style-type: none"> <li>▪ Focus for actual release</li> <li>▪ Wide dissemination and low cost</li> </ul>                                                | <ul style="list-style-type: none"> <li>▪ More planning and time consuming than press release</li> </ul>       |
| Public service advertisement                    | <ul style="list-style-type: none"> <li>▪ Maximum audience reach</li> </ul>                                                                                             | <ul style="list-style-type: none"> <li>▪ Passive channel, low involvement</li> </ul>                          |
| Newspaper Insert                                | <ul style="list-style-type: none"> <li>▪ Wide audience reach</li> </ul>                                                                                                | <ul style="list-style-type: none"> <li>▪ Significant additional cost</li> </ul>                               |
| Media interviews                                | <ul style="list-style-type: none"> <li>▪ Opportunity for in-depth review of the product</li> <li>▪ Can involve major collaborators</li> </ul>                          | <ul style="list-style-type: none"> <li>▪ Significant preparation</li> <li>▪ Time consuming</li> </ul>         |
| Special briefings                               | <ul style="list-style-type: none"> <li>▪ Targeted to major clients</li> <li>▪ Opportunity for in-depth review of the product</li> </ul>                                | <ul style="list-style-type: none"> <li>▪ Time consuming</li> </ul>                                            |
| Government information centers                  | <ul style="list-style-type: none"> <li>▪ Assistance for promotion and distribution</li> </ul>                                                                          | <ul style="list-style-type: none"> <li>▪ Limited reach compared to commercial bookstore</li> </ul>            |
| Distribution facilities of partners             | <ul style="list-style-type: none"> <li>▪ Wider reach than internal mechanisms</li> <li>▪ Increased credibility</li> </ul>                                              | <ul style="list-style-type: none"> <li>▪ Key messages may get diffused</li> </ul>                             |

Source: UNEP/DEIA (1996). Rump

## ANNEXES

### INDICATORS FROM VARIOUS SOURCES

Annex 1: Frequently Suggested Environmental Indicators

| THEME        | ISSUE                                    | POTENTIAL DATA VARIABLES                                                                                                                                                                                                                                                                                                                                                                                                   | PROPOSED KEY (LEAD) INDICATORS                                                                                                                                                                                                                                                                                       | UNITS                                                         | CURRENT PRIMARY (LEAD) DATA SOURCES                                                                                                                                                        |
|--------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Land         | Soil erosion                             | <ul style="list-style-type: none"> <li>◆ Water erosion (000 ton/ha)</li> <li>◆ Wind erosion (000 ton/ha)</li> </ul>                                                                                                                                                                                                                                                                                                        | ◆ <b>Average annual soil erosion rate</b>                                                                                                                                                                                                                                                                            | 000 ton/ha                                                    | ◆ <b>UNEP/FAO/ISRIC: GLASOD</b>                                                                                                                                                            |
|              | Desertification                          | <ul style="list-style-type: none"> <li>◆ Area affected by desertification (000 ha and %) of rainfed croplands, irrigated land, forest and woodlands</li> <li>◆ Livestock levels per km<sup>2</sup> in dryland area</li> <li>◆ Population living below poverty line in dryland areas</li> </ul>                                                                                                                             | <ul style="list-style-type: none"> <li>◆ <b>Total land affected by desertification</b></li> <li>◆ Population living below poverty line in dryland areas</li> </ul>                                                                                                                                                   | 000 ha, %<br>million, %                                       | ◆ <b>UNEP/FAO/ISRIC: GLASOD</b>                                                                                                                                                            |
|              | Land salinization                        | ◆ Areas affected by salinization and waterlogging (000 ha and % change)                                                                                                                                                                                                                                                                                                                                                    | ◆ Total area affected by salinization                                                                                                                                                                                                                                                                                | 000 ha, % p/y                                                 | ◆ <b>UNEP/FAO/ISRIC: GLASOD</b>                                                                                                                                                            |
| Forests      | Forest loss, Forest resources management | <ul style="list-style-type: none"> <li>◆ Forest management fractions (% protected)</li> <li>◆ Forest change / domestication by sector (to agric, urban)</li> <li>◆ Forest area change (open, closed, natural forests)</li> <li>◆ Deforestation rate (open, closed, natural forests)</li> <li>◆ Reforestation, natural and total, % success</li> <li>◆ Production &amp; trade of forestry products (wood, paper)</li> </ul> | <ul style="list-style-type: none"> <li>◆ Intensity of forest use (harvest / growth)</li> <li>◆ Area of forest and woodland</li> <li>◆ <b>Annual average change in forest area</b></li> <li>◆ Exports of forestry products (%)</li> <li>◆ Protected forest area</li> <li>◆ Regeneration/afforestation area</li> </ul> | % p/y<br>total, per cap, %<br>% p/y<br>% p/y<br>000 ha, % p/y | ◆ <b>FAO: FAOSTAT, FRA/SOFO</b>                                                                                                                                                            |
|              | Degradation of forest quality            | <ul style="list-style-type: none"> <li>◆ Volume distribution by major tree species group within each biome (ha per each biome)</li> <li>◆ Share of disturbed/deteriorated forests in total forest area</li> </ul>                                                                                                                                                                                                          | ◆ Share of affected forests                                                                                                                                                                                                                                                                                          | % of total forest area                                        |                                                                                                                                                                                            |
| Biodiversity | Loss of species                          | ◆ No. of species known (number) and threatened species (%) for Vascular plants, Mammals, Birds, Amphibians, Reptiles, Fresh water fishes                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>◆ Threatened plant species as % of total known plant species</li> <li>◆ <b>Threatened animal species as % of total known animal species</b></li> </ul>                                                                                                                        | %<br>%                                                        | ◆ <b>IUCN/WCMC: Red List</b>                                                                                                                                                               |
|              | Loss of habitat                          | ◆ Recorded wildlife habitat by ecosystem, for Forests (dry, moist, all forest), Wetlands, Mangroves, Grassland/savannah, Deserts/scrubland                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>◆ Total areas of wetlands/marshes</li> <li>◆ Total mangrove area</li> <li>◆ <b>Change in arable land area</b></li> </ul>                                                                                                                                                      | 000 ha<br>000 ha<br>000 ha                                    | <ul style="list-style-type: none"> <li>◆ <b>IUCN/WCMC: Protected Areas Database</b></li> <li>◆ USGS/EDC: Olson World Ecosys.</li> <li>◆ WWF: Ecoregions</li> <li>◆ FAO: FAOSTAT</li> </ul> |
|              | Wildlife Trade                           | ◆ Trade in flora & fauna (birds, reptiles, plants, mammals, butterflies, ornamental fish)                                                                                                                                                                                                                                                                                                                                  | ◆ Net trade in wildlife and captive-bred species                                                                                                                                                                                                                                                                     | Million US\$                                                  | ◆ CITES Secretariat                                                                                                                                                                        |
|              | Over fishing                             | ◆ Total inland, fresh water and marine fish catch, production, consumption and trade                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>◆ <b>Total &amp; per cap marine fish catch</b></li> <li>◆ Total fish catch in inland waters (incl aquaculture)</li> </ul>                                                                                                                                                     | 000 tons/year<br>000 tons/year                                | ◆ <b>FAO: FAOSTAT, FishStat, State of World Fisheries</b>                                                                                                                                  |
|              | Protected areas                          | ◆ National, international and local parks & protected areas: Biosphere reserves (terr. and marine),                                                                                                                                                                                                                                                                                                                        | ◆ <b>Total protected areas (number, size) and % of total land</b>                                                                                                                                                                                                                                                    | Number, Km <sup>2</sup> , %                                   | ◆ <b>IUCN/WCMC: Protected Areas Database</b>                                                                                                                                               |

| THEME                    | ISSUE                         | POTENTIAL DATA VARIABLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PROPOSED KEY (LEAD) INDICATORS                                                                                                                                                                                                                                                                                                                                            | UNITS                                                                                                    | CURRENT PRIMARY (LEAD) DATA SOURCES                                                                                                                                                                                                                                                                            |
|--------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          |                               | Wetlands of international importance, World heritage sites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                          | ◆ UNESCO World Heritage List                                                                                                                                                                                                                                                                                   |
| Freshwater               | Freshwater resources          | <ul style="list-style-type: none"> <li>◆ Annual internal renewable water resources</li> <li>◆ Annual river flows from/to other countries, by basin</li> <li>◆ Annual consumption by sector (domestic, industry, agric)</li> <li>◆ Annual groundwater recharge</li> <li>◆ Annual groundwater withdrawals by sector</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>◆ Annual internal renewable water resources per cap</li> <li>◆ <b>Annual freshwater consumption per cap</b></li> <li>◆ Population with water stress</li> </ul>                                                                                                                                                                     | Km <sup>3</sup> /year,<br>m <sup>3</sup> /cap/year<br>Km <sup>3</sup> /year,<br>m <sup>3</sup> /cap/year | <ul style="list-style-type: none"> <li>◆ <b>FAO: AquaStat</b></li> <li>◆ <b>WRI: World Resources Database</b></li> <li>◆ UNESCO: World Water Resources</li> <li>◆ <b>UNH/GRDC: Runoff Fields</b></li> <li>◆ Univ. of Kassel: WaterGap</li> <li>◆ IGRAC (Int Groundwater Resources Ass. Centre) GGIS</li> </ul> |
|                          | Water quality                 | <ul style="list-style-type: none"> <li>◆ River pH, concentrations of oxygen (DO, BOD), coliforms, particulates (TSS, TDS), nitrates (NO<sub>3</sub>, NH<sub>4</sub>, NP), phosphor (PO<sub>4</sub>), metals (HMs), pesticides</li> <li>◆ Fish biodiversity (reserves, specie no.)</li> <li>◆ Ground water pH, concentrations of nitrates, TDS (salinity), iron, chlorides, sulphates</li> <li>◆ Waste Water Treatment: % served, public expenditures</li> </ul>                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>◆ <b>BOD level of most important rivers</b></li> <li>◆ Nitrate level of most important rivers</li> <li>◆ Coliform count per 100 ml)</li> <li>◆ Pesticides concentrations in most important rivers</li> </ul>                                                                                                                       | mg/l<br><br>mg/l<br>no/100 ml,<br>µg/l,<br>US\$/capita                                                   | <ul style="list-style-type: none"> <li>◆ <b>GEMS/Water: Atlas of Global Water Quality, others</b></li> <li>◆ WRI: World Resource Database</li> </ul>                                                                                                                                                           |
| Atmosphere               | Climate change                | <ul style="list-style-type: none"> <li>◆ Anthropogenic emission of GHG (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, also HFCs, PFCs, SF<sub>6</sub>), total and by sector (transport, industry, agric, livestock, fossil fuels)</li> <li>◆ Emissions of precursors (NO<sub>x</sub>, CO, NMVOC, CH<sub>4</sub>), total and by sector</li> <li>◆ Emissions of acidifying gases (NH<sub>3</sub>, NO<sub>x</sub>, SO<sub>2</sub>), total and by sector</li> <li>◆ Atmospheric concentration of GHG, CO, SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub>, PM, Pb, VOC, O<sub>3</sub></li> <li>◆ Annual change of temp., precip.</li> <li>◆ Fossil fuel supply (% and intensity)</li> <li>◆ Rain water pH for selected areas</li> <li>◆ Expenditures on air pollution abatement and control</li> </ul> | <ul style="list-style-type: none"> <li>◆ <b>CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub> emissions per cap and per \$US</b></li> <li>◆ Global mean temperature rise</li> <li>◆ Global mean concentration of CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub></li> <li>◆ Fossil fuel consumption share</li> <li>◆ Renewables consumption share</li> </ul> | ton/cap, ton/US\$<br>oC<br>ppm<br>%                                                                      | <ul style="list-style-type: none"> <li>◆ CDIAC: Trends On-line</li> <li>◆ <b>UNFCCC: National Communications</b></li> <li>◆ IEA: Energy Statistics and Balances</li> <li>◆ IGBP/GEIA/RIVM: EDGAR Database</li> <li>◆ IPCC/CRU: Meam Monthly Climatologies</li> <li>◆ WMO: Climate Anomalies</li> </ul>         |
|                          | Stratospheric Ozone Depletion | <ul style="list-style-type: none"> <li>◆ Production, consumption, import &amp; export of CFCs, Halons, HCFCs, Methyls, CCl<sub>4</sub></li> <li>◆ Atmospheric ODS concentration over selected cities (parts per trillion)</li> <li>◆ Ozone levels/Total Ozone column over selected cities (Dobson units)</li> <li>◆ Ground level UV-B radiation over selected cities</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>◆ Total ODS production by compound</li> <li>◆ <b>Total ODS consumption per capita</b></li> </ul>                                                                                                                                                                                                                                   | ODP tons,<br>kg/cap                                                                                      | <ul style="list-style-type: none"> <li>◆ <b>UNEP Ozone Secretariat</b></li> <li>◆ World Ozone &amp; Ultrav. Rad.Data Centre</li> <li>◆ AFEAS Production, Sales and Emissions</li> </ul>                                                                                                                        |
| Coastal and Marine areas | Coastal & Marine pollution    | <ul style="list-style-type: none"> <li>◆ Average annual sediment load</li> <li>◆ Average annual untreated waste disposal by sector (dom. Ind. and agric – fertilizers, pesticides/insecticides)</li> <li>◆ Discharge of oil into coastal waters (000 ton)</li> <li>◆ Concentrations of HMs (Hg, Pb, Cd, Cu, Fe, Mn,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>◆ Average annual sediment load</li> <li>◆ Average annual untreated waste disposal by sector (dom/ind/agric, fertilizers, pesticides/insecticides.)</li> <li>◆ <b>% of urban population living in</b></li> </ul>                                                                                                                    | ton/year<br>ton/year,<br>%<br>%                                                                          | <ul style="list-style-type: none"> <li>◆ UNEP Regional Seas Programme and Global Programme of Action (GPA)</li> <li>◆ WCMC: Protected Areas Database</li> <li>◆ IMO: Global Waste Survey</li> <li>◆ <b>UNSTAT: UN Common Database</b></li> </ul>                                                               |

| THEME                         | ISSUE                   | POTENTIAL DATA VARIABLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | PROPOSED KEY (LEAD) INDICATORS                                                                                                                                                                                                                                                                                                  | UNITS                                        | CURRENT PRIMARY (LEAD) DATA SOURCES                                                                                                                                                                                                                                                                                                                |
|-------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               |                         | <ul style="list-style-type: none"> <li>Ni, Co)</li> <li>◆ Concentration of PCBs</li> <li>◆ Industrial activities in coastal region</li> <li>◆ Share of pollution caused by sector ( domestic, industrial, urban, coastal, transport, refineries)</li> <li>◆ Coastal population (growth, urban share)</li> <li>◆ Tourist arrival in coastal marine areas (million/year)</li> <li>◆ Number of hotels/resorts in coastal areas (000)</li> </ul>                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li><b>coastal areas</b></li> <li>◆ Area of Exclusive Economic Zone (EEZ)</li> </ul>                                                                                                                                                                                                         | km2                                          | <ul style="list-style-type: none"> <li>◆ ICLARM: ReefBase, FishBase</li> <li>◆ WRI: Reefs at Risk</li> <li>◆ G3OS (GOOS, GTOS, GCOS)</li> </ul>                                                                                                                                                                                                    |
| Disasters                     | Natural disasters       | <ul style="list-style-type: none"> <li>◆ Occurrences, financial damage and casualties (people affected, homeless, injured, killed) related to Floods, Droughts, Cyclones, Earthquakes, Landslides, Volcanic eruptions, Forest fires</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>◆ <b>Totql number of natural distarers p/y</b></li> <li>◆ Total number of people affected by natural disasters</li> <li>◆ Economic loss due to natural disasters</li> </ul>                                                                                                              | 000, million US\$                            | <ul style="list-style-type: none"> <li>◆ <b>OFDA/CRED: EM-DAT</b></li> <li>◆ Munich Re: Annual review of nat. dis.</li> <li>◆ UN-OCHA: ReliefWeb</li> <li>◆ UN-ISDR</li> </ul>                                                                                                                                                                     |
|                               | Human-induced disasters | <ul style="list-style-type: none"> <li>◆ Occurrences, financial damage and casualties (people affected, homeless, injured, killed) related to transport and industrial accidents</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>◆ <b>Total number of techn. accidents p/y</b></li> <li>◆ Total number of people affected by technological accidents</li> <li>◆ Economic loss due to techn. Accidents</li> </ul>                                                                                                          | 000, million US\$                            | <ul style="list-style-type: none"> <li>◆ OFDA/CRED: EM-DAT</li> <li>◆ UN-ISDR</li> </ul>                                                                                                                                                                                                                                                           |
| Urban Areas                   | Urbananization          | <ul style="list-style-type: none"> <li>◆ Urban population, total, growth rate,</li> <li>◆ Number of cities with over 750,000 population</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>◆ <b>Average annual urban population growth rate</b></li> </ul>                                                                                                                                                                                                                          | %                                            | <ul style="list-style-type: none"> <li>◆ <b>UNPD: World Urbanization Prospects</b></li> </ul>                                                                                                                                                                                                                                                      |
|                               | Waste management        | <ul style="list-style-type: none"> <li>◆ Waste generation and disposal methods by sector: municipal, industrial, agricultural, hazardous</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>◆ <b>Municipal waste production per cap (solids+water)</b></li> <li>◆ Industrial waste generated per \$US</li> <li>◆ Hazardous waste production per \$US</li> <li>◆ Waste management fractions</li> <li>◆ Exposure to HMs, toxic chemicals</li> <li>◆ Share of recycled waste</li> </ul> | kg/capita<br>kg/000 US\$<br>kg/000 US\$<br>% | <ul style="list-style-type: none"> <li>◆ UNSTAT: UN Common Database</li> <li>◆ WRI :World Resources Database</li> <li>◆ UNEP Chemicals, Basel Conv. Secr.</li> </ul>                                                                                                                                                                               |
| Socio-Economic (incl. health) | Population and social   | <ul style="list-style-type: none"> <li>◆ Population, total and growth rate</li> <li>◆ Total fertility rate</li> <li>◆ Adult literacy (%) by sex</li> <li>◆ Education enrollment, net and gross (primary, secondary, tertiary), by sex</li> <li>◆ Education expenditures (prim., sec., tert.)</li> <li>◆ Labour force total (% population), by sector (agric., industry., services. and by sex</li> <li>◆ Telephones (main lines and cellular per 100 people)</li> <li>◆ Daily newspapers (copies per 100 people)</li> <li>◆ Radios (number per 100 people)</li> <li>◆ Televisions (number per 100 people)</li> <li>◆ Computers (number per 100 people)</li> <li>◆ Internet connections (number per 10000 people)</li> </ul> | <ul style="list-style-type: none"> <li>◆ <b>Average annual population growth rate</b></li> <li>◆ Population density change</li> </ul>                                                                                                                                                                                           | %, inh/km2                                   | <ul style="list-style-type: none"> <li>◆ <b>UNPD: World Population Prospects</b></li> <li>◆ UNESCO: World Education Statistics</li> <li>◆ <b>UNDP: Human Development Indicators</b></li> <li>◆ UNSTAT: UN Common Database</li> <li>◆ ILO: Laborsta Database, KILM indicators</li> <li>◆ <b>World Bank: World Development Indicators</b></li> </ul> |
|                               | Economy                 | <ul style="list-style-type: none"> <li>◆ Real GDP, total and per cap, annual</li> <li>◆ Power Purchasing Parity (PPP)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>◆ <b>GDP per capita</b></li> <li>◆ PPP per cap</li> </ul>                                                                                                                                                                                                                                | Const 1995 US\$<br>Intern. \$                | <ul style="list-style-type: none"> <li>◆ <b>World Bank: World Development Indicators</b></li> </ul>                                                                                                                                                                                                                                                |

| THEME | ISSUE                      | POTENTIAL DATA VARIABLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PROPOSED KEY (LEAD) INDICATORS                                                                                                                                                                                                  | UNITS                                                                                   | CURRENT PRIMARY (LEAD) DATA SOURCES                                                                                                                 |
|-------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|       |                            | <ul style="list-style-type: none"> <li>◆ Number of people in absolute poverty, rural and urban</li> <li>◆ Merchandise exports (value), total and by sector: manufactures, fuels/minerals/metals, services</li> <li>◆ Merchandise imports (value), total, food, fuels</li> <li>◆ Trade (% of GDP)</li> <li>◆ Terms of trade (1995=100)</li> <li>◆ Inflation, consumer prices (annual %)</li> <li>◆ Unemployment rate (%)</li> <li>◆ Total external debt total and % of GNP</li> <li>◆ Total debt service (as % of exports of goods and services)</li> <li>◆ Foreign direct investment, net inflows (% of GDP)</li> <li>◆ Official Development Assistance &amp; Aid (ODA)</li> </ul>                                                                                                                                                               | <ul style="list-style-type: none"> <li>◆ Value added as % of GDP by sector: agriculture, industry, services</li> </ul>                                                                                                          | %                                                                                       | <ul style="list-style-type: none"> <li>◆ Univ. of Purdue: GTAP</li> <li>◆ UNCTADWTO(ITC): COMTRADE</li> <li>◆ UNSTAT: UN Common Database</li> </ul> |
|       | Consumption and Production | <ul style="list-style-type: none"> <li>◆ Total commercial energy production, by sector: fossil fuels, hydro, nuclear, geothermal, biomass, solar, wind</li> <li>◆ Total commercial energy use, total and per cap</li> <li>◆ Traditional fuel use (% of total energy consumption)</li> <li>◆ Energy imports, net (% of energy consumption)</li> <li>◆ Renewable energy use (%)</li> <li>◆ Total electricity generation by sector: thermal, hydro, nuclear, non-hydro renewables</li> <li>◆ Total electricity consumption</li> <li>◆ % Population with access to electricity</li> <li>◆ Value added by sector: agric., ind., manuf., services</li> <li>◆ Distribution of GDP by demand sector: government consumption, private consumption, gross domestic investment, gross domestic saving</li> <li>◆ Defense expenditures (% of GDP)</li> </ul> | <ul style="list-style-type: none"> <li>◆ Total commercial energy production</li> <li>◆ Commercial energy consumption per capita</li> </ul>                                                                                      | Tons of oil equivalent                                                                  | <ul style="list-style-type: none"> <li>◆ <b>IEA: Energy Statistics and Balances</b></li> <li>◆ World Bank: World Development Indicators</li> </ul>  |
|       | Transport                  | <ul style="list-style-type: none"> <li>◆ Motor vehicles in use (per 000 people), by type of engine</li> <li>◆ Total length of motor ways (000 km)</li> <li>◆ Density of motor ways (km / 10,000 km<sup>2</sup>)</li> <li>◆ Road traffic intensity per unit of GDP (vehicle km / US\$)</li> <li>◆ Number of departures and arrivals (airports)</li> <li>◆ Energy consumption by road transport (% share of total consumption)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>◆ Road traffic intensity per unit of GDP</li> </ul>                                                                                                                                      | vehicle km / 000 US\$                                                                   | <ul style="list-style-type: none"> <li>◆ World Bank: World Development Indicators</li> <li>◆ <b>UNSTAT: UN Common Database</b></li> </ul>           |
|       | Agriculture and Livestock  | <ul style="list-style-type: none"> <li>◆ Agricultural production index</li> <li>◆ Food production index</li> <li>◆ Pesticide consumption (tones)</li> <li>◆ Fertilizer use (000 kg)</li> <li>◆ Livestock units (000 heads)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>◆ Use of nitrogen on agric. land</li> <li>◆ Use of phosphate on agric. land</li> <li>◆ <b>Use of pesticides on agric. land</b></li> <li>◆ Agricultural production value added</li> </ul> | Tons/km <sup>2</sup><br>Tons/km <sup>2</sup><br>Active kg / km <sup>2</sup><br>% Of GDP | <ul style="list-style-type: none"> <li>◆ <b>FAO: FAOSTAT</b></li> <li>◆ IFA: Fertilizers &amp; their use</li> </ul>                                 |

| THEME     | ISSUE                       | POTENTIAL DATA VARIABLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | PROPOSED KEY (LEAD) INDICATORS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | UNITS                                                                                                                                                                                  | CURRENT PRIMARY (LEAD) DATA SOURCES                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Human Health and Well-being | <ul style="list-style-type: none"> <li>◆ Population below poverty line, urban and rural, by sex</li> <li>◆ % Pop with access to safe drinking water, urban and rural</li> <li>◆ % Pop with access to sanitation services, urban and rural</li> <li>◆ No. Of people per physician, per hospital bed</li> <li>◆ No. Of people with access to health services</li> <li>◆ Government expenditures on health services</li> <li>◆ Calories supply, total and from animal food</li> <li>◆ Available calories as % of requirement</li> <li>◆ Malnutrition in children under five years</li> <li>◆ Average life expectancy, by sex</li> <li>◆ Crude death rate</li> <li>◆ Infant mortality rate</li> <li>◆ <b>Mortality incidence, by disease (malaria, respiratory infections, AIDS etc)</b></li> <li>◆ <b>Burden of disease (DALYs)</b></li> <li>◆ Percent of population affected by noise</li> <li>◆ Percent of human population in noise prone areas</li> <li>◆ Level of noise in urbanized cities</li> </ul> | <ul style="list-style-type: none"> <li>◆ % Of total population access to safe drinking water</li> <li>◆ % Of total population access to sanitation services</li> <li>◆ No. Of people per physician (000)</li> <li>◆ Infant mortality rate (per 1000 births)</li> <li>◆ <b>Caloric intake per cap</b></li> <li>◆ % Of GDP spent for health services</li> <li>◆ Mortality caused by respiratory infections</li> <li>◆ Mortality caused by communicable diseases</li> <li>◆ Disability-Adjusted Life Years (DALYs)</li> </ul> | <ul style="list-style-type: none"> <li>%</li> <li>%</li> <li>No. Per 100</li> <li>%</li> <li>Cal/day/pp</li> <li>%</li> <li>No. Per 1000</li> <li>No. Per 1000</li> <li>Yrs</li> </ul> | <ul style="list-style-type: none"> <li>◆ UNPD: World Population Prospects</li> <li>◆ <b>WHO: WHOSIS</b>, World Health Report, Global Burden of Disease</li> <li>◆ UNICEF: Childinfo.org</li> <li>◆ WHO/UNICEF Joint Monitoring Program (JMP)</li> </ul>                                                                                                                                                                                            |
|           | Governance                  | <ul style="list-style-type: none"> <li>◆ Environmental institutions, policies in place</li> <li>◆ Environmental conventions signed</li> <li>◆ No. Of conflicts, state failures</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>◆ Signatories to major Envoy. Conventions</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>◆ <b>UNEP/IUCN/FAO Ecolab</b></li> <li>◆ CIESIN: ENTRI</li> <li>◆ CIDCM SFTF Database</li> <li>◆ Worlbank Governance indicators</li> <li>◆ Transparency International: Corruption Index</li> </ul>                                                                                                                                                                                                          |
| Geography | Support data sets           | <ul style="list-style-type: none"> <li>◆ Admin boundaries (incl EEZ)</li> <li>◆ Infrastructure (roads, rivers, lakes)</li> <li>◆ Watershed boundaries</li> <li>◆ Cities (location, area)</li> <li>◆ Population density (time series)</li> <li>◆ Land cover &amp; vegetation (time series)</li> <li>◆ Soil units and characteristics</li> <li>◆ Elevation &amp; slopes</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>◆ <b>ESRI :ArcWorld, ArcAtlas</b></li> <li>◆ <b>WHO: UN EIP admin boundaries</b></li> <li>◆ <b>CIESIN: GPW</b></li> <li>◆ <b>WRI: River basins</b></li> <li>◆ <b>UNH/GRDC: Run-off Fields</b></li> <li>◆ <b>GEMS-Water: Atlas of Global Water Quality</b></li> <li>◆ <b>USGS/EDC: GLCC, HYDRO1k</b></li> <li>◆ <b>FAO: Soil Map of the World</b></li> <li>◆ <b>UN-Habitat: Urban Observatory</b></li> </ul> |

Source: Rump (1996)